

Te Rautaki Pūngao ā-rohe o Waikato **Waikato Regional Energy Strategy – Technical Report 2026-2050**

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Chairmans foreword

This is the second regional energy strategy prepared for the Waikato region. The first was prepared in 2009 – the first in New Zealand – prompting the second-generation Waikato Regional Policy Statement (RPS) to recognise renewable energy as a significant regional issue, enabling smooth consenting processes to access natural resources containing renewable energy. The fundamental drivers that prompted the 2009 Regional Energy Strategy have not changed. In some ways they have only become more acute and in others, technology advances offer more choices and options.

The Waikato Regional Council (WRC) on behalf of the region, is now updating the strategy to align with today's energy landscape. In the absence of a national energy strategy, the Council is stepping up providing regional direction, identifying how the energy sector can support its strategic direction that sets WRC up for future change under the theme of enabling and promoting a productive region that delivers prosperity, profitability and security¹.

The Waikato region is already central to New Zealand's energy system and exports two thirds of the electricity generated in the region to households, industrial and commercial sectors in other parts of the country. This position means that changes in regional generation capacity, demand growth, and infrastructure investment have outsized economic effects. Investment in renewable electricity in Waikato not only supports local decarbonisation but also supports the rest of the country to electrify and grow. In this way meeting the needs of international markets while at the same time reducing supply chain risks from a dependence on imported liquid fossil fuels.

This strategy has benefited from engagement with key partners and stakeholders over the last two years under the previous council's direction for a transition to a low emissions economy. Scenario modelling shows that this is the very action that will achieve our renewed goal of regional productivity and prosperity. The regional transition to a low emissions economy is a move to reduce trade risk and increase economic resilience for positive economic development.

We appreciate the time, and efforts of partners and stakeholders and their experts engaging with our officials to ensure that this strategy is fit for purpose to take us forward in today's dynamic operating environment. We know where we need to head and we know that we will need to work together to co-ordinate actions over time as no one party has all the functions, roles and responsibilities to achieve agreed goals. It is only by collective action and advocacy can we ensure that this is not the end but the beginning and that we all have a contribution to make. We each hold different pieces of the jigsaw puzzle, and this strategy provides the picture on the box that helps bring them all together.

We anticipate the strategy will be actioned through the establishment of a region-wide energy forum. We invite partners and stakeholders to progress actions or make appropriate recommendations for change that will increase regional productivity and prosperity whilst at the same time imparting resilience to the supply and use of energy through ambitious electrification of all economic sectors.

We will use the policy levers available to WRC and work through genuine partnerships, recognising that partners may support different recommendations while remaining aligned on shared goals.

I commend this strategy to all in the region engaged with the supply, distribution and use of energy for the benefit of individuals, communities and the productive economy to adopt and promote this energy strategy that champions a resilient, affordable and sustainable energy system for the Waikato region.

Warren Maher

Chairman: Waikato Regional Council

¹ [Waikato Regional Council, 2026.](#)

Strategy on a page

The Waikato Regional Energy Strategy is a roadmap for transitioning to a low-emissions, affordable and resilient energy system that reduces reliance on fossil fuels and strengthens the regional economy.	
Vision <i>Waikato's energy system – resilient, affordable and sustainable. Powering Waikato's growth and New Zealand's clean energy transition.</i>	
Outcomes	
Improve energy equity: communities have fair access to affordable and reliable energy, reducing energy hardship.	
Strengthen energy security: our energy system is secure and resilient, able to withstand disruptions and reliably meet the region's needs now and into the future.	
Achieve environmental sustainability: greenhouse gas emissions are reduced, and renewable resources are used in ways that protect the environment and taonga.	
Strengthen economic growth: economic growth is strengthened through greater use of renewable, affordable and reliable energy.	
Action – WRC to implement	
Establish a regional energy forum to consider the recommendations and lead implementation of the Waikato Regional Energy Strategy.	
Recommendations – regional energy forum to consider and implement	
Pou 1 Strategic partnerships Strategic partnerships across government, iwi, industry, research and communities accelerate progress by reducing duplication, sharing resources, and combining expertise to unlock innovation and ensure communities shape and benefit from the transition.	1. Support partnership models that enable co-investment, shared governance and equitable participation. 2. Support iwi partnership, participation and engagement in the energy sector.
Pou 2 Advocacy and leadership Strong advocacy and leadership drive the region's low-emissions transition by shaping supportive policy, aligning stakeholders and signalling long-term commitment.	1. Advocate for and enable renewable energy developments. 2. Lead by example through procurement and organisation decision-making, and case studies. 3. Advocate for a New Zealand energy strategy.
Pou 3 Supportive policy settings Clear, coordinated policy and spatial planning provides long-term direction, enables consistent renewable energy development, and builds investor confidence to accelerate delivery.	1. Maintain and strengthen regional policy settings. 2. Use spatial planning to identify renewable energy opportunities.
Pou 4 Workforce capability and capacity A skilled and well-supported workforce is vital to the energy transition, backed by sustained investment, strong training pathways, and collaboration across government, iwi, industry and communities.	1. Build workforce capability and capacity through education, training and investment.
Pou 5 Information and monitoring Transparent, timely and reliable information, supported by robust monitoring, enables evidence-based decisions, reduces uncertainty, and strengthens collaboration.	1. Build understanding of renewable energy resources and regional use. 2. Maintain up-to-date information. 3. Provide guidance to help high-use fossil-fuel industries transition.
Pou 6 Funding and finance Financial schemes and incentives are important to help communities transition, making low-emissions technologies more accessible, reducing upfront costs, and enabling households, businesses, iwi and community organisations to participate meaningfully in the energy shift.	1. Explore financing schemes to improve access to energy efficient and renewable technologies. 2. Advocate for government incentives to help make low-emissions technologies more accessible. 3. Promote total cost of ownership analysis.
Pou 7 Renewable and energy efficient technology Widespread adoption of renewable energy and energy-efficient technologies is essential to lowering emissions, reducing energy costs and strengthening regional resilience.	1. Encourage the adoption of renewable energy and energy efficient technologies. 2. Support iwi renewable energy initiatives. 3. Support research and development opportunities 4. Encourage energy hubs 5. Encourage mode shift toward lower-emissions transport. 6. Advocate for rail electrification and support more frequent rail services. 7. Encourage the use of low emission vehicles and enable public EV charging infrastructure. 8. Utilize smart charging technology. 9. Support grid expansion and distributed generation.

