Priority One Tauranga Moana

Our Energy Future

Energy in Western Bay of Plenty Subregion

An analysis of our regional energy context across stationary energy, transport and industrial process heat.

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Author/s: Timothy Allan
Contributors: Mike Pond (Beca)

1 Executive Summary

Energy in the Western Bay subregion

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Complex energy needs

Tauranga and the Western Bay have a complex range of energy needs that are being driven by: significant GDP growth (averaging 4.6% CAGR); additional step loads to industrial energy demand; and the drive to decarbonise to maintain social license and competitiveness in offshore markets.

Disconnection & a lack of engagement

Priority One has been involved with a range of central government led initiatives; Regional Energy Transition Accelerator (RETA), MBIE Energy Strategy, and the Transpower Major Capex Proposal. This has illustrated a disconnection between stationary energy and transport energy and demonstrated a lack of engagement and coordination within the wider industry and local government.

The result could be ongoing and significant constraints to both growth and the economy and an inability to effectively transition to low carbon fuels. To establish this energy strategy, we have taken a deliberately broad look, encompassing stationary energy, industrial process heat, and transport.

National context

New Zealand's renewables have reached 88% of 'electricity' generation in 2023. When we step back and look at total 'energy' consumption (including refined oil products such as petrol, diesel, and aviation fuel) renewables have dropped to 30.1% of our total. Energy self-sufficiency and energy intensity have declined or remained static.

Regional challenges

Regionally, we have limited electricity generation and are a net importer via the grid. Most of the Bay of Plenty generation is at the eastern end of the region (around Kawerau) but the bulk of the load is near the western end (near Rotorua and Tauranga), so power flow within the region is generally from east to west (Transpower 2023). There is one dominant 220kV double circuit into the region, which presents resilience issues should anything impact that line.

There is a limited amount of non-transmission solutions (solar, geothermal, batteries etc) at scale deployed either residentially or commercially.

Freight and logistics

The region has the largest port in New Zealand, the Port of Tauranga which transacts 50% of the value of goods exported by the region. The Bay of Plenty Regional Council completed a Community Carbon Footprint in 2021, this highlighted that the largest contributor to the region's emissions was transport at 44% (when marine freight is considered). The region's emissions have increased 12% in between the reporting periods of 2015/16 and 20/21. Transport emissions are hard to shift with technologies like hydrogen and biofuels for heavy vehicles and green methanol for shipping offering potential pathways to decarbonisation.

Industrial process heat

The Regional Energy Transition Accelerator (RETA) highlighted that 88% of the region's industrial process heat emissions are from natural gas. This is largely due to the fact the region has reticulated gas supply. This contributes 4.8% of the gross emissions to the region.

It anticipated due to international commitments and national policy and environmental statements, alongside changing consumer preferences, that gas demand will decline alongside declining supply from existing gas fields. This presents a challenge for regional process heat users. Biogas and biomethane have been investigated as a potential pathway for replacing natural gas, as it has the ability to utilise the same infrastructure.

Future of electricity

Starting in 2023, Transpower and Powerco entered a major capital expenditure process in the Western Bay. As a part of this, they formulated a set of consultation documents that looked at the electricity demand growth and resulting challenges through to 2050.

"*As demand continues to grow in the Western Bay of Plenty, transmission constraints will emerge.... To supply the fast-growing forecast load requires development within the distribution network as well as the transmission system*"

Transpower and Powerco have taken both a top-down and bottom-up review of demand through to 2050, looking at the base growth, step loads (new demand from manufacturing and other new developments etc.), uptake of EVs, decarbonisation of industrial processes and transport, along with the uptake of solar and battery storage. Our peak (winter) demand is projected to increase from just under 300MW to just over 500MW, while total energy demand annually rises from 1.3TWh to over 2.4TWh in 2050. Step loads are expected to play a major role in driving growth in the region in the next 10 years, contributing 84MW to 108MW to peak growth by 2030.

Pathway to Net Zero.

New Zealand signed-on to the legally binding Paris Agreement, which commits the country to achieve net-zero emissions by 2050. In addition, the country has established an interim target of a 10% reduction in emissions from 2017 levels by 2030. Internationally, there are incoming directives that will impact our exporters such as the Carbon Border Adjustment Mechanism (CBAM), which is aimed at preventing carbon leakage across borders with countries that have less stringent climate policy. This creates an imperative for businesses to decarbonise over the next 25 years.

Technical, economic and political uncertainty

Business have expressed there is considerable technical, economic and political uncertainty. This is impacted by changing policy and regulatory settings (both here and abroad), evolving customer preferences, a rapidly evolving macro-economic environment, and the difficulty of selecting the right technology before mainstream adoption. The future, security and cost of energy were front of mind for businesses across the spectrum.

Regional opportunities

Within our region there are specific technologies which could be further developed for commercial application including Geoheat, biomass, and biomethane. These can reduce the region's GHG emissions and improve our energy resilience. These nascent technologies need to be developed further before commercial application by regional businesses.

Interdependence

There is a high level of interdependence between stationary energy, process heat and transport energy. The solutions for decarbonisation are also highly connected and could be advantaged when considered together rather than separately. Some use the same base material (i.e. biomass) or could be made more cost effective through utilisation of new platform technologies (i.e. Geoheat).

Energy reporting

The Western Bay subregion currently does not have energy reporting across stationary, process heat and transport. This will present a challenge into the future when tracking our progress around the transition to low-carbon energy sources.

Decarbonisation is a significant regional threat

A significant part of our regional emissions is related to freight and logistics. Setting aside the debate of where these emissions should be attributed, they are hard to shift and have international commitments attached to their reduction. While there are a range of technologies available today, many require systemic change and are difficult for any one company to take ownership of. They require regional and national commitment to change.

Collaboration and coordination

Businesses have indicated a weakness in the current approach is a lack of collaboration and coordination. Most businesses are tackling the same or similar challenges in isolation and without the benefit of collective support.

Highly Regulated

The electricity sector and system in New Zealand are highly regulated. Who and how they are regulated is a key piece of information for politicians, local body analysts, businesses, consumers and investors.

Constantly evolving

Patterns of electricity demand and supply are constantly evolving - It's important to emphasise that there is not a static picture, but patterns of demand and supply are evolving rapidly. The reference to systems, loads, demands, supply and stats is not static.

Technology and Flex Markets

The role of technology and emerging flexible (flex) markets in the electricity sector are likely to play a key role in the future. Distributors are looking to utilise energy effectively across the spectrum more flexibly to meet the dynamic needs of both consumers and businesses.

1.1 Our Energy Future

The facilitated energy forums, attended by businesses within the region, developed a vision statement that articulated our energy future:

"Our region will be energy self-sufficient and a net exporter of clean energy, creating economic advantages and opportunities for growth. We will lead the way in low-carbon transport and industrial innovation, integrating energy systems with advanced infrastructure while ensuring energy equality and accessibility for every community."

The group set out some key themes:

1) Strategic and collaborative planning
    a) Clear business, regional, and community-focused plans are essential for guiding the energy transition, supported by flexible regulatory frameworks and strong collaboration across sectors.
2) Innovation and technology
    a) Developing and deploying innovative technologies (hydrogen, solar, wind, geothermal) and energy storage systems, alongside incentivising trials and clean energy projects, will be crucial.
3) Policy and financial support
    a) Financial incentives and enabling policies are necessary to accelerate the adoption of renewables, streamline processes, and support industries in transitioning to low-emissions solutions.
4) Learning from others
    a) A key theme is to adopt proven systems and solutions from other regions, learning quickly and implementing what works best for local contexts.
5) Community and stakeholder engagement
    a) Education, awareness, and engagement with local communities and businesses are seen as vital to driving collective action and fostering a smooth energy transition.

1.2 Energy Strategy

The goal of this work was to lead into the development of an Energy Strategy on completion of this review. That would done in conjunction with and be led by business. To support this Priority One has developed a programme of work over the next 12-18 months. It is anticipated that this strategy would be completed in 2025.

The key areas we would be seeking to address:

- There is not a coordinated regional energy strategy or reporting, meaning we do not know our current and future position.
- We are reliant on a singular significant line of energy supply into the region, which is a risk to our resilience.
- Our manufacturers are reliant on gas for process heat and will need to transition away from this in the near term.
- We are a freight and logistics hub and face significant pressure to decarbonise within the next 25-year period.
- It is currently more challenging to obtain consents required to implement new technology in our region compared to elsewhere.
- The high level of uncertainty facing businesses on transition requires a more collaborative approach and support from across the spectrum to succeed.

Outcomes

For the energy strategy to effect change it needs to be action oriented. Some of the key outcomes it needs to achieve:

a) Increase awareness and acceptance of the core issues at the regional leadership level, both politically and commercially.
b) Drive support from business to be able to translate strategy into action with the required level of financial support.
c) Create momentum, government acceptance, and ideally funding for this region to lead the decarbonisation of freight and logistics nationally.
d) Network with other regions (like Taranaki) with a view to collaborate on key technology and to combine the regional support for new technology platforms and projects.

Specific actions that would lead to outcomes:

1) Our Energy Future (Priority One)
    a) Put together a dedicated energy event to launch the energy strategy and the vision developed by our businesses and provide a catalyst for discussion and activity including:
        i) Case studies of innovation approaches being used in our region and New Zealand to solve energy problems across stationary energy, process heat and transport.
2) Support Business Transition & Resilience (Priority One)
    a) Information & Education (Priority One)
        i) Assist businesses by providing information and education opportunities around new technologies.
    b) Directly support the active transition to decarbonise energy systems and energy use regionally.
    c) Directly support the development of both new generation and non-transmission solutions within the region.
3) Form an Energy Leadership Group (Business led, Priority One facilitated)
    a) Drawn from industry and local government to coordinate our energy strategy, reporting, delivery and advocacy. Seek support and funding from the region to coordinate this activity and enable the group to perform specific research on behalf of industry.
        i) Assist with coordinating support for research into regional energy opportunities, to bridge the gap between research and commercial adoption, such as:
            (1) Geothermal
            (2) Biomass
            (3) Biogas
            (4) Hydrogen
    b) Start functional reporting on energy use for the region to understand our current position and to assist with planning.
    c) Develop a Regional Energy Plan using Dynamic Adaptive Planning Pathways (DAPP) for our region.

2 Background

Priority One has been involved in several national and regional initiatives over time that highlighted the interconnected nature of our energy system along with the fragmented nature of the information that relates to it.

Priority One's goal is to develop a coordinated picture of our current state and understand the challenges and opportunities for businesses in our region. It also sought to put together a more holistic picture of energy within our region across transport, stationary energy and process heat.

A series of facilitated forums/workshops were used as a mechanism to cover a range of topics, bringing together technology providers, experts, industry leaders and central and regional government.

These forums were structured around several different topics, enabling a deep dive into each area, with the team bringing these threads together into a combined overview that can be presented back to the business community.

They aimed to achieve the following:

- Promoting better awareness of the problem.
    - Sharing issues/concerns and bringing them together.
- Provoking discussion around the challenges.
- Informing our stakeholders.
    - Central government strategy.
    - Transpower 10 Year Strategy & MCP.
    - Powerco – Regional View (forecast).
- Showing the connected nature of the topics.
- Encouraging cross pollination.
- Generating insight through discussion.

This feeds into the Regional Energy Strategy that has be developed and will be used to support an integrated regional approach to energy.

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2.1 Aim for the Strategy

To create a coordinated picture of our energy future ranging across stationary energy, manufacturing, and transport. To drive investment into infrastructure and technology in our region to build resilience, GDP growth and higher value job creation.

2.1.1 Objectives of the Strategy Development Process

1. Establish and deliver forums/workshops to draw information out to inform the development of a regional strategy.
2. Leverage existing information, reports and summary materials generated at a local, regional and national level.
3. Compile a regional energy strategy and present back to a wider regional forum.
4. Consult with business and stakeholder organisations on the regional strategy to align.
5. Identify actions that can be taken by Priority One to facilitate the efficient and effective implementation of energy projects and infrastructure in the region. This will support both regional economic growth and decarbonisation.
6. Deliver strategy to central government, advocating for the needs of the region.

2.1.2 Outcomes

We were seeking wide ranging input, experiences, issues and opportunities around the production, management and use of energy in our region. Through canvassing a wide range of organisations, it will better inform the key issues, constraints, interdependencies and opportunities for the strategy. It will also add weight and credibility to the strategy when it is presented to central government.

1) Our goal was to document the output of the forums and alongside recently produced research and material around the topic, to bring together a coordinated perspective of the region's energy future. This would help inform policy, infrastructure commitments, and raise the awareness of this important part of our economy within the business community.
2) Creation of a document that synthesises all the various work components and regional input into an artefact/strategy. The intent is that this would be a common reference that would be updated biennially.

Out of these workshops, we hope to also identify a group of willing participants and contributors to engage on the region's energy future.

3 Acknowledgements

The foundations for this body of work are drawn from a range of sources and we would like to acknowledge the following key inputs and influences:

1) Beca: Mike Pond and the team at Beca have contributed to the development of the energy strategy, including the development and delivery of the workshops. Laura Robichaux also provided expert insight into the use of Dynamic Adaptive Pathway Planning (DAPP), which we are hoping to use downstream.
2) Transpower & Powerco Major Capex Process for the Western Bay of Plenty: The information that surrounded this consultation published by Transpower provided an excellent window into the structure, challenges and opportunities within our electricity transmission and distribution system.

3) **MBIE Energy Strategy (Freight & Supply Chain):** Priority One was involved with the coordination of the workshop in our region. This served to illustrate the benefit of bringing a disparate group of stakeholders together to create effective insights around how the decarbonisation of transport could work and some of the dynamics associated with it.
4) **EECA Regional Energy Transition Accelerator:** This body of work highlighted the challenges of industrial process heat within our region and identified some regional opportunities in biomass and geothermal that offer some real potential in our region.
5) **Bay of Plenty Regional Council and Tauranga City Council Community Carbon Footprint:** This report provides cut-through insight into the composition of our regional emissions.