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Executive Summary

The Waikato Regional Energy Strategy provides a forward-looking roadmap for transitioning the region to a **low-emissions, affordable and resilient energy system**. Waikato is central to New Zealand's energy future, producing 36 percent of the nation's electricity, and in the absence of a national energy strategy, regional leadership has become essential. This strategy sets out how the Waikato can drive a coordinated, partnership-based transition that strengthens the economy, protects taonga, and improves wellbeing for communities across the rohe.

The strategy recognises that the current energy system is no longer fit for purpose. New Zealand faces high and volatile energy prices, declining domestic gas supply, increasing electricity demand, and rising climate and energy hardship pressures. Successive governments have made fragmented, short-term adjustments that have not resolved structural issues in affordability, market performance, or energy security. Political support remains uneven, investment is lagging, and much of the broader social and economic benefits of renewable energy remain unrealised. The region now requires a clear, durable direction to support investment, guide land-use and infrastructure planning, and align regional partners.

A just transition is fundamental. The strategy is grounded in iwi partnership, protection of taonga, wāhi tapu, wai, whenua and mauri, guided by Te Ture Whaimana o te Awa o Waikato and Treaty settlements. Iwi leadership should be enabled across all energy roles, supported by efforts to reduce energy hardship for whānau and marae and unlock Māori land and assets for renewable energy. Building iwi capability, upholding data sovereignty, and embedding early, relationship-first co-design are essential to achieving an equitable and culturally grounded energy future.

Modelling of three long-term scenarios shows that a proactive, and coordinated transition delivers the strongest outcomes – lowest long-term costs, deepest emissions reductions, strongest economic outcomes and greatest resilience.

Coordinated regional action is required. The strategy's central action is to establish a regional energy forum to bring together iwi, industry, government, infrastructure providers and major energy users to drive delivery of the strategy. Seven pou (pillars) set out the recommendations for the forum's consideration and implementation.

Significant opportunities exist to decarbonise industry while leveraging the region's strengths in hydro, geothermal, wind, solar, biomass and emerging technologies such as hydrogen, energy storage and sustainable fuels. These advantages position the Waikato to anchor new low-emissions industries and accelerate the shift away from fossil fuels. Within this context, Wairakei/Taupō, Tokoroa and Huntly stand out as priority renewable-energy hubs, each offering strong resource potential, skilled labour, and well-developed infrastructure that can support large-scale, regionally aligned development.

Overall, the Waikato Regional Energy Strategy positions the region to harness its natural strengths, drive economic transformation, and lead the country toward a fair, secure, and sustainable energy future. It provides the direction and practical steps needed to coordinate regional partners, attract investment, and create long-term, intergenerational benefits for the Waikato and Aotearoa New Zealand.

PART A – SETTING THE SCENE

1 Introduction

Energy underpins every aspect of life in the Waikato, providing the power that supports homes, transport and industry, while also holding deep cultural significance as a taonga to iwi Māori. The way energy is produced and consumed has significant consequences, especially for the environment. The combustion of fossil fuels releases greenhouse gases that drive climate change leading to more extreme weather, water shortages and infrastructure strain. These impacts, combined with rising electricity demand and costs, and growing clean-energy expectations are influencing community wellbeing, industry performance and investment decisions – prompting global shift in the way we plan for, and invest in, energy production and supply.

Waikato is well placed to lead an energy transition. The region’s hydro and geothermal assets provide a strong renewable foundation, while substantial untapped potential in wind, solar, and emerging green fuels offers new opportunities for innovation, skilled jobs, and sustainable economic growth. At the same time, protecting taonga, whenua, and the wellbeing of future generations remains paramount.

Waikato also has a history of energy leadership. It was the first region in New Zealand to develop a regional energy strategy, in 2009, prompting the Waikato Regional Policy Statement (RPS) to recognise renewable energy as a significant regional issue. Waikato Regional Council (WRC) on behalf of the region, is now updating the strategy to align with today’s energy landscape. In the absence of a national energy strategy, the Council is stepping forward to provide regional direction.

The updated strategy is underpinned by Council’s strategic direction², the Waikato Regional Energy Inventory³, modelling and economic analysis, a technical support document, and iwi perspectives. Iwi perspectives have been fundamental to this strategy, shaping its direction through a focus on protecting taonga and upholding genuine partnerships.

While WRC does not hold all the levers needed to deliver the energy transition, it plays an important enabling role through its statutory responsibilities, regional scale, planning functions, and role as an advocate for sustainable economic development. This strategy recognises that maintaining the status quo is not an option. It calls for a proactive, future-focused approach.