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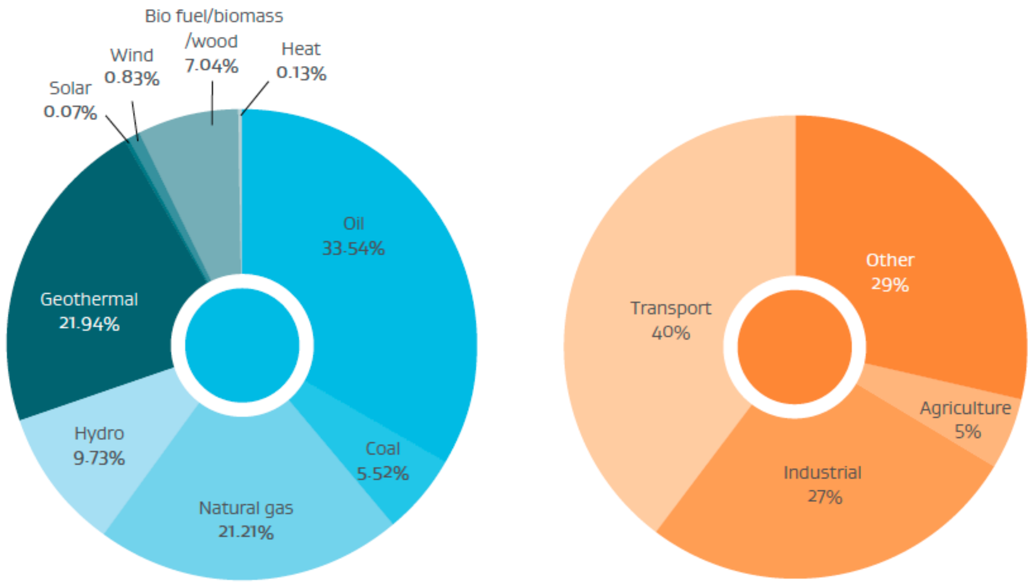
4 Context

4.1.1 National Context (MBIE 2024)

New Zealand's renewables have increased to reach 88.1% of electricity generation in 2023, driven by increases in hydro, wind and solar generation. However, when we step back and look at total consumption of energy, renewables have dropped and now comprise of 30.1% of our total. This includes refined oil products such as petrol, diesel, and aviation fuel.

Figure 1 Total Primary Energy Supply in New Zealand and source and fossil fuel by sector (MBIE, ARUP 2023).



Energy intensity[1] has declined over time from 3.5MJ/NZD$ GDP but has now flattened and sits at 1.97MJ/NZD$ GDP. This is due to slower economic activity and an increase in the commercial sector which is now the largest part of the economy.

Energy self-sufficiency is a measure of how much energy we import and export relative to the needs at a national level. It provides a view of how well we could meet our own energy needs through domestic production. Although the measure can't directly provide a true measure, given some of the energy imported is for specialised use.

[1] *Energy Intensity is a measure of energy used per $NZD of GDP. It is generated by dividing total energy use by GDP.*

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Table 1 National Energy Indicators (MBIE 2024)

Renewable Electricity	88%	↑
Renewable Energy	30.1%	↓
Energy Intensity	$1.97 MJ/NZD$ GDP	→
Energy Self Sufficiency	73%	→

Residential electricity use grew by 4.5% over the last 5 years becoming the biggest energy user in New Zealand largely through the addition of 75,000 new dwellings. Transport logged a 42.4% increase in electricity use from 2019, growing from 82GWh to 275GWh in 2023.

Industrial consumption has declined in large part due to reduced demand from the wood processing sector. Total generation increased 2.2% mainly through strong solar capacity growth at 42.1% and wind at 10.4%. It is still useful to look at the total proportion of generation by plant type as it is still dominated by hydro.

Table 2 Electricity Generation by Plant Type (MBIE 2024)

Hydro	61%	↑
Geothermal	18%	↓
Gas	9%	↓
Wind	7%	↑
Coal	2%	↓
Solar	1%	↑
Other	2%	

Figure 2 NZ Potential Additional Renewable Capacity (MBIE 2024)

GENERATION TYPE	Existing Capacity (MW)	Potential Capacity (MW)
Wind	700	10000
Geothermal	1000	1200
Hydro	5500	1000
Solar	50	2500

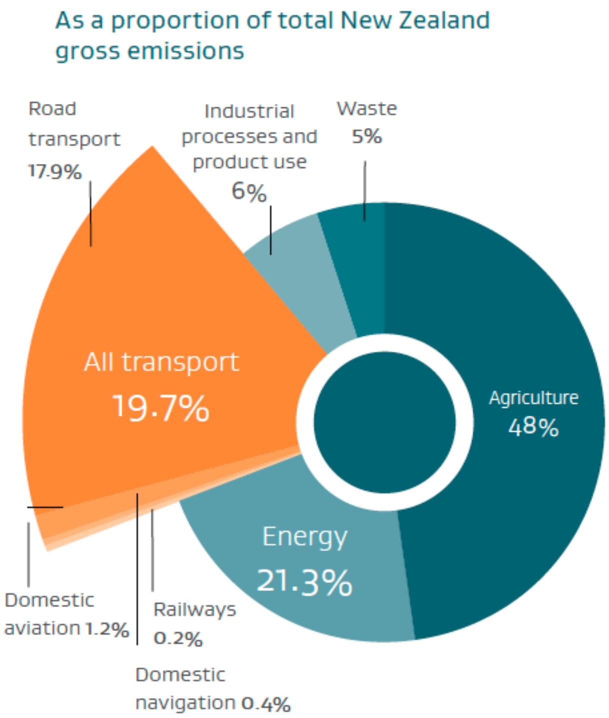
4.1.2 Direct Use

Whilst there is a focus on electricity production renewable energy is also used for direct applications such as industrial process heat. This includes geothermal, woody biomass, liquid biofuels, and biogas. The total supply of renewable energy fell to 363.8PJ in 2023, a 2.6PJ drop from 2022. This was driven by a decline in the wood processing sector, which offset increases in hydro, geothermal, solar, wind, and liquid biofuel supply. (MBIE 2024)

4.1.3 Emissions

New Zealand's total gross emissions at a national level are dominated by agriculture, transport and energy.

Figure 3 NZ Gross Emissions by Sector (MBIE, ARUP 2023).



4.2 Regional Context

The economy in the Western Bay of Plenty has had GDP growth 148% since 2000 with the population growing 76% over the same period adding 161,800 residents. Tauranga is home to the largest port in New Zealand, which exports 50% of the value of our goods. This growth has, however, placed a strain on our energy system and has also impacted our emissions and air quality. The Bay of Plenty region has an **emissions intensity** (Statistics New Zealand 2024) of 127.3 (tonnes CO_2-e per $millions of GDP), this compares favourably to other regions ranking in the top quarter. It is not clear what currently drives this, and that would be useful to know.

4.2.1 Total Primary Energy Consumption

There isn't currently reporting on the total primary energy consumption (not just electricity) for the Western Bay of Plenty subregion. The closest proxy we have can be drawn from the Tauranga and Bay of Plenty Community Carbon Footprint completed for the BOPRC by AECOM. The data shown below is for the wider Bay of Plenty Region, not just the Western Bay subregion. Emissions can provide a relative correlation to energy use at a high level, highlighting the biggest overall energy users.

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Table 3 BoP Region Emissions Summary tonnes CO_2 e[2] **(AECOM 2022)**

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Transportation	1,913,063	2,284,075	2,473,258	2,570,146	2,328,634	2,446,464
Agriculture	1,968,906	1,958,454	1,815,900	1,977,633	1,872,707	1,873,042
Stationary Energy	676,859	635,824	714,808	745,929	743,576	878,331
Waste	294,824	300,529	269,484	230,590	230,375	229,498
IPPU	90,644	99,633	109,941	112,412	109,742	110,668

The BoP Emissions Breakdown shows further detail as to what makes up the total emissions sources. This gives more specific insight into the contributing emissions sources within the bigger categories like energy and transport.

Table 4 BoP Emissions Breakdown **(AECOM 2022)**

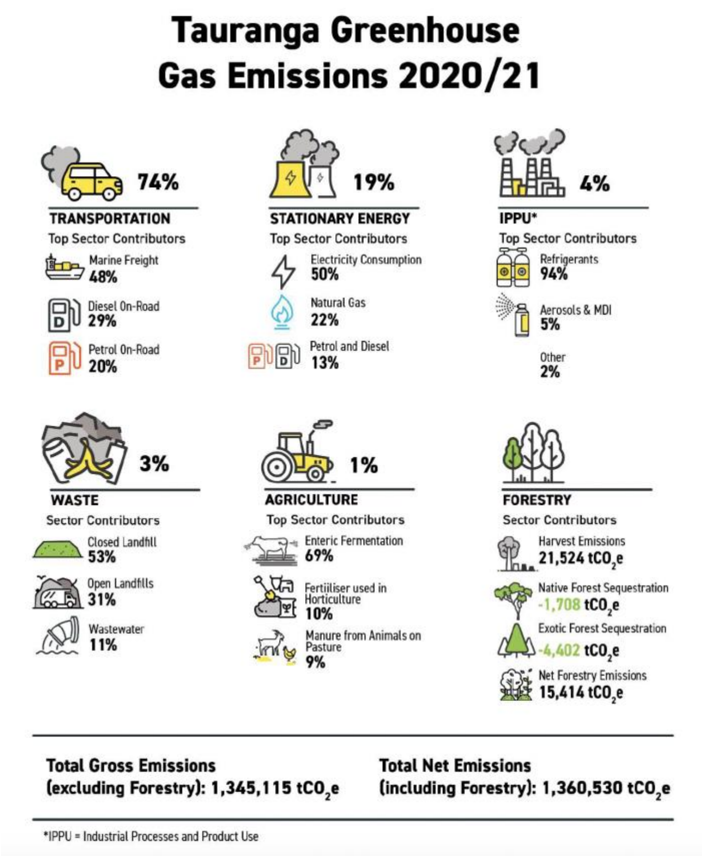
Emission Sources		2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Unit
Stationary energy	Residential	111,833	97,865	118,934	126,886	130,322	174,805	t CO_2e
	Industrial	403,963	381,057	417,895	431,778	430,872	487,067	t CO_2e
	Commercial	89,421	78,370	92,372	96,643	96,937	124,883	t CO_2e
	Other Sources	71,642	78,531	85,606	90,623	85,445	91,577	t CO_2e
Transportation	On-Road	1,026,778	1,098,598	1,170,387	1,213,877	1,123,048	1,206,652	t CO_2e
		-	-	-	-	-	-	t CO_2e
	Rail	29,958	29,384	28,809	28,235	25,327	25,456	t CO_2e
	Air travel	19,592	21,725	23,860	25,565	19,278	23,434	t CO_2e
	Marine	711,984	997,486	1,101,012	1,144,864	1,012,388	1,031,276	t CO_2e
	Off-Road	124,751	136,882	149,190	157,604	148,592	159,645	t CO_2e
Waste	Solid Waste Disposal	260,126	264,001	230,459	190,385	188,037	184,885	t CO_2e
	Composting (Green Waste)	1,880	1,907	1,933	1,885	2,783	3,682	
	Waste Water	32,818	34,621	37,092	38,320	39,555	40,931	t CO_2e
IPPU	Industrial Emissions, HFCs, PFCs, SF_6	90,644	99,633	109,941	112,412	109,742	110,668	t CO2e
Agriculture	Agriculture	1,968,906	1,958,454	1,815,900	1,977,633	1,872,707	1,873,042	t CO_2e
Forestry	Exotic Forest Sequestration	- 6,970,096	- 6,928,799	- 6,887,503	- 6,871,537	- 7,037,016	- 6,891,223	t CO_2e
	Native Forest Sequestration	- 447,287	- 447,159	- 447,030	- 446,901	- 446,901	- 446,901	t CO_2e
	Total Harvest Emissions	9,984,768	10,778,721	10,001,107	9,242,458	9,129,700	8,963,108	t CO_2e
Total (net) incl. forestry		**7,511,682**	**8,681,278**	**8,049,965**	**7,560,730**	**6,930,817**	**7,162,986**	t CO_2e
Total (gross) excl. forestry		**4,944,297**	**5,278,514**	**5,383,391**	**5,636,710**	**5,285,033**	**5,538,003**	t CO_2e

(IPPU - Industrial Processes and Product Use)

When specifically stepping down into Figure 4 Tauranga Greenhouse Gas Emissions (AECOM 2022) from the Bay of Plenty, the total contributions change. This does give a more concentrated view of the industrial hub of the Western Bay. The transport figure is likely distorted due to the inclusion of maritime transport emissions form the Port of Tauranga at a city level, as opposed to being more broadly allocated to exporters and importers that utilise the transport hub.

[2] *Carbon Dioxide Equivalents - a unit of measurement that compares the global warming potential of different greenhouse gases by expressing them as the equivalent amount of carbon dioxide emissions.*

Figure 4 Tauranga Greenhouse Gas Emissions (AECOM 2022)



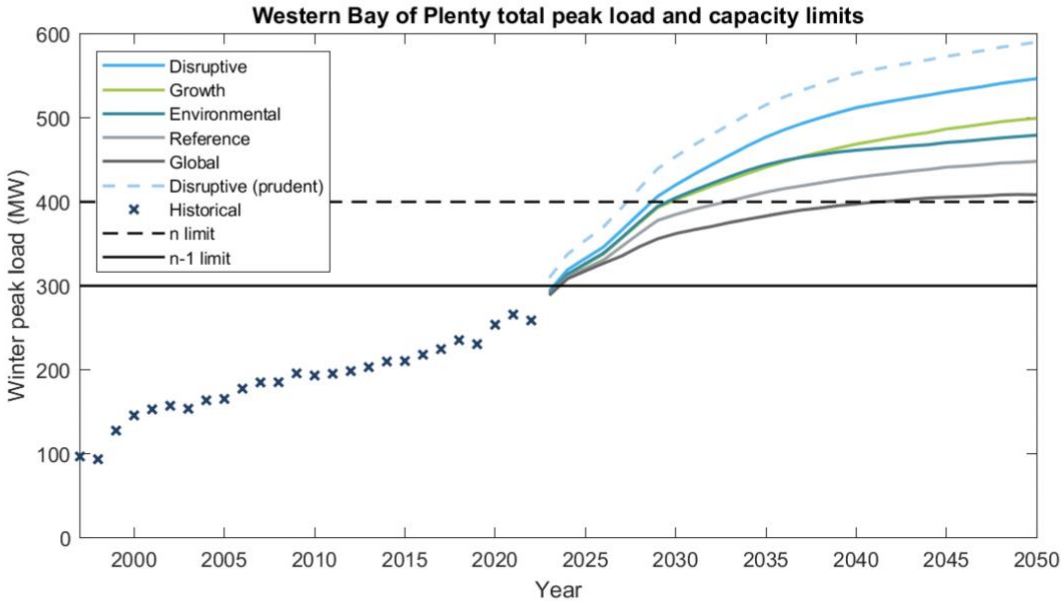
4.2.2 Electricity

Transpower began a Major Capex Consultation in 2023 with a view of upgrading the grid and distribution of electricity within the Western Bay of Plenty (through to 2050). Their consultation documents provided a great overview of the regional system and the challenges that increased demand has placed on the system.

The Western Bay is a net importer of electricity from the national grid with limited generation capacity locally, with the Kaimai hydro scheme at 40MW being the only substantive generation within the area. We are supplied from the south via the national grid through Tārukenga (Ngongotahā) and Ōkere.

Our peak (winter) demand is projected to increase from just over 280 MW increasing to 460MWover the next 15 years whilst total energy demand annually rises from 1.3TWh to over 2.4TWh in 2050. Step loads are expected to play a major role in driving growth in the region in the next 10 years, contributing 84MW to 108MW to peak growth by 2030 (Transpower 2023).