1.1 What is energy?

Energy is a master resource⁴ that underpins modern life. It is part of a living system that connects atua (ancestor), whenua (land), wai (water), te taiao (environment) and tangata (people), sustaining life and binding all forms of existence⁵. It powers homes, fuels transport, drives industry and supports the digital technologies that enable everyday activity, making it essential for economic development, public health and overall wellbeing. As communities grow and evolve, so too does their need for reliable, affordable and sustainable energy.

Energy is fundamental to how an economy operates – it is a continuous, essential flow that makes all economic activity possible.

Energy takes many forms, including electricity, heat, fuel and mechanical power, and is contained in fossil fuels such as oil, coal and natural gas and is available from renewable resources. Renewable energy comes from solar, biomass, wind, hydroelectricity, geothermal and marine sources.

² [Waikato Regional Council, 2026.](#)

³ [Dickie, B., & Andrews, K., 2024.](#)

⁴ [Bradley, R., 2009.](#)

⁵ Marsden, M., 2003.

People experience energy in different ways, shaped by housing, income, location and connection to place. For many households, energy is understood through everyday realities such as power bills, winter warmth and supply reliability, while for iwi Māori it is also tied to responsibilities as kaitiaki of the landscapes, waterways and ecosystems that sustain their communities. From a Māori worldview, energy is not simply a commodity, but a taonga that must be respected, protected and carefully managed⁶.

1.2 Why we need an energy strategy

The Waikato needs an energy strategy now because energy is getting more expensive, supply is less certain, and climate change is affecting people's lives and businesses. The strategy will set a clear direction to make energy more **affordable**, **secure**, and **cleaner** for the region – this is essential not only for community wellbeing but also for sustained **economic growth**. It will do this by working with partners, guiding investment, and supporting practical actions that help the region transition to a prosperous, profitable, and secure region.

Energy affordability (or equity), security and sustainability are collectively known as the energy trilemma (Figure 1).

Energy equity

Energy equity and accessibility, focuses on making energy available and affordable for all people, including businesses and vulnerable and low-income communities. It's about ensuring fair access and avoiding energy poverty. Energy hardship remains persistent across New Zealand, driven by rising energy costs, uneven income growth and structural inequalities. Māori, Pacific peoples, renters and crowded households are most affected. High electricity prices, combined with low incomes, poor housing quality and reduced heating efficiency, place increasing pressure on household budgets and amplify vulnerability to energy stress.

Energy security

Energy security refers to the need for a reliable and uninterrupted supply of energy to meet current and future demands. New Zealand faces growing challenges to its energy security and resilience due to supply disruptions, geopolitical risk and climate change. Declining domestic gas reserves and ageing infrastructure are reducing the system's ability to respond to shocks. Climate change is compounding these risks, with rising sea levels, more extreme weather, warmer summers, droughts, and shifting rainfall patterns. Rainfall records over the past 60 years show that the most recent decade has been the driest. This trend is projected to continue, reducing water reliability for farming, communities, hydro generation, industry and potential new industries, including those reliant on water for cooling or processing.

Environmental sustainability

Environmental sustainability means reducing the ecological impacts of energy production, particularly by lowering carbon emissions. It also requires using renewable energy resources in ways that protect the environment and taonga. While renewables deliver significant environmental benefits, their development can still create local pressures. Hydroelectricity can alter river flows, habitats and culturally significant sites; geothermal development may disturb landforms and sensitive taonga-protected systems; and wind generation can affect landscapes, birdlife and culturally important skylines.

Economic growth

Economic activity depends on energy. Achieving national and regional growth relies on a sufficient, reliable, and affordable energy supply. High energy costs remain a major headwind for New Zealand's economic recovery and contribute to persistently weak productivity⁷. Rising electricity prices and high transport costs continue to erode the competitiveness of New Zealand exports.

⁶ [Sims, R. et al., 2016.](#)

⁷ [OECD, 2025.](#)

Global experience shows that the *more electrified an economy is, the less vulnerable the economy is*⁸. Growth pathways that prioritise local jobs, affordable energy, and community resilience, deliver stronger economic and social outcomes.

Integrating the trilemma

The elements of the energy trilemma are often viewed as being in tension, with the traditional view suggesting that security, equity, and sustainability cannot be advanced simultaneously. However, technological progress is increasingly easing these trade-offs. Rapid improvements in renewable energy technologies, such as solar, wind, geothermal and bioenergy, are making clean energy more accessible and cost-effective. Advances in energy storage, smart grids, and distributed generation are also strengthening system flexibility and reliability. Together, these developments are enabling a shift away from fossil fuels while still supporting energy security and affordability.

Rather than progressing each of the three elements in isolation from each other, this strategy aims to progress all three simultaneously in an integrated way (Figure 1).

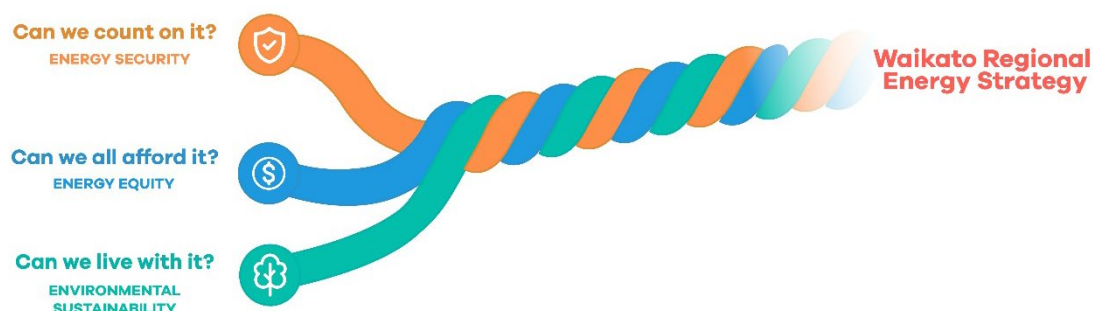


Figure 1: Integration of the three elements of the energy trilemma

1.3 Scope

This strategy is centred on the Waikato region, with links to neighbouring areas where significant energy-related interconnections exist, whether through resources, infrastructure, or demand. It takes a regional approach while acknowledging broader systems and dependencies.

The strategy addresses both the supply and demand sides of the energy system. On the supply side, it focuses on renewable energy sources and carriers including hydroelectricity, geothermal, wind, solar, biomass, marine and low-emission hydrogen-based fuels, alongside innovative storage solutions. On the demand side, it promotes energy conservation, efficiency, and the development of new energy-dense industries. It also supports alternative transport options such as electric and hydrogen-powered vehicles, and modal shifts to low or zero-carbon travel including walking and cycling.

The scope of this strategy is grounded in iwi perspectives, aspirations and leadership, recognising that iwi Māori hold essential roles as kaitiaki, landholders, partners, investors, and communities directly affected by energy-related impacts.

New fossil energy sources are excluded due to their long-lived emissions and market pressures. This includes waste-to-energy proposals that release fossil carbon, previously sequestered in manufactured products, into the atmosphere as CO₂, increasing the region's emissions footprint, contrary to Council's commitment to a low-emissions future.

Nuclear fission is acknowledged as a low greenhouse gas-emitting energy source. However, it is excluded from this strategy due to the lack of social licence and regulatory framework, high costs, being slow to build, unresolved waste management challenges, and the need for large volumes of cooling water, typically requiring coastal siting. These factors, combined with climate change-driven sea level rise and New Zealand's tectonic risks (as highlighted by the 2011 Fukushima incident), make nuclear development unsuitable at this time. Should opportunities arise in the future, it can be included in future reviews.

⁸ England-Hall, S., 2025.

The strategy is limited to technologies that are available and proven today. However, as energy technology is advancing at a rapid pace, the strategy will be regularly reviewed and updated to incorporate emerging innovations – ensuring it remains current and ahead of technological developments.

Tidal and ocean current energy is unlikely to contribute significantly to Waikato’s low-emissions transition and is therefore hasn’t been pursued. The two significant Waikato harbours (Whaingaroa and Kawhia) lack sufficient tidal exchange and depth making large-scale tidal energy generation unfeasible.

2 Current energy situation

2.1 National picture

New Zealand’s energy system reflects historic investment patterns, national policy settings, and market structures that prioritised efficiency and scale over resilience and equity. Today, the system is undergoing rapid change as declining domestic gas supply, rising electricity demand, and growing expectations for affordable, secure, low-emissions energy place increasing pressure on both supply and affordability. While New Zealand continues to benefit from one of the world’s highest shares of renewable electricity, primarily from hydro and geothermal, its overall energy supply still relies significantly on fossil fuels to meet its energy needs – mainly comprising oil, natural gas and coal. This reliance is becoming increasingly challenging as gas fields deplete, global fuel markets remain volatile, and climate change heighten risks to infrastructure and reliability. New Zealand’s energy supply mix is shown in Figure 2.

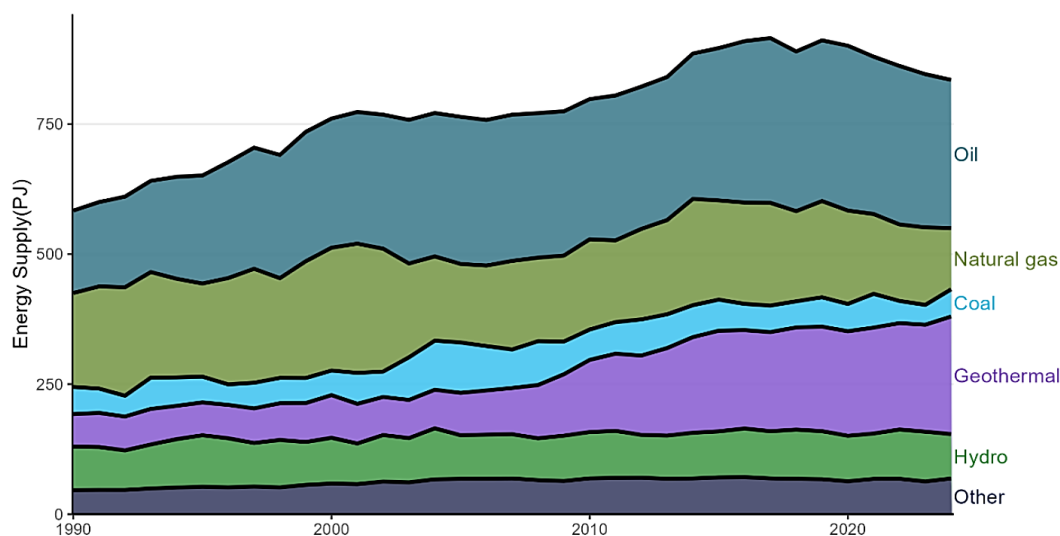


Figure 2: New Zealand’s total energy supply⁹

In 2024, renewable energy reached a record 45.5 percent of New Zealand’s total primary energy supply, and renewable electricity generation remained high at 85.5 percent. At the same time, total energy supply fell due to declining gas production (Figure 3), with natural gas consumption dropping to its lowest level since 2011. Despite strong renewable output, the electricity system still requires thermal peaker¹⁰ plants to support demand during dry periods or high-load events.