Figure 5 Regional load vs interconnection capacity (Transpower 2023)



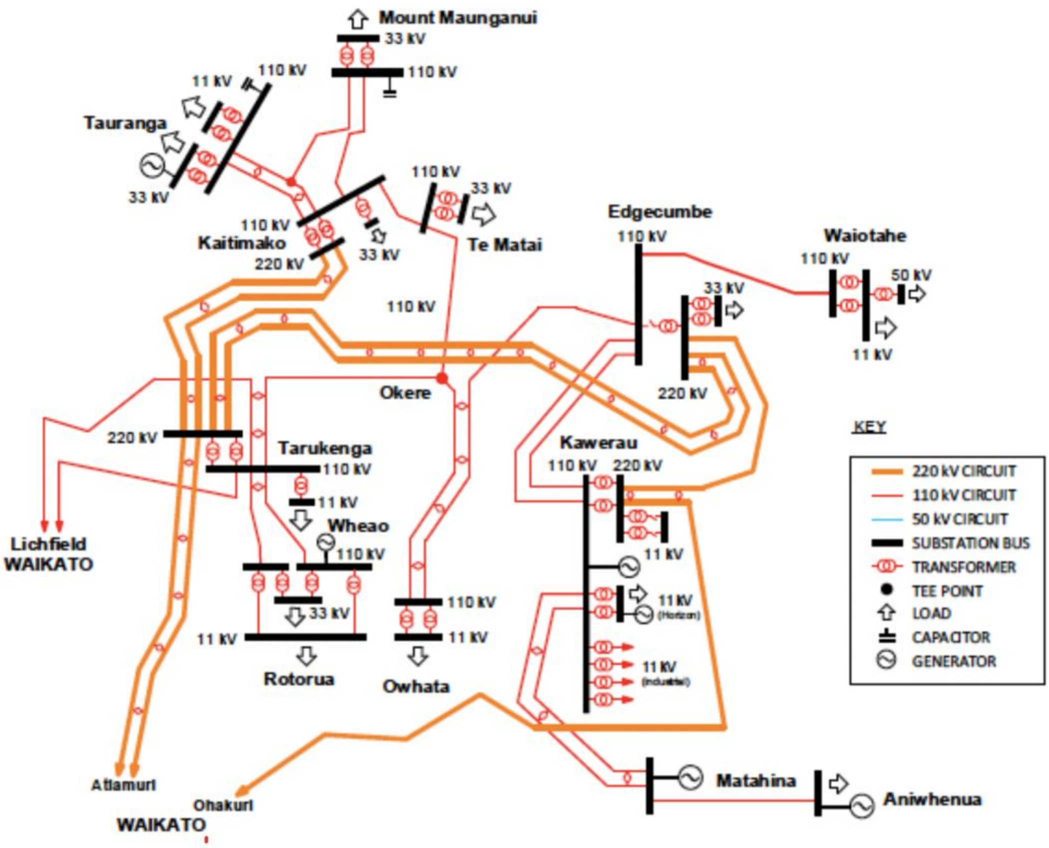
Note: Figure will be updated when then 2025 Transmission Planning Report is available.

The western bay of plenty is connected to the national grid via two high-capacity circuits providing N-1 level of security. However, there could be factors that could result in redundancy dropping to N from N-1[3] with risks of total loss of supply to Tauranga. External transmission can directly impact Tauranga's redundancy. "*The 220kV Atiamuri–Whakamaru and Ohakuri–Wairakei circuits connect the region to the rest of the National Grid. The Bay of Plenty load is predominantly supplied through these two circuits, and the region will be on N security whenever one of these circuits is out of service*." (Transpower 2023)

Most of the Bay of Plenty generation is at the eastern end of the region (around Kawerau) but the bulk of the load is near the western end (near Rotorua and Tauranga) so power flow within the region is generally from east to west.

[3] *An "N-1 rating" in the context of electricity supply means that a power system is designed to maintain stable operation even if a single major component, like a transmission line, transformer, or generator, fails, essentially ensuring continued power delivery despite a single contingency event; "N" represents the total number of components in the system, and "1" signifies the single component that can fail without causing a system-wide outage.*

Figure 6 Existing Supply Schematic (Transpower 2023)



Note: Figure will be updated when then 2025 Transmission Planning Report is available.

4.2.3 Proposed Changes

Transpower and Powerco have developed a preferred option (Figure 7 Preferred Option Upgrades (Transpower 2024)) for addressing the challenges of demand within the region.

They have done so taking the top (disruptive) forecast and aligned with the region's spatial planning. These combined upgrades strengthen internal distribution and capacity within the region but don't change the total import capacity. NTS solutions were initially ruled out of scope within the Short List documentation review period. However subsequently NTS funding request of $2.5m has been included in the WBoP MCP application and the Commerce Commission have recommended in their draft decision to grant this.

The changes, whilst providing improvements, don't directly address the resilience risk to the region on a long-term basis without strong active growth in NTS or the establishment of further grid scale generation within the region.

Figure 7 Preferred Option Upgrades (Transpower 2024)

4.2.3.1 Flexible Markets

An electricity flex market (short for *flexibility market*) is like a marketplace where people and businesses can get paid to use less electricity or shift their usage to different times—especially when the power grid is under stress.

Transpower believes the role of technology and emerging flex markets in the energy space creates opportunities and challenges. As identified in the strategy document, understanding and utilising technology is essential to supporting the achievement of the strategies renewable goals. However, they consider the scope of innovation and new technology needs to be considered broader. Its impact on behaviour, needs and expectations of residents and businesses in the region creates uncertainty when planning for the future.

Recognising the evolving ways of how energy can be generated, transported, stored and consumed will impact long term investment decisions for all interests in the region.

The Electricity Authority has published draft guidance on flexible markets within the New Zealand electricity markets. (Electricity Authority 2024).

4.2.4 Transport

Tauranga and the Western Bay is seen as a critical part of New Zealand's export and freight infrastructure. The Port of Tauranga accounts for about 50% of exports by value and is the fastest growing port in New Zealand. Export value of freight from Tauranga has grown by more than 250% in the last 10 years (Ministry of Transport 2023) and contributes 9% of NZ GDP.

In 2023 Heavy Vehicle (HV) Transport represents about 5.4% of total on road traffic with light commercial vehicles around 1.02% with cars at 93.62%. However, HV contribute 25% of the total GHG emissions regionally (Tauranga City Council 2023).

Further transport emissions breakdowns are available through the Community Climate Study (AECOM 2022) which provides a view of the largest transport emitters. This can be used to give a perspective on transport energy consumption. (*Noting again that waterborne navigation includes marine freight through the Port of Tauranga, which should be allocated to the source rather than just the specific entry/exit point*)

Figure 8 WBOP Subregion Transport Emissions Summary (AECOM 2022)

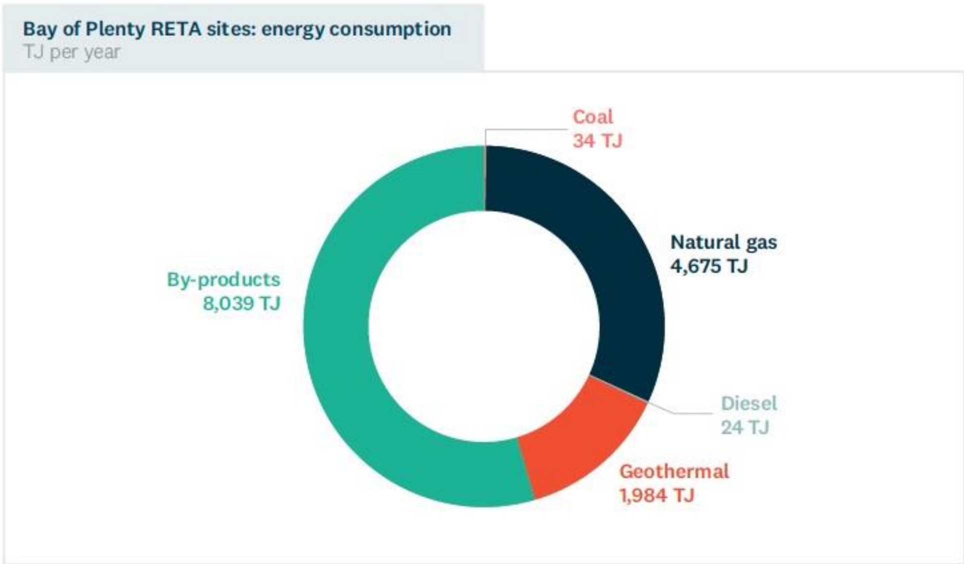
Transportation FY21		Total t CO2e		
		TGA	**WBOP**	**Total**
On road transportation		**430,315.57**	**284,396.494**	**714,712.07**
1	Emissions from fuel combustion on-road transportation occurring within the city boundary	430,315.57	284,396.494	714,712.07
Railways		**21,478.56**	**2.1**	**21,480.65**
3	Emissions from proportion of transboundary journeys occurring outside the city boundary	21,478.56	2.1	21,480.65
Waterborne navigation		**475,866.49**	**177,122.54**	**652,989.03**
1	Emissions from fuel combustion for waterborne navigation occurring within the city boundary	473,044.91	177,122.54	650,167.45

3	Emissions from proportion of transboundary journeys occurring outside the city boundary	2,821.59	0	2,821.59
Aviation		**12,190.09**	**4,564.35**	**16,754.44**
3	Emissions from proportion of transboundary journeys occurring outside the city boundary.	12,190.09	4,564.35	16,754.44
Off-road transportation		**55,287.08**	**38,242.36**	**93,529.44**
1	Emissions from fuel combustion for off-road transportation occurring within the city boundary	55,287.08	38,242.3592	93,529.44

4.2.5 Industrial Process Heat

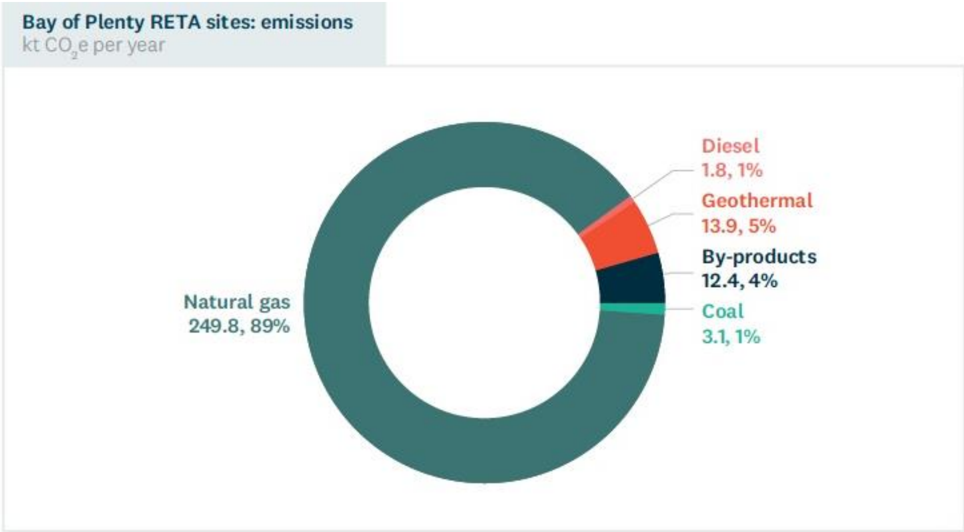
Industrial process heat was assessed by EECA through the Regional Energy Transition Accelerator (EECA 2024). This looked at industrial process heat users above 500kW. The 28 sites were assessed in this programme. (*The region was designated as 'Bay of Plenty Plus' as it contained the Kaingaroa Forest for assessment purposes*).

Figure 9 2022 annual process heat fuel consumption in BOP RETA (EECA 2024)



These sites collectively consume 14.7 TJ, primarily using natural gas, by-products (waste oil and black liquor) and geothermal. 8,039TJ is met with by-products and 1,984TJ from geothermal and 4,719TJ comes from fossil fuels. Collectively these sites product a total of 281kt of CO_2e (EECA 2024).

Figure 10 2022 annual emissions by process heat fuel Bay of Plenty RETA (EECA 2024)



According to the Bay of Plenty community carbon footprint '*Industrial Stationary Energy consumption accounts for 56% of Stationary Energy emissions (487,067 tCO_2e) and 8.8% of total gross emissions. Industrial Stationary Energy is energy used within all industrial settings (including agriculture, forestry and fishing, mining, food processing, textiles, chemicals, metals, mechanical/electrical equipment and building and construction activities)*' (AECOM 2022).

The sites within the RETA study totalled 281kt CO_2e per year which points to a gap of 206 kt CO_2e difference in industrial use of stationary energy. This delta possibly indicates stationary energy from grid supply source as there was not a way to measure non transmission solutions for Industrial Process heat. To get a clearer picture of the use, there would need to be a more detailed review of process heat within the SME sector below 500kw.

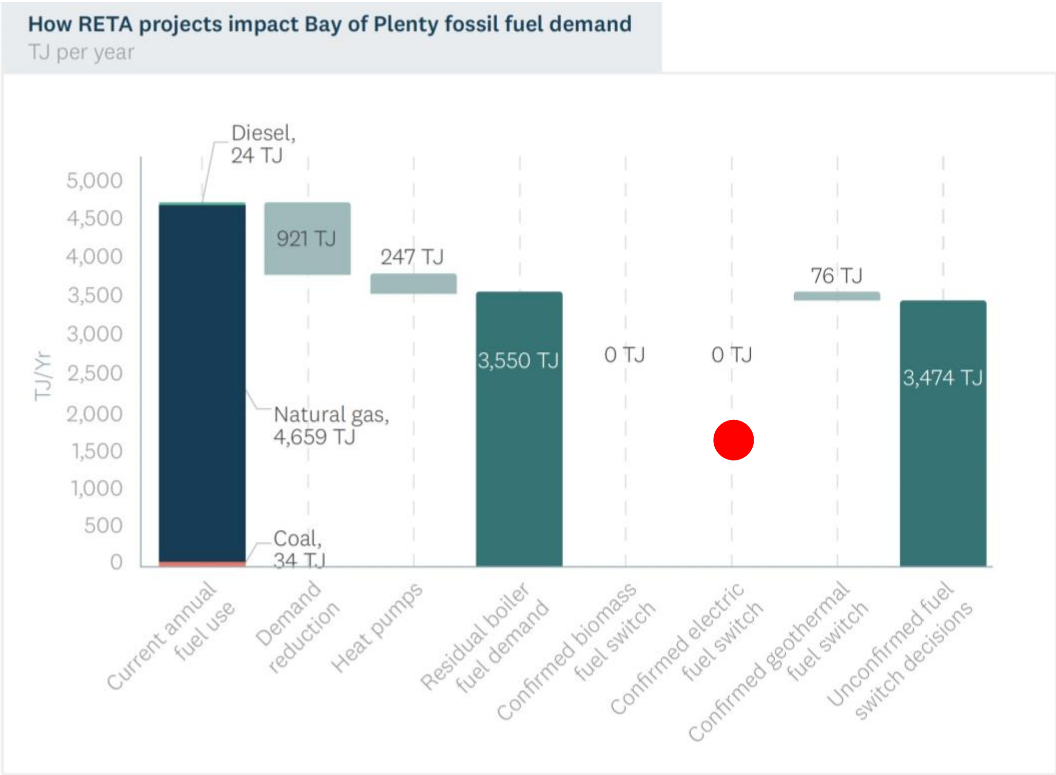
4.2.6 Decarbonisation Pathways

The RETA study looked at decarbonisation pathways for industrial process heat that were contextually specific to the region. The key opportunities were defined as:

1. Demand Reduction
2. Biomass
3. Geothermal
4. Electricity

Demand reduction opportunities are qualified are illustrated below, along with the unconfirmed fuel switching opportunity.