⁹ [Ministry of Business, Innovation & Employment, 2025a.](#)

¹⁰ Electricity generation source available at short notice using fossil fuels.

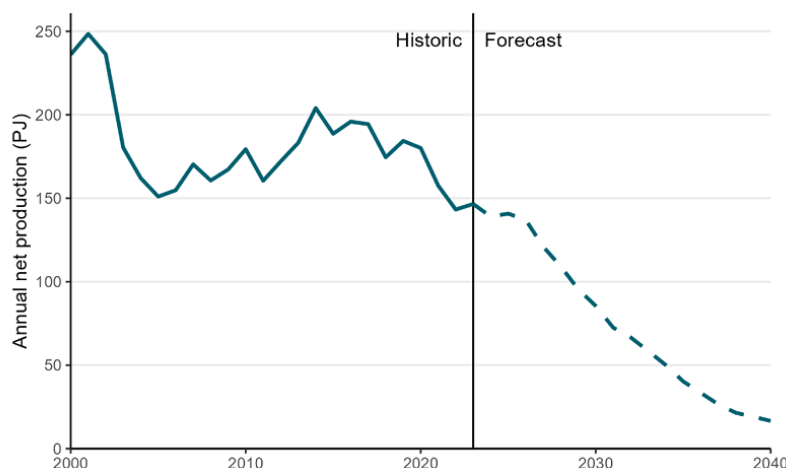


Figure 3: Historic and projected gas production¹¹

New Zealand retains significant coal reserves, over 15 billion tonnes, mostly lignite in the South Island. Oil production remains centred in Taranaki, but unlike many countries, New Zealand exports nearly all its crude oil. Since the closure of the Marsden Point refinery, the country now imports all refined petroleum products, including petrol, diesel and jet fuel, to meet domestic needs.

Natural gas has long supported New Zealand’s electricity system and industry, but declining fields and unsuccessful exploration have tightened supply and increased costs for users. New Zealand’s gas industry relied on take-or-pay contracts, requiring the government to pay for minimum volumes whether gas was taken or not. This structure locked in high fixed costs across the sector. Reducing industrial gas demand and improving supply security would help lower gas prices and indirectly ease electricity costs. However, the strongest lever for reducing wholesale power prices remains decreasing gas-fired electricity generation¹².

In 2018, the government banned new offshore oil and gas exploration to align with climate commitments, while allowing 22 existing permits to continue. Onshore exploration was allowed to continue for three years. The ban was not welcomed by industry which had already withdrawn from the area in the previous two years¹³. However, exploration under those permits has so far been unsuccessful: since 2020, companies have spent more than \$1.2 billion¹⁴ drilling 53 wells¹⁵ with no commercial discoveries.

The transition away from gas has slowed. The offshore exploration ban was repealed by the Coalition government in 2025, alongside a \$200 million Gas Security Fund, managed by Kānoa¹⁶, to support new field developments, infrastructure and storage, with the Crown potentially taking a 10–15 percent equity stake in successful projects. The fund aims to address declining production and stabilise supply for industrial users and regional economies. Minister Shane Jones said the initiative was introduced to address declining gas production affecting industry and regional growth, and that the \$200 million could increase if more credible investment opportunities emerge¹⁷.

The Coalition government also cancelled the Government Investment in Decarbonising Industry (GIDI) Fund, removing co-funding for firms to electrify or switch to biomass. This has delayed industrial decarbonisation, extended reliance on gas-fired equipment, and increased emissions compared with an electrification-led pathway. The Government also halted development of the National Gas Transition Plan¹⁸, which was intended to guide the orderly phase-down of gas use.

¹¹ [Ministry of Business, Innovation & Employment, 2026a.](#)

¹² [Hobbs, et al., 2025.](#)

¹³ [Dempsey, D., 2024.](#)

¹⁴ [Hickey, B., 2026.](#)

¹⁵ [Daalder, M., 2025a.](#)

¹⁶ [Kanoa Regional Economic Development Unit, 2026.](#)

¹⁷ [Daalder, M., 2025b.](#)

¹⁸ [Gas Industry Co., 2023.](#)

In addition, the Government has committed to a \$2.7 billion hire-purchase of a liquefied natural gas (LNG) import facility in Taranaki. Independent analysis (BCG’s *Energy to Grow*) identified LNG as a “last-resort” option to maintain security of supply as domestic production declines.

Despite these pressures, the North Island’s gas network remains a valuable asset. In 2023, most gas in New Zealand was used by the industrial sector – either for process heat (35%) or being used as feedstock (26%). Around 29% was for electricity generation, and the remaining 10% represented use by households, schools, hospitals and other businesses¹⁹. Economic value varies widely by use: for example, Fonterra generates \$45–\$75 in GDP per gigajoule of gas used, while Methanex and Balance Agri-nutrients generate only a few dollars.

The energy sector is now facing a convergence of pressures that expose growing vulnerabilities: shrinking gas supply, increasing electricity demand, higher price volatility, and dry-year risks that strain system resilience.

2.2 Regional picture

Waikato’s role in Aotearoa’s energy system is deeply connected to wai, whenua and its geothermal systems. Waikato is a key contributor to the country’s energy system, home to 75 percent of New Zealand’s high-temperature geothermal resources, major hydro schemes, strong solar and wind potential, and the country’s largest thermal station at Huntly. Additionally, the region is the major source of coal in the North Island, with production primarily sourced from the Huntly East and Rotowaro mines, and on the west coast in the Mokau area.