Figure 11 Potential Impact of Fuel switching **(EECA 2024)**



● - Fonterra announced the electrification of their Edgecumbe Site in early 2025 this is a significant to most projections up until this announcement. This sites peak demand is 29.7 MW. **Edgecumbe:** The site will transition from the use of steam and electricity generated through a co-generation plant, to a reliable source of renewable energy with the installation of a new electrode boiler. The $57 million investment is expected to reduce the site's annual emissions by an estimated 28,000 tonnes – equivalent to removing around 11,000 cars from New Zealand roads – and contribute a 1.5% reduction** towards Fonterra's overall 2030 Scope 1 and 2 GHG emissions reduction target and reduce the Co-op's overall natural gas reliance by approximately 8%***. (Fonterra 2025)

An interesting set of insights within the EECA looked at the consequences if all fuel switching decisions elected electricity and/or biomass (EECA 2024):

1. **If all unconfirmed fuel switching decisions choose electricity***, this could result in an increase in instantaneous electricity demand of 166MW across the three electricity distribution networks by 2050, if all sites reached their maximum outputs at the same time. This instantaneous demand would increase the maximum demand in the region by 43%. These electrification decisions would also* ***increase the annual consumption of electricity by 652GWh****, approximately 30% of today's gross electricity consumption in the Bay of Plenty region*.' (EECA 2024)
2. **If all unconfirmed boiler fuel switching decisions choose biomass**, this could result in an increase of 493,672t (**3,546 TJ**) per annum by 2050. Assuming sufficient resources were available, this is a 64% increase over our estimate that, in 2024, **around 300,858t of biomass** will be used for heat within the Bay of Plenty region.

EECA developed a set of preferred decarbonisation pathways which are outlined in the table below covering biomass, electricity, BAU and MAC Optimal. This was then expressed in a trajectory. The challenge with the trajectory as it is expressed, is that illustrates a very late transition prior to net zero in 2050, which is unrealistic and unlikely for industry given the risks to their operational sustainability over time. This is driven by the current information to hand but does serve to illustrate the challenge to decarbonising industrial process heat.

Figure 12 Decarbonisation Pathways.

Pathway name	Description
Biomass Centric	All unconfirmed site fuel switching decisions proceed with biomass where possible, with the timing based on the criteria above.
Electricity Centric	All unconfirmed fuel switching decisions with electricity where possible, with the timing based on the criteria above.
BAU Combined	All unconfirmed fuel switching decisions (i.e. biomass, electricity or geothermal) are determined by the lowest MAC value for each project, with the timing based on the criteria in the fuel-centric pathways above.
MAC Optimal	Each site switches to a heat pump or switches its boiler to the fuel with the lowest MAC value for that site. Each project is timed to be commissioned in the first year when its optimal MAC value first drops below a ten-year rolling average of the Climate Change Commission's Demonstration Path of future carbon prices. If the MAC does not drop below the ten-year rolling average, then the timing based on the fuel-centric pathway criteria is used.

Figure 13 Emissions Trajectory

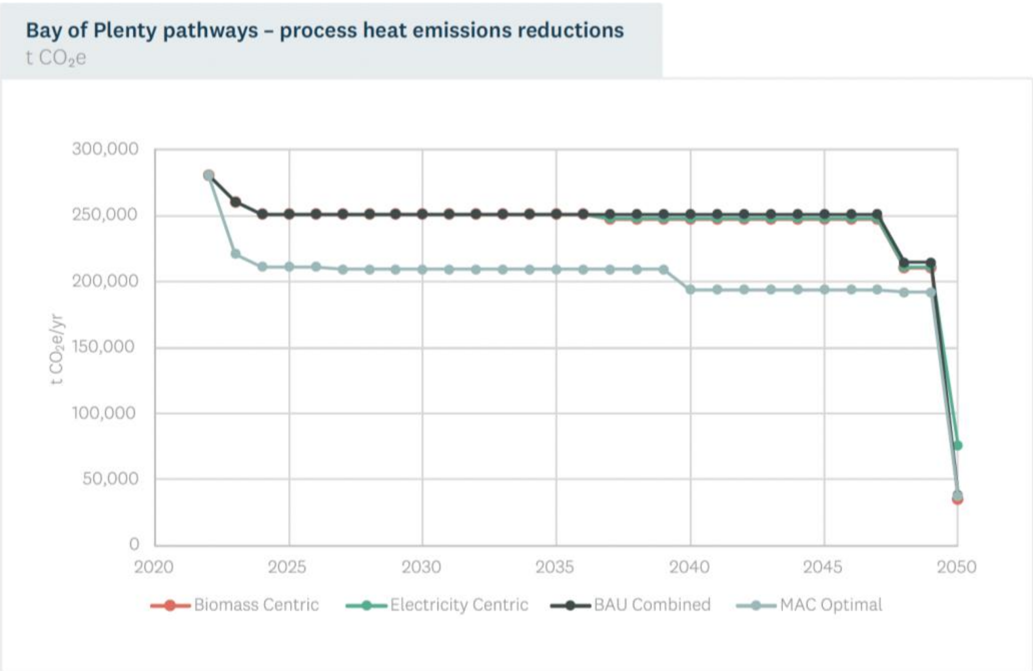


Figure 14 MAC Optimal Pathway by Technology

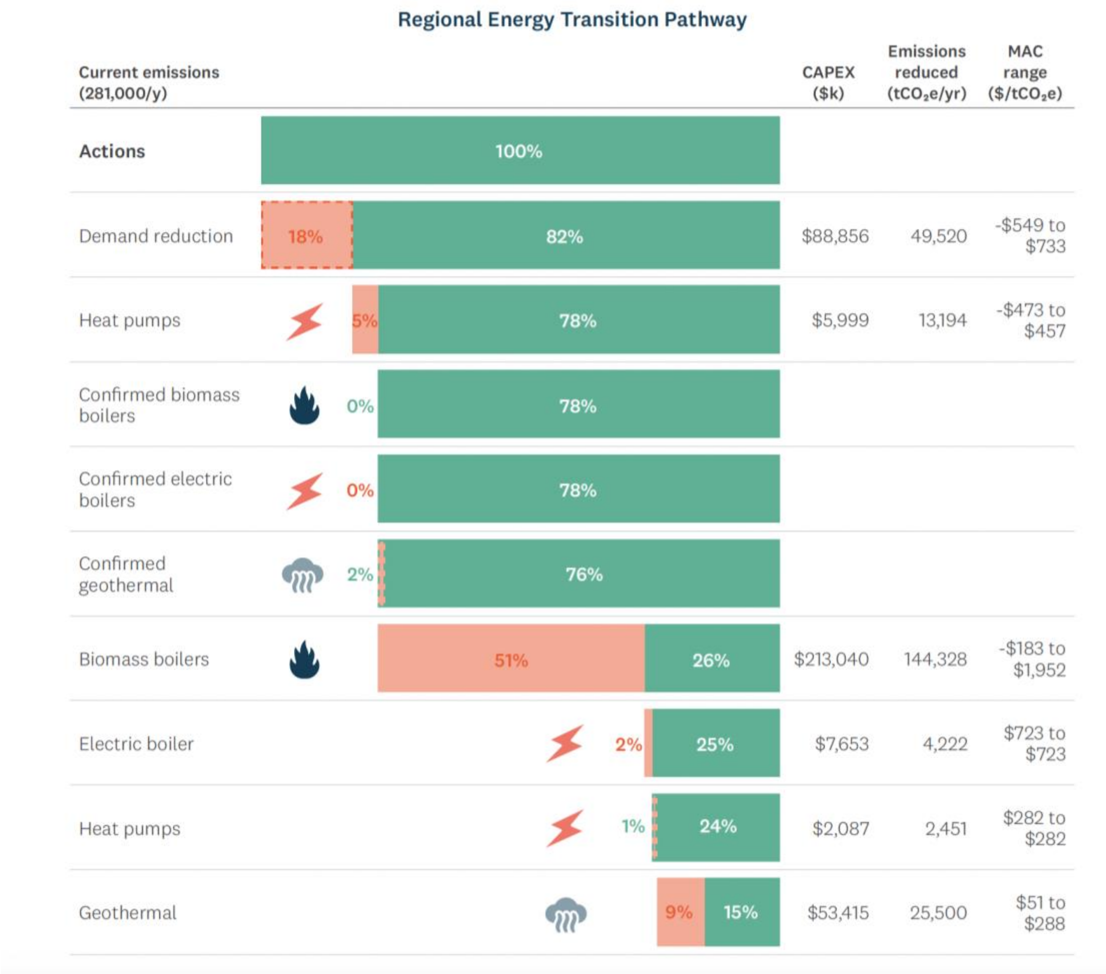


Figure 14 MAC Optimal Pathway by Technology - was created before confirmation of the Fonterra Edgecumbe electrification. This would have impacted these numbers.

4.3 Natural Gas & Biogas

4.3.1 Natural Gas

The RETA programme highlighted the region's dependence on reticulated natural gas. Gas supply has become increasingly volatile, which has had an impact on both pricing and availability. This has impacted regional businesses who are assessing their options.

Deta have undertaken a detailed study of the gas industry and supply in New Zealand. (DETA 2024) This offers some real insight, covering key issues such as:

1. Declining field production (faster than anticipated).
2. Declining demand.
3. Pricing volatility and price increases.
4. Difficulty in both exploration and permitting.

Figure 15 State of Play - DCA of Existing Fields

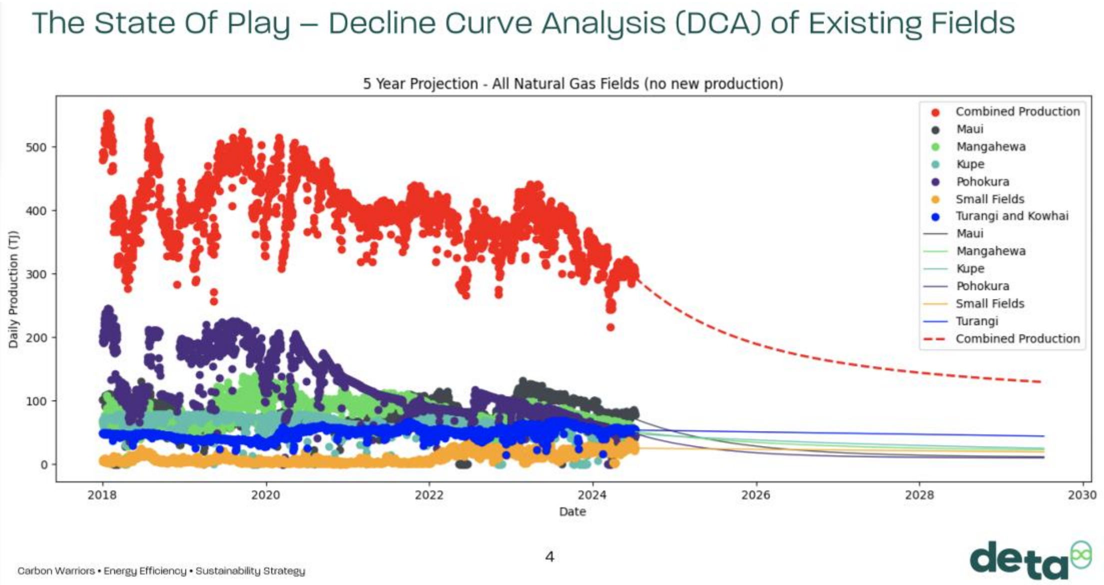


Figure 16 5 Year Projection - Supply vs Demand (with anticipated investment)

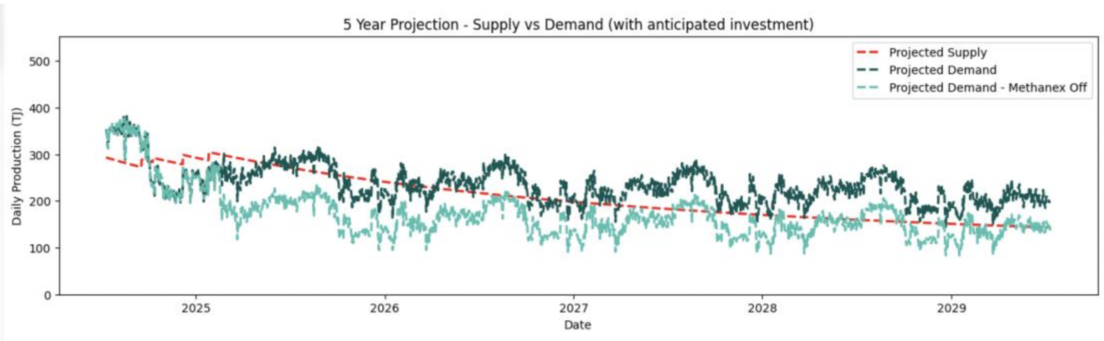


Figure 17 2P Remaining Reserves – NZ Gas Fields

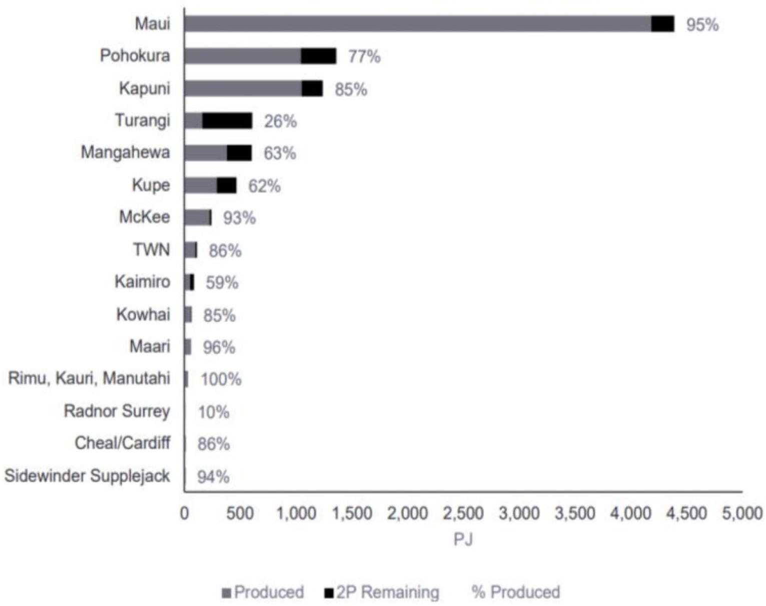
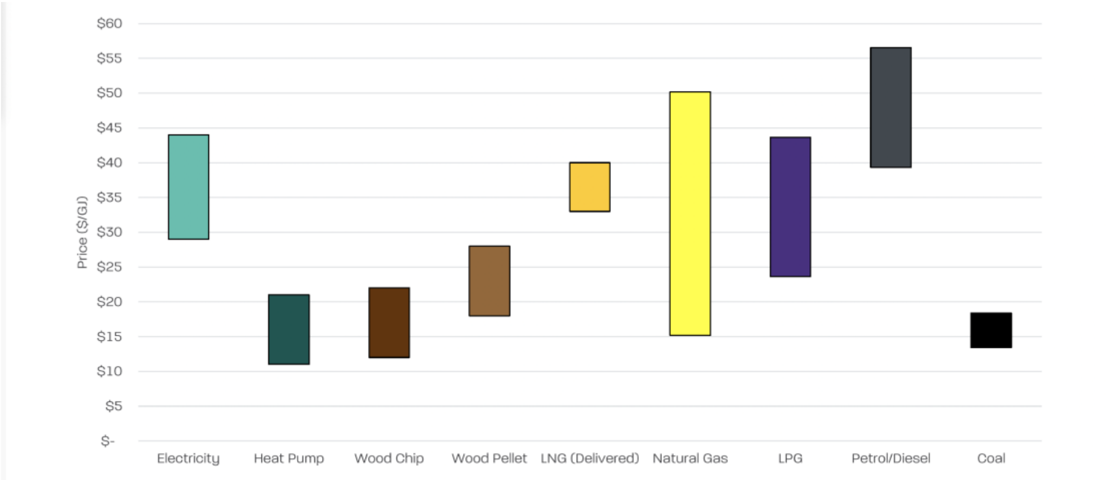


Figure 18 Relative Energy Price ($/GJ)



4.3.2 Biogas & Biomethane

Refined biomethane can replace natural gas and is able to use the same existing infrastructure and equipment used by residential and industrial customers. It also has the potential to reduce waste to landfill (and the resulting emissions). Previous studies have shown that New Zealand has a biogas potential of up to 23.4 PJ per year (Wood Beca 2023). However, there is a lack of alignment and common incentives. The table below provides a useful overview of the emissions and targets New Zealand has made over the next 25 years.