In 2024, the Waikato region’s total energy supply reached 130,215 terajoules (TJ), sourced both locally and through imports. Just over half of this (51 percent) came from local renewable sources, 15 percent came from Taranaki region as gas, and 33 percent was imported internationally as liquid fossil fuels, with some coal. Most fossil fuels were used by industry, manufacturing, transport and for electricity generation. In contrast, nearly all renewable energy produced within the Waikato was converted into electricity, with 68 percent exported to other regions.

The Waikato region continues to lead New Zealand in electricity supply (Figure 4) and generation (Figure 5). In 2024, Waikato generated 36 percent (15,701 GWh) of the nation’s electricity.



Figure 4: Waikato’s electricity supply (2024)

¹⁹ [Ministry of Business, Innovation & Employment, 2026a.](#)

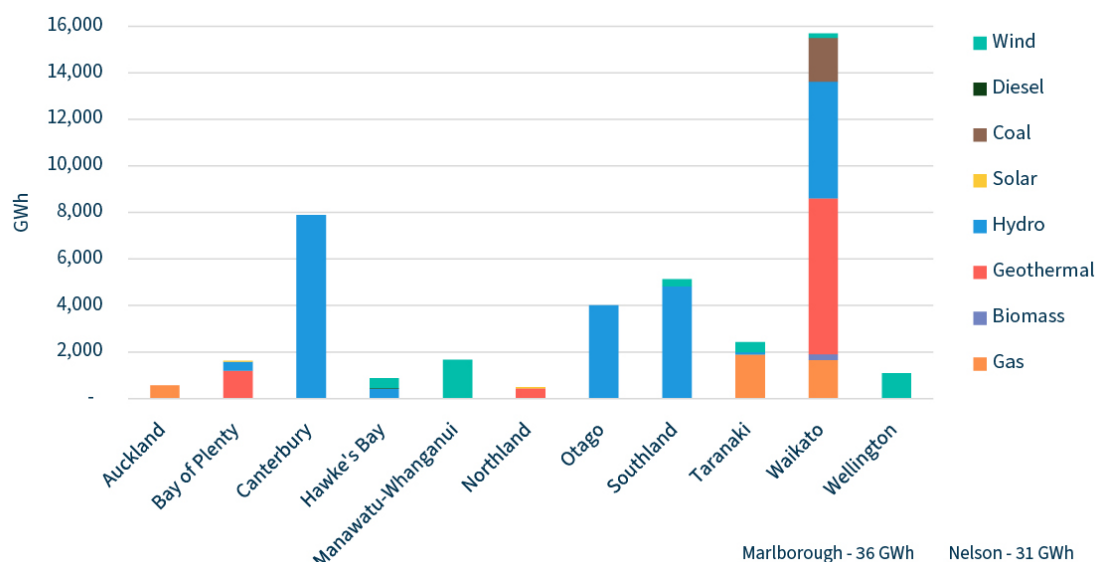


Figure 5: Grid connected electricity generation by region (2024)²⁰

A summary of renewable sources and their installed capacities is provided in Table 1.

Table 1: Current electricity generation from renewable sources in the Waikato region

Source	Size	Comments
Solar	204 MW	Rooftop solar is the most widespread form of solar in the Waikato region, with over 10,000 systems (December 2025). Note: two of the network boundaries extend beyond the Waikato region's administrative boundaries, making a slight overestimate of installed capacity. In addition, there are several small solar farms operating in the region.
Biogas	160 TJ = 7,200 houses	Ecogas operates a gas-2-grid connection using renewable gas from food waste.
Wind	64 MW	There is single network connected wind farm at Te Uku west of Hamilton city.
Hydro	1,503 MW	There are two major hydroelectric power schemes on the Waikato River system – one above lake Taupō (Tongariro Power Scheme), and one below (Waikato River scheme). In addition, several smaller stations are located on tributaries.
Geothermal	1068 MW	There are 15 large geothermal systems in the region, of which five have been developed for use, including large scale energy developments – Wairakei-Tauhara, Ōhaaki, Mokai, Rotokawa and Ngā Tamariki.

Industrial decarbonisation is a major regional priority: the Energy Efficiency and Conservation Authority (EECA) has identified 91 high-use fossil-fuel sites, mainly dairy and meat processors, with significant potential for emissions reductions through fuel switching, efficiency improvements and heat-pump technologies.

Strategic transmission upgrades, particularly between Whakamaru and Auckland, have made the Waikato the strongest part of the national grid. This is a significant regional advantage, allowing for rapid expansion of grid-connected wind and solar generation.

The co-location of geothermal fields and extensive central North Island forests offers strong potential for biomass and bioenergy industries, supported by electrified rail links for efficient transport. Strategic industrial hubs such as Tokoroa, Huntly and Wairakei/Taupō are well-placed to offer further potential in renewable energy, leveraging available land, infrastructure, labour, transport networks and freshwater. These hubs also create opportunities for iwi-led and partnered development, provided engagement and resourcing occur early and meaningfully.

The current (2025) energy flows for the Waikato region are shown in Figure 6.