Table 5 Emissions Targets across waste, energy, and agriculture. (Blunomy 2023)

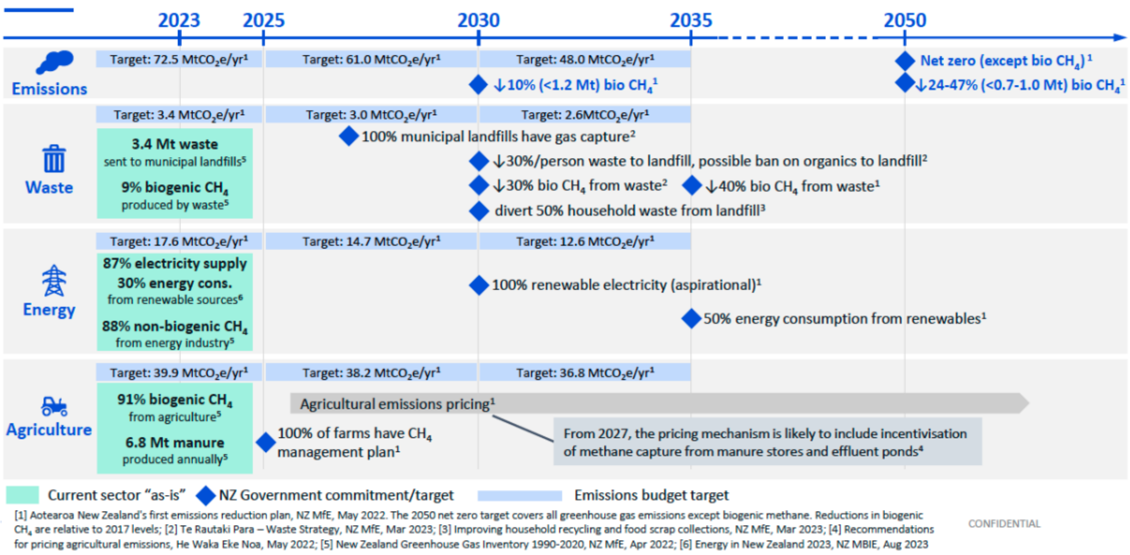
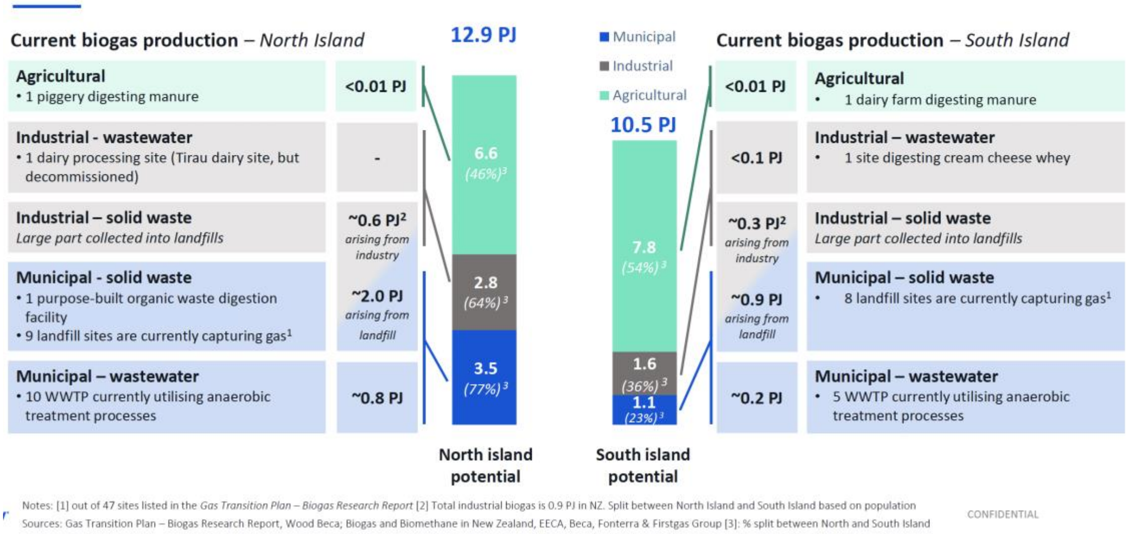


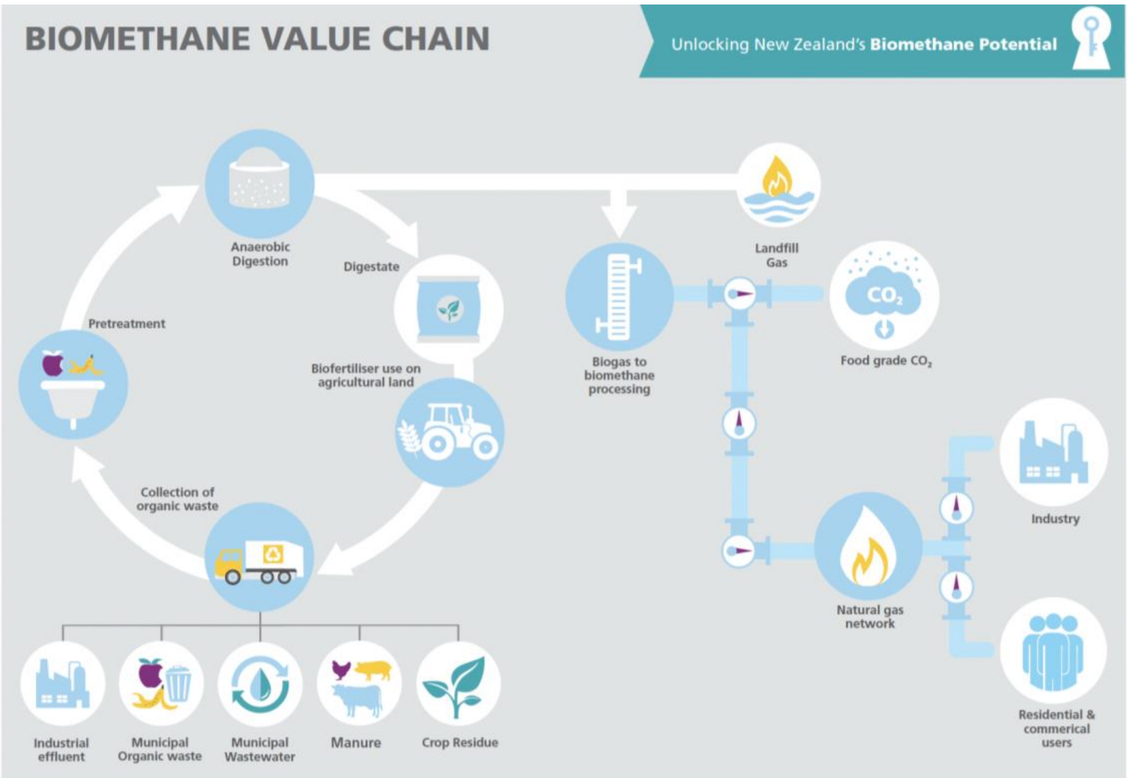
Table 6 Projected biogas production **(Blunomy 2023)**.



Note on Table 6: This figure was created before Ecogas Reporoa site was fully operational. This site has been fully operational for 18 months diverting 75,000 tonnes of organic waste from landfill generating both renewable electricity and injecting renewable gas into the national gas grid.

Regionally there are likely opportunities across municipal, agriculture, horticulture, and industrial waste sources. This would also be interlinked to the biomass opportunity which is detailed in Section 0. Further work needs to be done regionally to establish the scale of the opportunity in our region. Figure 19 Biomethane Value Chain (Beca, First Gas, EECA, Fonterra 2021)provides an oversight of the whole biomethane production, and distribution chain.

Figure 19 Biomethane Value Chain **(Beca, First Gas, EECA, Fonterra 2021)**

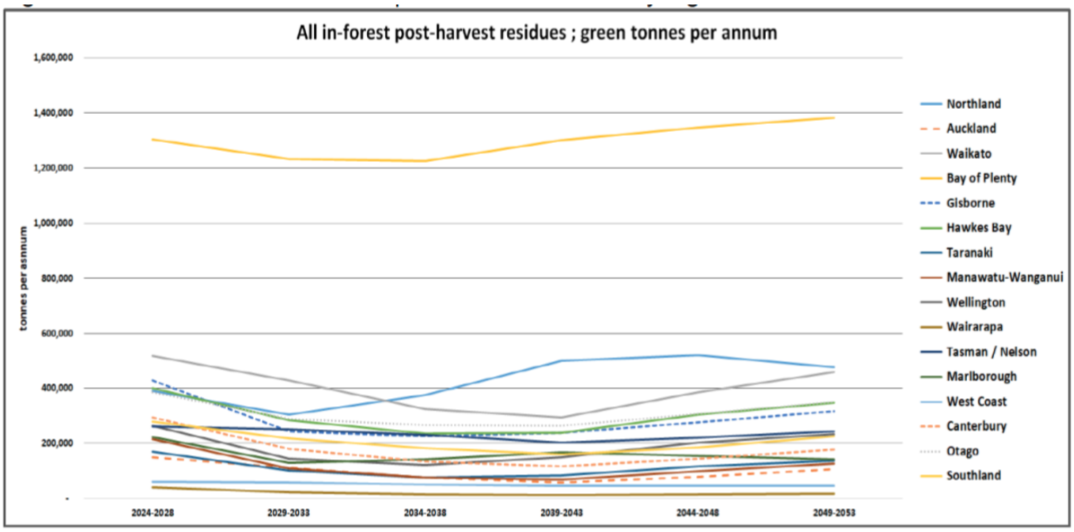


4.4 Biomass Opportunity

Biomass was highlighted in the RETA study as a regional opportunity. This is due to the large plantation forestry within the wider Bay of Plenty Region.

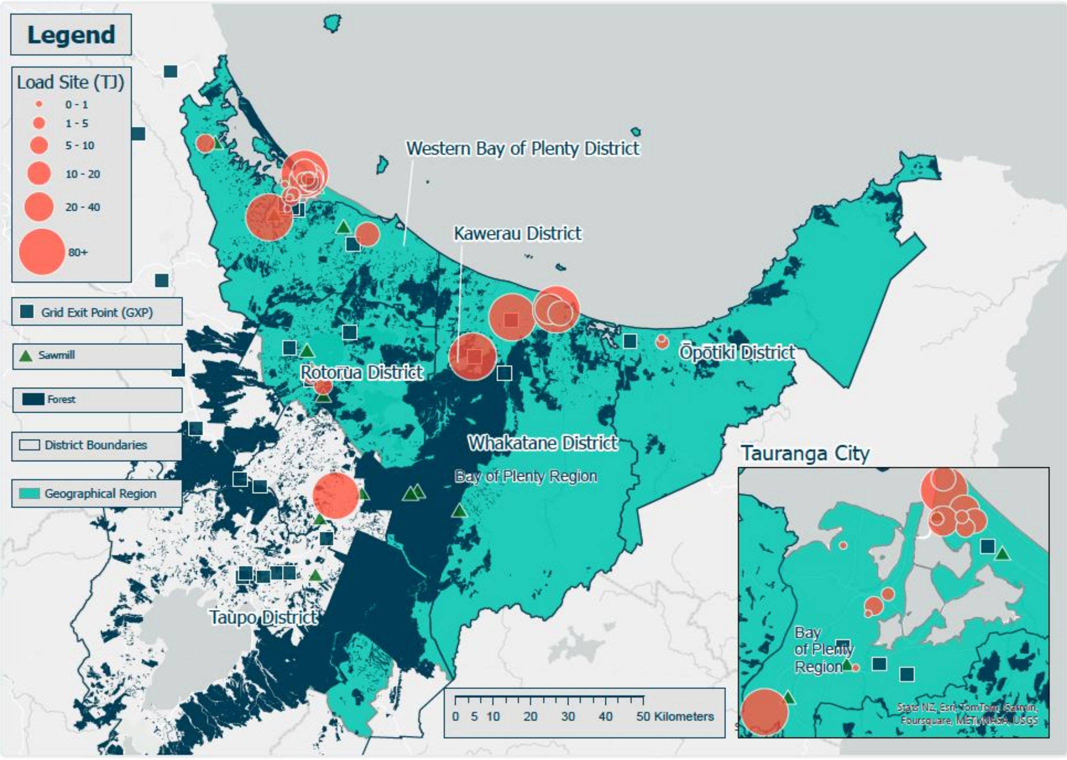
Scion (New Zealand Forest Research Institute) has completed a Biomass Projection (Hall 2024) which illustrates that the BOP region has the most significant quantity of post-harvest residue (green tonnes per annum).

Figure 20 Gross Volume of in-forest post-harvest residues by region. (Hall 2024)



A complimentary picture of our regional strength is within Figure 21 Map of Bay of Plenty Forest resources & wood processors (EECA 2024). This illustrates the distribution and scale of forests within the Bay of Plenty Region, along with processing sites. While there are existing use cases for biomass within industrial process heat, scale adoption appears still in need of further investigation and development. There are also competitive use cases for biomass within the wider energy system, just as Sustainable Aviation Fuel (SAF), marine biofuel and biofuel, which may offer better returns for resource owners. Further work is required within our region to investigate use cases and the best applications of this resource within the energy system.