²⁰ Based on Concept Consulting Ltd analysis

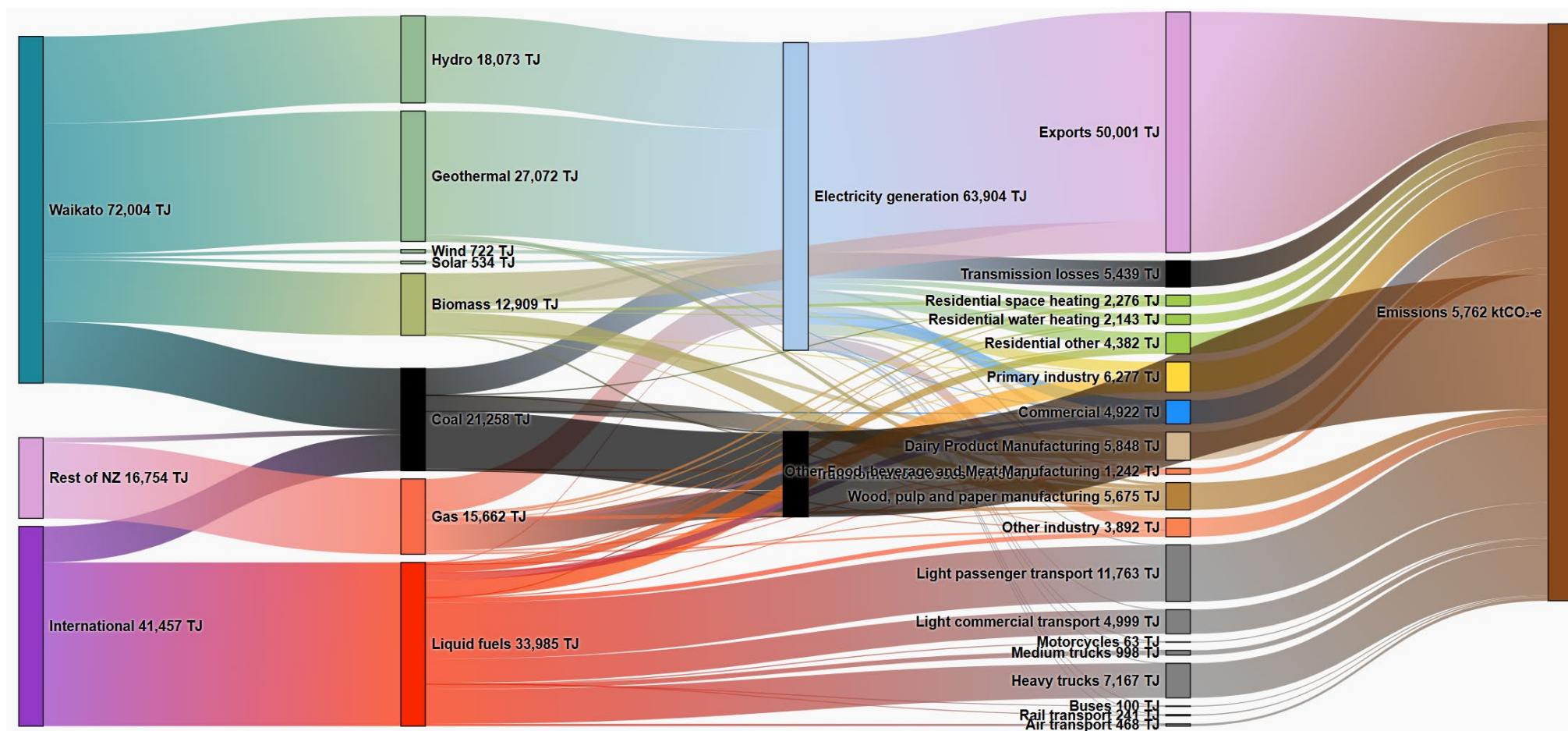


Figure 6: 2025 energy flows and emissions²¹

²¹ Prepared by Concept Consulting. An interactive version of the diagram is available at <https://econergy.earth/ConceptApps/waikato/WaikatoSankeyDynamic.html>

2.3 Greenhouse gas emissions

The Waikato region's economic sectors have the highest greenhouse gas emissions of any region, contributing 18.7 percent of the national total in 2024. This equates to 14.5 million tonnes of CO₂e emissions annually. Electricity, gas, water and waste services contribute 22.9 percent of the emissions, including fossil fuels used for electricity generation (for example coal at Huntly power station) and industrial process heat. Transport and industrial processes are significant contributors through fossil fuel use for freight, passenger vehicles and manufacturing²².

The pastoral agricultural (dairy export) sector is a key driver of the region's economy including support industries such as product processing, livestock, agricultural contracting and transport firms. Although emissions reductions and decarbonisation arising directly from pastoral land use (specifically carbon dioxide (CO₂) from peat drainage and methane (CH₄) from ruminant livestock), has been excluded from the scope of this report, the emissions from support industries have not. These are predominantly CO₂ from use of fossil fuels imported into the region and collectively contribute to the embodied greenhouse gas footprint of exported produce.

How are greenhouse gas emissions managed?

Greenhouse gas emissions are primarily managed through the ETS (Emissions Trading Scheme). The ETS requires emitters to surrender one 'emissions unit' (known as New Zealand Units; NZU) to the government for each one tonne of emissions they emit²³. This creates a financial incentive to reduce emissions. Emissions are also being shaped by international market pressures. The European Union (EU) has introduced a Carbon Border Adjustment Mechanism (CBAM), which imposes a carbon levy on certain emissions-intensive goods imported into the EU – in sectors which are considered at risk of carbon leakage (i.e. the offshoring of production to countries with laxer emission constraints)²⁴. The mechanism requires the price of embodied emissions of imported products to mirror the European price. At the time of writing, a tonne of CO₂ emissions is priced at NZ\$160 with expectations of between NZ\$200 and NZ\$300 (current exchange rate) by 2030.