Figure 21 Map of Bay of Plenty Forest resources & wood processors (EECA 2024)



4.5 Geothermal

The RETA report also highlighted the potential of the Tauranga Geothermal System (TGS). This system is not widely used by business today but has potential to provide non-transmission solutions to energy use in the Bay.

"The Tauranga Geothermal System (TGS) covers an area of approximately 875km2 in the Western Bay of Plenty ... It is classified as a groundwater system that is warmed by underlying geothermal influences. The groundwater temperatures in this area range from approximately 15°C in the absence of a geothermal influence up to a maximum recorded temperature of 70°C. Approximately 70% of consented wells are shallower than 200m and the deepest well is at 916m. (GeoExchange NZ Limited 2024)

The full report commissioned by Bay of Plenty Regional Council, and undertaken by GeoExchange NZ Ltd, is publicly available.

What is Geoheat?

'Geoheat' broadly refers to geothermal energy, which is thermal energy extracted from the earth's crust. In New Zealand, geothermal temperatures are typically those as equal to or greater than 30°C.

Geoheat systems are typically either:

1. Direct Use – Systems that use the heat directly like a hot pool.
2. Indirect Use – Systems that require a heat pump to modify the source temperature.

Most business and commercial applications will be Indirect due to available subsurface temperatures.

The Tauranga Geothermal System

The maps below provide two perspectives of the temperatures available over the TGS. The temperatures within the Te Papa Peninsula, the Mount and Rangiuru are assessed at the higher end of the temperature bands. The second map provides a different perspective, which is the coverage of 30°C at various depths. This shows that a very wide part of the TGS is geothermally influenced.

Currently the primary users of the TGS are community facilities, tourism and a smaller amount of private commercial usage. The TGS, being an aquifer, also has a range of users who are just accessing it for water as opposed to heating/cooling.

Table 7 TGS Usage Breakdown

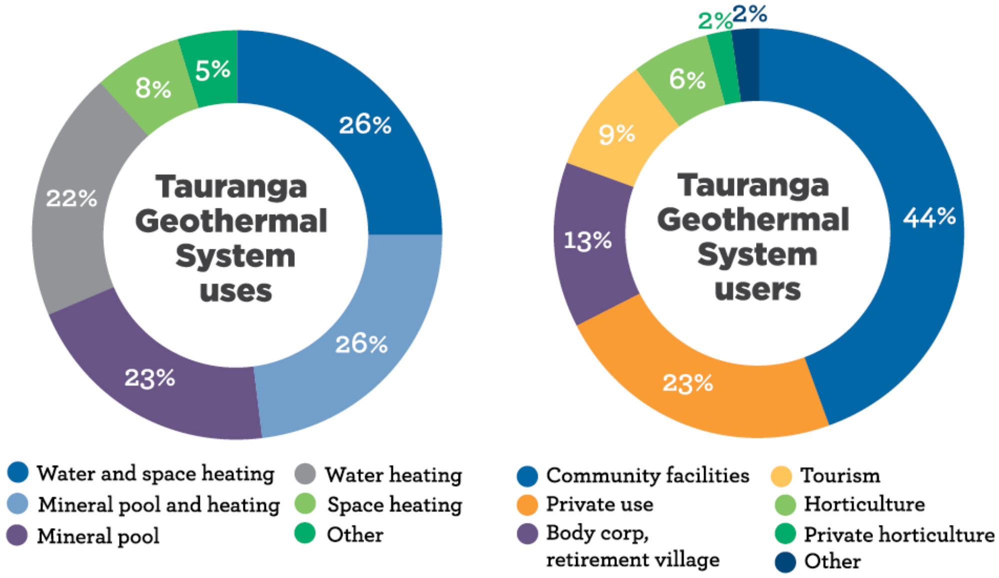


Table 8 TGS Temperatures at 150m b.s.l

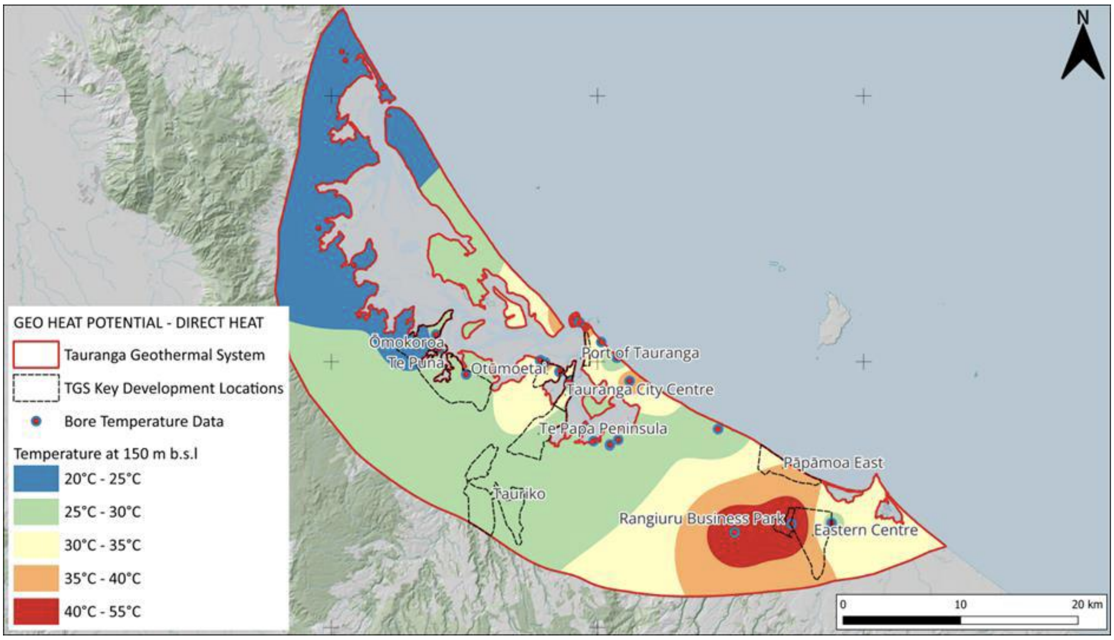
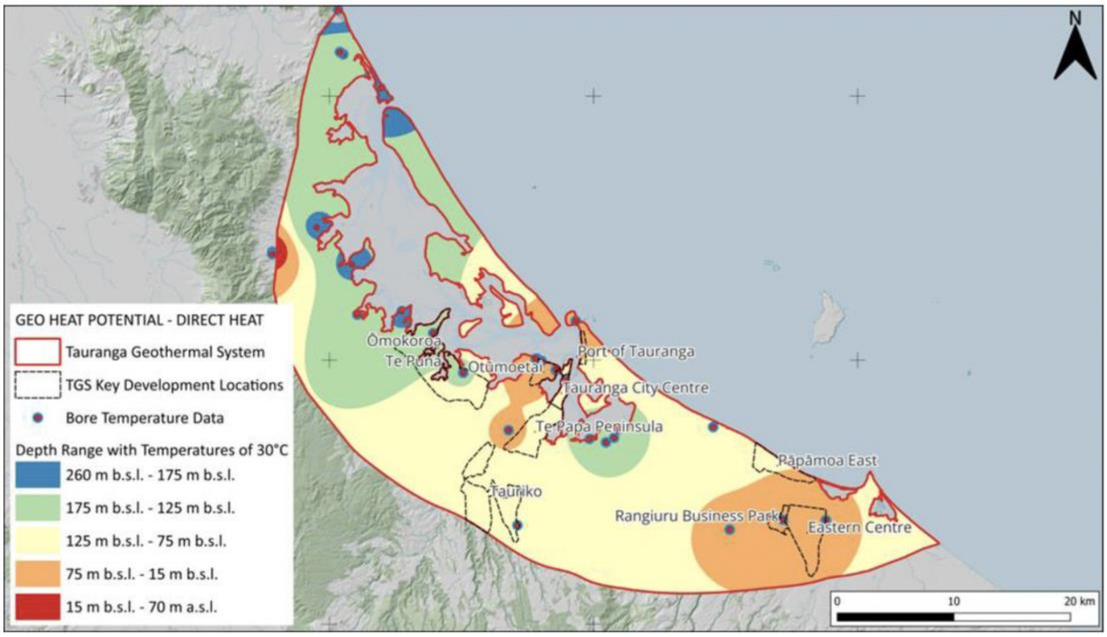


Table 9 Depth Range with Temperatures of 30C



For commercial use, GeoExchange illustrated the use of Ground Source Heat Pumps (GSHP). Heat pumps transfer heat from a source (ground, water, air) to provide heating or cooling. The advantage with a GSHP is they are not influenced by variable air temperatures and are relatively constant, unlike some other sources such as air.

The table below is useful in conjunction with the temperature map. It shows the 'Coefficient of Performance' (COP) relative to the source temperature. The higher the COP, the bigger the savings.

Table 10 Impact of Source Temperature on Heat Pump Efficiency & Output (GeoExchange NZ Limited 2024)

Source Temperature (°C)	Heating COP	Heating Output (kW)	Cooling COP	Cooling Output (kW)
10	4.15	13.7	9.4	17.3
15	4.6	15.2	8.0	16.7
20	5.0	16.7	6.5	16.0
25	5.15	17.7	5.7	15.2
30	5.3	18.6	4.8	14.3
35	Direct Use Zone*		4.4	13.6
40			3.9	12.9
45			3.4	12.2
*These temperatures are commonly used for direct use. However, as discussed in Section 6.3 they can be used with a high temperature GSHP to reach higher temperatures, including steam.				

This table provides a view of the relationship between the COP and the possible savings on energy cost which is useful.

Table 11 Influence of Geothermally Enhanced Groundwaters on System Performance

Influence of Geothermally Enhanced Groundwaters on System Performance				
Heat Pump Type (Source Temperature)	System COP	Electrical Input (kWe)	Energy Cost[1] ($)	Savings
ASHP (0 'C)	2.0	2460	$1,215,320	--
GSHP (10 'C)	2.4	2000	$1,012,767	$202,554 (17%)
GSHP (15'C) X	2.77	1733	$877,488	$337,833 (28%)
GSHP (20 'C)	3.2	1500	$759,575	$455,745 (38%)
GSHP (25 'C)	3.6	1333	$675,178	$540,142 (44%)
GSHP (30 'C)	4.0	1200	$607,660	$607,660 (50%)
Note 1: Energy cost at 26c/kWh and excludes maintenance etc				

The TGS is still early days in terms of the commercial applications, but it looks promising as a tool in the suite of options for the region to decarbonise and to improve energy resilience.

4.6 Hydrogen

Hydrogen offers a credible pathway for a range of applications within our region, from heavy vehicle transport to marine shipping, and agriculture/primary sector applications.

The previous government developed an 'Interim Hydrogen Roadmap' (Ministry of Business, Innovation & Employment 2024) for supporting hydrogen, which was updated earlier in 2024 under the new government.

Transport accounts for ~18% of New Zealand's gross emissions and the current energy mix is dominated by fossil fuels such as petrol and diesel. As a result, there is an opportunity for hydrogen to become a source of fossil fuel displacement (Ernst & Young 2023). In the hydrogen economic modelling it suggests a decentralised model, leading to a more centralised model of production over time as volume increases. This would also lead to efficiencies and improved costs.

Critically, hydrogen requires clean energy and water. It takes 9 litres of water for each kilogram of hydrogen (Ernst & Young 2023) and requires 30-40kWh of energy. The EY hydrogen economic modelling report indicates large-scale production of hydrogen would have '*Material implications for the electricity system*'. In other words, it needs to be planned for.

4.6.1 Tauriko Refuelling Station

The first heavy vehicle refuelling station is currently under construction in Tauranga (Tauriko) by Hiringa Energy with a tentative opening date in May-June 2025. This station becomes part of a network with the existing already commissioned stations in Auckland, Waikato and Palmerston North.

This refuelling station has an initial commissioned capacity of 1MW with the potential to scale to 5MW. This would provide 750kgs of hydrogen daily, which can supply 15 vehicles.

Table 12 Schematic Description of Refuelling Station (Hiringa Energy).

Fuelling stations are comprised of:
o An electrolyser
o Compressor
▪ Runs at 350bar pressure as the vessels need to be pressurised to fill quickly.
o Storage
o Fuelling capability
1MW station has an implied capital cost of $6.5m.
o whereas a 5 MW has an implied cost of $15m.
Each truck would average 50kgs of hydrogen fuel, this currently provides 350km in range to the heavy truck.
o 1MW site estimated capacity of up to 750kg
Takes approximately 15-20 minutes to fill.
Resulting in a theoretical daily maximum refuelling capacity of 4,800kgs or 96 vehicles at 100% efficiency (not likely).
o Current Tauriko capacity (estimated) 15 trucks a day based on the above metrics.
It is understood Hiringa Energy have a 60 vehicle per day target.
The capital cost of a hydrogen truck is $750k to $1m without subsidies.

Scaling from the initial level of refuelling 15 vehicles a day to a level that can accommodate thousands of vehicles refuelling each day is a challenge that would require significant resources and infrastructure. Estimate daily heavy vehicle kilometres travelled (VKT) are estimated to exceed 900,000 per day. This equates to over 90,000kgs of Hydrogen consumed per day if 100% of the Heavy Commercial Vehicle Fleet were transitioned.

5 Forums

There were four forums held in total. The first three were subject matter specific, the fourth was strategic and more general, utilising the information from the first three.

1. Employers, Manufacturers & Processors
2. Transport & Logistics
3. Growth Infrastructure & Planning

The first two differ from the third as they addressed the direct energy users. The third was more concerned in the growth and planning related issues that arise from energy over time. As such we have grouped and summarised some of the information from the first two forums to provide an insight into some of the common concerns and opportunities.

Table 13 Group 1&2 Summary (Drivers of Change, Technology, Future Problems)

GROUP 1 Employers, manufacturers and processors	GROUP 2 Transport and logistics
Drivers of Change	Drivers of Change
Regulation, legislation and social responsibility.	Regulation, legislation and policy
Cost and economic considerations	Environmental and sustainability concerns
Supply and demand management	Economic and market forces
Technology	Technology
Renewable energy, generation & storage	Electrification and electric vehicles
Electric vehicles and transportation	Low-carbon and alternative fuels
Energy efficiency and optimisation	Infrastructure and operational optimisation
Future Problems	Future Problems
Security of supply	Infrastructure and grid capacity
Energy security	Policy and Regulatory uncertainty
Cost of energy	Cost and economic pressures

Table 14 Group 1&2 Summary (Challenges, Barriers, Constraints & Issues)

GROUP 1		GROUP 2	
Bigger/harder to resolve			
Challenges Policy uncertainty Infrastructure Costs	Barriers Red tape Cost of renewables	Challenges Behaviour & social Resistance Uncertainty & complexity in transition	Barriers Regulation & policy gaps Infrastructure & technology availability
Constraints Skills Shortage Infrastructure Costs	Issues Coordination required to implement new tech Poor regulation of the electricity market	Constraints Skills gaps & training Funding & support for low emissions transition	Issues Collaboration & coordination Lack of clear direction & goals
Smaller/easier to resolve			

5.1 Group 1: Employers, Manufacturers & Processors

The provocation statement for this forum was: '*For most businesses, stable consistent energy is a critical part of doing business. With challenges to traditional gas supply and pressure to decarbonise, it is a dynamic and changing environment to plan for*'.

5.1.1 Direction of Change

The direction of change area incorporated the drivers of change the technology companies are looking at or already using and sought to define the future problems.

5.1.1.1 Drivers of Change

These three drivers – regulations, cost, and supply management – represent key forces that influence energy strategies, investment decisions, and operational adjustments across industries.

Regulations, legislation, and social responsibility
This theme covers a broad range of critical drivers, including regulations, carbon targets, and international standards that have a significant influence on energy strategies. Government policies, such as CO2 constraints and ETS auctions, play a key role in shaping energy decisions and investment priorities. Regulatory changes and the push for compliance are powerful motivators for both short-term and long-term shifts in energy practices.

Cost and economic considerations
Cost remains a fundamental driver for most organisations. The need for affordable energy, managing transition costs, improving efficiency, and coping with unexpected supply shifts are all key concerns. Economic considerations drive decisions around whether to invest in new technologies, shift production methods, or optimise existing infrastructure. The economic viability of any energy transition is crucial, influencing how rapidly organisations can adapt to changing energy landscapes.

Supply and demand management
The stability and reliability of supply are top priorities, especially in a region where energy resilience and growth are strategic goals. Concerns about security of supply, capacity, and the ability to manage fluctuating demand are significant factors driving both immediate actions and long-term planning. Ensuring a steady supply while managing electrification and infrastructure expansion is critical aspect of future energy strategies.

5.1.1.2 Top Three Emerging Technology Themes

The most common three areas across both current and future technologies were: renewable energy, electric vehicles, and energy efficiency.

Renewable energy generation & storage

In use: Solar, office solar panels.
Being investigated: Geothermal (GSH), wind generation, solar generation, solar/BESS micro-grids renewables, grid-scale solar and wind generation, Solar on new structures. Renewable energy solutions like solar and wind dominate both the current technologies in use and those being actively investigated for further adoption.

Electric vehicles & transportation

In use: EVs, Electric vehicles (EVs), Hybrid straddle carriers, pool cars are hybrid, vehicle fleet upgrade to EV/Plug-in hybrid, PHEV fleet, mode shift.
Being investigated: Hydrogen, EV vehicles and infrastructure, Electric steam generation, hybrid diesel/electric tugs, electric straddles, methanol and hydrogen-powered straddles (marine assets), ship-to-shore power. The emphasis on electric vehicles and hydrogen-powered transport solutions shows a clear trend toward decarbonising transportation.

Energy efficiency & optimisation

In use: Modern production methods with better efficiencies, load shedding, more granular data, hybrid equipment, alternate energy equipment, change of energy type, measure and manage, machine learning and BMS optimisation, 'handprint' opportunities, hybrid/WFH and reduced travel, optimising concrete and steel use, industrial refrigeration optimisation, LED lighting, biogas, woody biomass for process heat.
Being investigated: HVAC systems (emissions/energy), demand response, heat pumps (thermally upscaled heat), thermal megawatt storage, high-temp heat pumps, heat recovery, automation (lighting, HVAC circuits to reduce waste), AI and robotics over people, collaboration – PPAs.

There is a strong focus on improving energy efficiency, both in current operations and in investigating innovative technologies to optimise energy use and reduce waste.

5.1.1.3 Future Problems – Emerging Themes

What energy problems do you perceive will impact you in the next 2 /15 / 30 years?

Uncertainty of supply (short-term – 2 Years)
This issue encompasses several related concerns including uncertainty and scarcity, cost, and consistent supply. Maintaining a reliable energy supply is fundamental, and disruptions could affect every sector, from manufacturing to daily operations, causing economic and social challenges.

Energy security (mid-term – 15 years)
Energy security touches on both supply and infrastructure resilience. With concerns about supply running low, capital investment needs, and controlling energy costs, this issue represents a major challenge for maintaining stable and affordable energy in the future.

Cost of energy (across all time frames)
The cost of energy is a recurring issue across all timeframes. It includes aspects such as price volatility, affordability, the economic competitiveness of energy (especially for industries), making it a critical issue.

5.1.2 Barriers & Constraints

Future problems: what energy problems do you perceive will impact you in the next 2 /15 / 30 years. For interpretation challenges, barriers, constraints, and issues sit on a grid.

5.1.2.1 Challenges

Policy uncertainty
Uncertainty around government policies, coherent strategies, and regulatory standards is a major obstacle to long-term planning and investment in energy transitions.

Infrastructure costs
High costs associated with upgrading or building infrastructure are fundamental challenges that impact the feasibility and speed of energy transitions.

5.1.2.2 Barriers

Red tape
Bureaucratic obstacles and regulatory delays significantly slow down progress in implementing new energy initiatives and technologies.

Cost of renewables
The financial burden of adopting renewable energy solutions remains a significant barrier, affecting both large-scale investments and widespread adoption.

5.1.2.3 Constraints

Skills shortage
A lack of qualified personnel and expertise limits the ability to efficiently manage energy projects and implement new technologies.

Infrastructure costs
While costly, infrastructure upgrades are more manageable in comparison to other systemic challenges, especially with targeted investments.

5.1.2.4 Issues

Coordination required to implement new technology
Effective collaboration and project management can address this issue, facilitating smoother transitions and integrations of new technologies.

Poor regulation of the electricity market
Addressing regulatory gaps and improving market oversight can lead to more stable and predictable energy pricing and supply dynamics.

5.2 Group 2: Transport & Logistics

The provocation statement for the workshop was: '*74% of the region's CO2 emissions arise from transport. It is a significant contributor to other pollutants and impacts the health and wellbeing of the local community. Transport's energy requirements could change dramatically in the next 15-30 years as new technology is adopted*'.

5.2.1 Direction of Change

5.2.1.1 Top Three Drivers of Change

Regulations, legislation, and policy
Regulatory frameworks, government policies, and international agreements are critical drivers. Climate change policy, decarbonisation targets, and specific regulations like the EU ETS are shaping how organisations prioritise energy use and transition strategies. Compliance and alignment with these policies are mandatory, making them a significant influence on decisions and investments.

Environmental and sustainability concerns
The growing emphasis on sustainability is a major driver. The push for carbon reduction, the shift toward more sustainable energy sources, and the need to address environmental impacts are fundamental motivators for change. Public perception, internal sustainability goals, and the global focus on net-zero emissions are compelling organisations to act and adapt.

Economic and market forces
Market expectations and economic considerations play a central role. Cost efficiency, competitive advantage, and the economic viability of low-emission technologies are key factors driving energy-related decisions. Companies must balance the cost of energy transitions with market competitiveness and the financial impacts of these changes. These three drivers are foundational to how the transport and logistics sector, as well as other industries, navigate the evolving energy landscape. They are interlinked and represent the major forces that will shape future strategies.

5.2.1.2 Top Three Emerging Technology Themes

These three areas – **electrification, adoption of alternative fuels, and infrastructure enhancements** – are the most common themes across both current and future technologies.

Electrification and electric vehicles
In Use: Electric vehicles (EVs) and small trucks, electric cars (BEVs), hybrid container handlers, battery electric container handlers, EV fleet, EVs (public), electric buses, hybrids, e-bikes.
Being Investigated: On-orchard electric vehicles, EVs for public transport (buses), Electric container stacking gantry. Electrification is a dominant theme across both lists, with extensive adoption and continued exploration of electric vehicles, buses, and supporting infrastructure.

Low-carbon and alternative fuels
In Use: Natural gas (instead of diesel).
Being Investigated: Low-emissions shipping (LNG, biofuel, methanol, hydrogen), Marine biofuel, Sustainable Aviation Fuel (SAF), Green methanol, Ammonia (long-term), Biofuels, eFuels, Marine biofuels from wood, SAF from wood & MSW, Hydrogen generation, Hydrogen mobile & stationary plant. The transition to alternative fuels is a significant focus, with extensive investigation into low-carbon and renewable fuel sources for various transportation modes.

Infrastructure and operational optimisation
In Use: Fleet telematics, Route optimisation, transport modelling, traffic signal controls (TTOC), network optimisation, protected cycleways and bus lanes.
Being Investigated: PT NZ grid study, shore power at ports, traffic signal optimisation (TTOC), rail over road, road pricing (congestion charge). Optimising existing infrastructure and developing new technologies to improve efficiency and reduce emissions are key priorities across both current use and future exploration.

5.2.1.3 Future Problems – Emerging Themes

Infrastructure and Investment:
The need for robust and adaptable infrastructure is a consistent theme across all timeframes. Whether it's short-term grid sufficiency, mid-term renewable energy generation and distribution, or long-term capital-intensive projects, infrastructure investment is crucial at every stage.

Policy and Regulatory Stability:
Uncertainty around government focus, changing targets, and regulatory inconsistencies are constant challenges. The ability to align long-term goals with consistent policy direction is essential for driving sustainable change across the energy sector.

Supply Chain Resilience and Resource Management:
Ensuring reliable access to resources and maintaining stable supply chains for energy generation, transportation, and technological upgrades are major considerations across all timeframes. From immediate concerns about vehicle supply to long-term risks of being excluded from key shipping corridors, supply chain resilience is key to supporting a sustainable energy transition.

5.2.2 Barriers & Constraints

Challenges
Behavioural and social resistance
Ingrained behaviours and the lack of public support for initiatives like road pricing and bus lanes. This behavioural and social resistance is a major obstacle to change.
Uncertainty and complexity in transition
In transitioning to low-carbon energy solutions many participants highlighted the difficulty in identifying the "winning" alternative technology and the lack of a clear roadmap, with too many unknowns complicating decision making.

Barriers

Regulation and policy gaps

Government standards that dictate client requirements, alongside a lack of clear and supportive regulation, create substantial hurdles.

Infrastructure and technology availability

Issues like inadequate infrastructure and the difficulty in accessing the right technologies further slowdown the transition to low-carbon solutions.

Constraints

Skill gaps and training

There is a shortage of skilled people, particularly in comparison to competing markets like Australia, and a pressing need for training in new technologies.

Funding and support for low-emissions transition

The cost of low-emissions options requires government support in the interim, with funding for both large-scale transformation and incremental steps posing ongoing challenges.

Issues

Collaboration and coordination

Participants emphasised the importance of fostering better collaboration both between companies and across sectors.

Lack of clear direction and goals

The absence of clear targets and the limited financial incentives to drive change leave many organisations uncertain about the benefits of transitioning to low-emissions alternatives.

5.3 Group 3: Growth Infrastructure & Planning

5.3.1 Planning Considerations – Emerging themes

Costs and funding

The costs associated with energy infrastructure, including who pays, how costs are recovered, and the financial impact on projects, are critical considerations. Funding mechanisms, capital costs, and the allocation of financial responsibilities often dictate the feasibility and prioritisation of energy projects within infrastructure planning.

Planning and coordination

Effective planning and coordination across different sectors, energy types, and stakeholders are crucial. This includes integrating energy into broader infrastructure projects, aligning local and national policies, and ensuring that planning considers both current and future energy needs. Inconsistencies and a lack of coordination often lead to inefficiencies, missed opportunities, and fragmented energy planning.

Infrastructure and technology integration

Ensuring that energy considerations are integrated into infrastructure planning involves focusing on the resilience and capacity of current systems, incorporating new technologies (like EV charging and renewable generation), and understanding the infrastructure requirements for future energy demands. This includes addressing technical challenges like transmission capacity, embedding new materials, and ensuring that infrastructure can handle new technologies.

5.3.2 Energy Challenges Emerging Themes – Short, Medium & Long Term

5.3.2.1 Short term (2 years)

Economic and cost pressures
The immediate focus is on managing costs, including the affordability of energy sources, supply costs, and the financial implications of transitioning to alternative energy options. The instability of energy prices and the impact of external factors like currency fluctuations further stress the challenge of affordability and cost management.

Infrastructure and planning challenges
Planning inconsistencies and immediate needs, such as aligning infrastructure with energy requirements, managing urban sprawl, and addressing the lock-in of existing solutions, highlight the urgency to integrate energy considerations into broader planning processes.

Regulatory and environmental constraints:
Short-term regulatory barriers like consenting, renewable energy timeframes, and the need for CO2 reduction.

5.3.2.2 Medium term (15 years)

Regulatory evolution and market adaptation
Adapting regulatory frameworks, dealing with infrastructure costs, adjusting market pricing methods, and incentivising the right energy sources to maintain momentum toward decarbonisation and sustainability.

Technological integration and infrastructure upgrades
There is a significant push towards integrating new technologies, such as battery storage, geothermal, hydrogen, and electrifying transport options. Upgrading existing infrastructure to meet new energy demands and mitigate climate impacts will remain a critical focus.

Social and behavioural adaptations
Understanding and managing ingrained behaviours, generational differences, and the need for broader collaboration and stakeholder engagement are essential. These factors influence both energy demand and the effectiveness of transitioning to sustainable energy practices.

5.3.2.3 Long term (30 years)

Uncertainty and future risk management
Long-term planning faces high uncertainty regarding geopolitical impacts, technological obsolescence, and unforeseen risks, including natural disasters.

Technological evolution and infrastructure transformation
The focus is on ensuring that energy technologies evolve without becoming obsolete and that infrastructure development aligns with new technological needs.

Long-Term Investment and policy alignment
Attracting long-term investors and aligning short-term decisions with long-term goals are vital to sustaining energy growth and resilience. Policy and investment strategies must be designed to handle the complexities of a rapidly changing energy landscape.

5.3.2.4 Top Barrier if Resolved

Table 15 Top Barrier if Resolved (Voted)

Dot Votes	Barrier
8	Lack of industry-wide collaboration (8 Dots)
7	Knowledge and understanding (7 Dots)
6	Underwriting economics (govt)
3	2 months vs 2 years consents (3 Dots)
2	Knowledge data sources not readily available (2 Dots)
1	What is iwi role/involvement (1 Dot)

5.4 Final Forum – Strategy Review

5.4.1 Provocation

Based on the work done to date and feedback from the previous forums, what are the collective actions that can be taken to move energy forward in the region?

1. What does your ideal energy future look like?
2. What are the barriers to achieving this?
3. Which barriers are in the 'to hard basket' now?
4. What is the low hanging fruit?
5. What changes in policy would enable decarbonisation and economic growth?
6. How do we provide market certainty to drive infrastructure investment in the region?
7. What are the opportunities for better regional coordination and cooperation?

5.4.2 Where do we want to be as a Subregion by 2050?

Primary Question: What does our IDEAL ENERGY FUTURE look like?
It could be technological, process based, regulatory, or anything that reasonably help the region to achieve its goals.

5.4.3 Key themes

Resilience and security

Resilient networks: A focus on building energy systems that are robust, secure, and capable of handling future demands and potential disruptions.
Energy security: Reducing reliance on external energy supplies and ensuring a stable, self-sufficient energy system.
Self-sufficiency and export potential: Aspiration for the region to become a net exporter of energy, generating more than enough to meet local needs and enabling export opportunities.

Renewable energy and sustainability

- Renewable energy: Aiming for nearly complete reliance on renewable sources like solar, wind, geothermal, and biofuels for energy by 2050.
- Geothermal energy:
- Utilising geothermal resources for energy generation and process heat, offering a competitive advantage.
- Managing geothermal resources sustainably while adopting new technologies to harness both low- and high-temperature geothermal energy.
- Biofuels:

- Using biomass and wood waste for process heat and producing biofuels like biodiesel and marine biofuels from local resources.
- Focusing on waste-to-fuel initiatives and circular economy practices to minimise waste and optimise resource use.
- Implementing Combined Heat and Power (CHP) systems fuelled by biomass to enhance energy efficiency in industrial sectors.
- Low Emissions and Carbon Neutrality: Striving for low-carbon, zero-carbon, or carbon-negative energy systems to align with New Zealand's climate goals.
- Circular Economy: Prioritising sustainable practices and minimising waste through a circular economy model integrated into the energy system.

Technological innovation and adoption

Smart Networks and Energy Storage: Embracing flexible, smart energy networks and adopting diverse energy storage solutions.

Distributed and Decentralised Generation: Promoting community-based, decentralised energy systems that rely on local renewable generation.

Collaboration and leadership

Coordinated Action and Partnerships: Encouraging collaboration between government, businesses, Māori and iwi, and local communities to drive long-term energy planning and development.

Global Leadership: Positioning the region as a national and global leader in low-emissions energy, transport technologies, and energy innovation.

Economic and social equity

Affordable and Accessible Energy: Ensuring that energy is affordable and accessible for all, with a focus on energy equality.
Economic Competitiveness: Using renewable energy and energy efficiency to gain a competitive advantage for businesses and industries in the region.

Transport and infrastructure

Low-Carbon Transport: Electrification of transport, the use of biofuels, and creating low-emission logistics systems are key to decarbonising the transport sector.
Optimised Infrastructure: Upgrading and optimizing energy infrastructure, integrating it with other systems like transport for a holistic approach.

Community engagement and education

Community Buy-In: Engaging the local community in the energy transition and promoting renewable energy and efficiency.
Education and Awareness: Raising awareness about energy use, efficiency, and sustainability practices to foster a more energy-conscious society.

5.5 Our Energy Future

"**Our region will be energy self-sufficient and a net exporter of clean energy, creating economic advantages and opportunities for growth**. We will lead the way in low-carbon transport and industrial innovation, integrating energy systems with advanced infrastructure while ensuring energy equality and accessibility for every community."

5.5.1 How will we get there?

Primary Question: Leveraging the output of the 'Ideal Energy Future' conversation, what are the options/actions that the region can develop, deploy or learn more about that could help us get to where we want to be? Solutions can be technological, process based, regulatory, or anything that reasonably help the region to achieve its goals.

5.5.1.1 Develop

- Strategic Planning and Frameworks
  - **Regional and Business Plans**: There's a strong emphasis on developing clear business, delivery, and regional-wide coordinated plans that align with both short- and long-term strategies.
  - **Flexible Frameworks:** The need for adaptable frameworks that can evolve with the region's needs, such as the right regulatory frameworks and strategic urban planning.
  - **Transition and Roadmaps:** Planning for supply/demand transitions, realistic policies, and a pathway for regional commitment toward low-carbon goals.
- Renewable Energy and Technology
  - **Geothermal and Renewable Energy:** There's a focus on tapping into local resources, including geothermal (geothermal heat park, low-temp GeoHeat), and expanding renewable energy generation like integrated solar farms and wind farms.
  - **Storage and Energy Trading:** Storage technologies and peer-to-peer energy trading platforms are considered important for improving flexibility and resilience in the energy system.
  - **Innovative Technology and Solutions:** Hydrogen as a solution for various sectors, democratisation of energy systems, and innovative clean-energy technology training are recurring ideas.
- Collaboration and Community Engagement
  - **Collaborative Relationships:** Fostering relationships with investors, the community, and government bodies to ensure collective action toward energy transition.
  - **Education and Awareness:** Developing energy education centres, raising awareness, and engaging communities to socialise ideas and ensure broader participation in the transition.
- Policy and Regulation
  - **Enabling Policies:** Advocating for regulations that support low-emissions industries, shipping, and renewable energy uptake, alongside streamlining consent processes for faster adoption.
  - **Supportive Policy Environment:** The emphasis is on policies that enable and incentivise renewable energy use, support low-emissions shipping, and integrate renewable energy into urban development.

5.5.1.2 Deploy

- Incentivising and Supporting Innovation

  - **Financial incentives:** Rate relief, government support, and incentives for innovative trials and clean energy technologies are key themes to encourage new technology adoption.
  - **Government support:** Central and local government roles in facilitating tech innovation and supporting clean energy initiatives are vital for deployment.
- Renewable Energy and Infrastructure
  - **Diverse energy sources:** The deployment of renewable energy sources like solar, wind farms, and battery storage technologies is a priority to enhance energy resilience and reduce emissions.
  - **Infrastructure for clean energy:** There's an emphasis on viable electric vehicle (EV) and hydrogen infrastructure and metering/monitoring systems to support the clean energy transition.
- Collaboration and Coordination
  - **Alignment of industry, research and government:** Effective coordination between various stakeholders (industry, research, government) to deploy solutions collaboratively and at scale.
  - **Community and industry coordination:** Ensuring communities are involved in energy initiatives through community energy pilots and ongoing communication on energy efficiency.

5.5.1.3 Learn

- Learning from Others and Proven Systems
  - **Adopt proven solutions:** The region seeks to learn from "proven" energy systems from other regions, cities, or countries and adopt those that align with local needs.
  - **Best practices and benchmarking:** A focus on understanding what works well elsewhere and applying those lessons to local challenges (good and bad from other cities/countries).
- Research and Local Insights
  - **Geothermal and sustainability research:** There's a focus on researching low-temp geothermal sustainability and the viability of district heat schemes for the region.
  - **Energy resilience:** Understanding the region's specific triggers, thresholds, and pathways to resilience to be better prepared for future energy challenges.
- Education and Community Engagement
  - **Education on benefits**: Educating local businesses and communities about the benefits of renewable energy and energy efficiency is seen as critical to gaining buy-in and accelerating adoption.

5.5.1.4 Key Themes

1) Strategic and Collaborative Planning
Clear business, regional, and community-focused plans are essential for guiding the energy transition, supported by flexible regulatory frameworks and strong collaboration across sectors.
2) Innovation and Technology
Developing and deploying innovative technologies (hydrogen, solar, wind, geothermal) and energy storage systems, alongside incentivising trials and clean energy projects, will be crucial.
3) Policy and Financial Support
Financial incentives and enabling policies are necessary to accelerate the adoption of renewables, streamline processes, and support industries in transitioning to low-emissions solutions.
4) Learning from Others
Adopt proven systems and solutions from other regions, learning quickly and implementing what works best for local contexts.
5) Community and Stakeholder Engagement
Education, awareness, and engagement with local communities and businesses are seen as vital to driving collective action and fostering a smooth energy transition.

5.5.2 Supporting Actions

How do we keep this alive and connected? What other collective actions can we take?

Communication, marketing, and engagement

- Share and Market the Vision: Develop consistent messaging and communication strategies that bring everyone on the journey, engaging stakeholders through various channels.
- Create Community Buy-In: Engage communities through programmes, support mechanisms, and outreach initiatives like regional and business roadshows.
- Promote and Champion the Plan: Identify a spokesperson to champion the plan and drive public awareness through good examples, case studies, and success stories.
- Leverage the BOP Energy Story: Use local energy success stories to build momentum and inspire action.
- More Conversations, Knowledge Sharing: Facilitate ongoing conversations to share knowledge, successes, and challenges within the region and beyond.

Governance, leadership, and strategy

- Refine & Agree a Regional Energy Strategy and Action Plan: Establish a regional energy strategy with clear, actionable steps, led by a well-defined leader or leading group.
- Create Strong Leadership and Accountability: Ensure strong leadership and hold stakeholders accountable for progress, setting a singular direction and measurable goals.
- Establish a Long-Term Energy Working Group: Form an ongoing working group focused on energy strategy, leadership, and execution.
- Set Big, Bold Goals: Establish ambitious goals that guide long-term progress, ensuring a streamlined, unified direction for the region's energy future.

Government and stakeholder engagement

- Develop a Central Government Engagement Plan: Foster open, honest communication with central government to ensure alignment with national policies and funding opportunities.
- Lobby and Build Connections: Actively lobby local and central government officials, ensuring the right people are in the room for key discussions.
- Leverage Central and Local Government: Strengthen relationships with both central and local governments to unlock resources and support.
- Reinstate GIDI Fund: Advocate for the reinstatement of key government funds, like the GIDI fund, to support clean energy projects.
- Engage Iwi and Māori Stakeholders: Ensure early engagement with Tangata Whenua, through forums and partnerships, to support inclusive energy solutions.

Investment, talent, and resources

- Attract Key Companies and Talent: Focus on attracting the right companies and skilled talent to drive innovation in the region’s energy sector.
- Secure Venture Capital and Business Donations: Mobilise funding from venture capital and local businesses to support energy projects.
- Create Incentives for Clean Energy: Ensure that biomass is fairly considered in consenting processes and explore renewable freight certificates to incentivise green energy solutions.

- **Investigate and Improve Energy Pricing**: Conduct thorough investigations into electricity pricing mechanisms to make energy more accessible and affordable.

Local focus and pilot projects

- **Launch Pilot Projects**: Identify and implement pilot projects that take advantage of local resources, focusing on low-hanging fruit to create iconic, replicable examples of success.
- **Leverage Local Strengths**: Focus on what the region already has, emphasising local solutions to meet energy needs.
    - **Organise a WBOP Energy Conference**: Create a platform to showcase regional energy initiatives, bringing together stakeholders to share progress and opportunities.

Innovation, education, and excellence

- **Establish an Energy Centre of Excellence**: Create a hub for research, innovation, and collaboration on clean energy solutions.
- **Foster Innovation through Competitions and Awards**: Encourage competition and innovation through energy- focused awards and recognition programmes.
- **Promote STEM and Vocational Education**: Invest in STEM and vocational education programmes to develop the next generation of energy professionals.
- **Engage Youth**: Ensure youth involvement in energy initiatives to cultivate long-term engagement and leadership in the sector.
- **Run Mock Crisis Events**: Organise mock crisis events to test the region's energy resilience and preparedness.

International engagement and learning

- **Tap into International Expertise and Learnings**: Actively seek out global best practices, tapping into international expertise to inform local projects and strategies.
- **Focus on Global Markets**: Keep an eye on global trends, ensuring that the region stays competitive in the evolving international energy landscape.
- **Democratise the Energy Market**: Explore ways to create a more inclusive and accessible energy market that benefits all stakeholders.

6 Timeline

There are international events and commitments that occur over time that will impact our ability to operate and, in some contexts, trade as an exporting region.

6.1 Climate Targets

1. **2050:** Net Zero Reduction of GHG
    a. Emissions of all GHG gases other than biogenic methane by and beyond 2050.
2. **2030:** 10% Reduction in GHG
    a. Reduction below 2017 biogenic methane emissions.
3. **2050** 24-47% Reduction of Biogenic Methane
    a. Reduction below 2017 biogenic methane emissions by and beyond 2050.

6.2 Carbon Border Adjustment Mechanism (CBAM)

Expected by 2026 – aimed at preventing carbon leakage across borders with countries that have less stringent climate policy than the European Union.

6.3 Process Heat

2037 – Ban on new low-medium temp coal boilers and phase to those that are already in use by 2037.

A discussion paper on the national direction was released in April 2021 for public consultation. Following the feedback received, Cabinet has approved the development of a National Policy Statement (NPS) and National Environmental Standard (NES), which will introduce nationally consistent policies and rules to decarbonise process heat.

The policy intent is to ban new low- and medium-temperature coal boilers and phase them out those that are already in use by 2037. It also requires sites with material emissions from process heat to prepare GHG Emission plans and adopt the best practicable option to reduce emissions.

7 Climate Action

The Tauranga City Council (TCC) and the Bay of Plenty Regional Council (BOPRC)both have climate action and investment plans which have the potential to contribute to a downstream energy strategy outcomes. Priority One meets with both Sustainability teams to coordinate activity and provide updates.

8 Recommendations

The key areas a strategy would be seeking to address:

- There is not a coordinated regional energy strategy or reporting, meaning we do not know our current and future position.
- We are reliant on a singular significant line of energy supply into the region, which is a risk to our resilience.
- Our manufacturers are reliant on gas for process heat and will need to transition away from this in the near term.
- We are a freight and logistics hub and face significant pressure to decarbonise within the next 25-year period.
- It is currently more challenging to obtain consents required to implement new technology in our region compared to elsewhere.
- The high level of uncertainty facing businesses on transition requires a more collaborative approach and support from across the spectrum to succeed.

Outcomes

For the energy strategy to effect change it needs to be action oriented. Some of the key outcomes it needs to achieve:

a) Increase awareness and acceptance of the core issues at the regional leadership level, both politically and commercially.
b) Drive support from business to be able to translate strategy into action with the required level of financial support.
c) Create momentum, government acceptance, and ideally funding for this region to lead the decarbonisation of freight and logistics nationally.
d) Network & collaborate with other regions (like Taranaki) support for key technology platforms and projects.

Specific actions that would lead to outcomes:

1) Our Energy Future (Priority One)
    a) Put together a dedicated energy event to launch the energy strategy and the vision developed by our businesses and provide a catalyst for discussion and activity including:
        i) Case studies of innovation approaches being used in our region and New Zealand to solve energy problems across stationary energy, process heat and transport.
2) Information & Education (Priority One)
    a) Assist businesses by providing information and education opportunities around new technologies.
3) Support Business Transition & Resilience (Priority One)
    a) Directly support the active transition to decarbonise energy systems and energy use regionally.
    b) Directly support the development of both new generation and non-transmission solutions within the region.
4) Form an Energy Leadership Group (Business led, Priority One facilitated)
    a) Drawn from industry and local government to coordinate our energy strategy, reporting, delivery and advocacy. Seek support and funding from the region to coordinate this activity and enable the group to perform specific research on behalf of industry.
        i) Assist with coordinating support for research into regional energy opportunities, to bridge the gap between research and commercial adoption, such as:
            (1) Geothermal
            (2) Biomass

(3) Biogas

b) **Start functional reporting on energy use** for the region to understand our current position and to assist with planning.

c) **Develop a Regional Energy Plan** using Dynamic Adaptive Planning Pathways (DAPP) for our region.

Priority One Tauranga Moana

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