Following the removal of decarbonisation incentives for industry and transports sectors by the incoming coalition government, the ETS remained as the nation's primary emissions abatement mechanism. Recent government policy announcements and changes to the regulatory settings have created a loss of confidence in the ETS mechanism, price volatility²⁵ and a price drop from a lack of a credible policy mechanism to assist decarbonisation of our export sectors.

The price of NZU has decreased from a peak of \$90.50 in September 2022 to a price of \$53.00 in June 2026 (Figure 7). This reduction in the price of NZUs reduces the relative price paid for continued use of high carbon emitting fuels and lessens the incentive to decarbonise in favour of low emission electricity or carbon neutral biomass for industrial heat. This has the potential to expose the economy (export sectors) to additional costs not covered by the ETS such as pastoral agriculture to international Carbon Border Adjustment Mechanisms (CBAM).

²² [Stats NZ, 2026.](#)

²³ At the time of writing the price of carbon was \$53 (June 2026).

²⁴ [New Zealand Foreign Affairs & Trade, 2026.](#)

²⁵ [Carbonnews, 2026.](#)

Carbon price NZU



Figure 7: Carbon price NZU, 2022-2026²⁶

3 Human use of energy

In pre-industrial times, energy was primarily sourced from natural, renewable materials such as plant biomass, animal oils, muscle power (human and animal strength), water and wind. These sources were directly tied to ecological systems, meaning energy use was limited by what nature could provide and regenerate.

The industrial revolution marked a major shift with the invention of the steam engine and the widespread use of fossil fuels (coal, gas and oil). These fuels powered machines, transportation, and electricity, transforming economies and societies. Over the past 250 years, the use of fossil fuels has evolved – from coal powered steam engines to oil powered transport, and natural gas for heating, lighting and industrial processes. Fossil fuels enabled mass production and urban expansion, and a legacy reliance on fossil fuels, especially for vehicles.

The use of fossil fuels created unforeseen consequences – releasing carbon dioxide (CO₂) into the atmosphere. Carbon dioxide is a major contributor to global warming as it traps heat in the atmosphere. The effect of emissions from combusting fossil fuels and atmospheric concentrations of CO₂ has been measured from 1958. Figure 8 shows atmospheric carbon dioxide concentrations since pre-industrial²⁷. The concentration that is stored in the atmosphere is just 70 percent of the CO₂ emitted from burning fossil fuels and land use change. The remaining 30 percent has been absorbed into the oceans and contributes to ocean acidification.

²⁶ [Interest.co.nz, 2026](https://www.interest.co.nz).

²⁷ [UC San Diego & Scripps Institution of Oceanography, 2026](https://www.scripps.edu/).

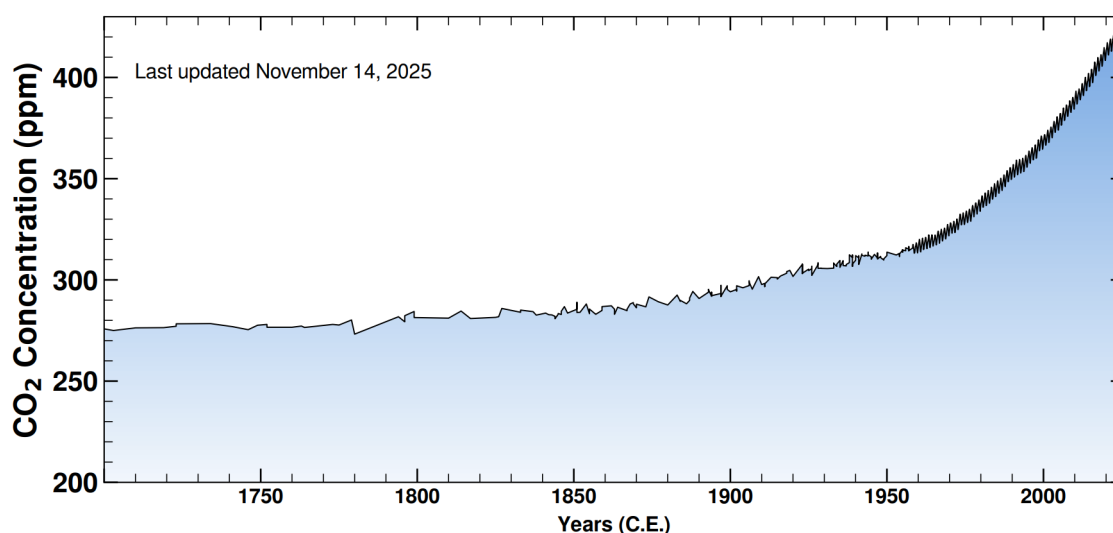


Figure 8: Atmospheric carbon dioxide concentrations over time

From the earliest days of human civilisation, our modern economy has grown from and is now driven using energy. Fossil fuels still dominate globally, but their role is being re-evaluated in light of sustainability goals. The Waikato Energy Strategy aims to be a catalyst for change, a practical, regionally grounded roadmap that supports the transition to a low-emissions economy while ensuring energy remains affordable, secure, and sustainable for all.

4 Operating environment

4.1 International obligations

While there are limited international obligations relating to the direct provision of energy services, there are binding international commitments to reduce greenhouse gas emissions from fossil fuel use and, increasingly, from traded goods and services. These obligations require implementation approaches that protect taonga and deliver equitable outcomes, ensuring transition costs are not shifted onto whānau, marae, or future generations.

In October 2016, New Zealand signed up to the 2015 Paris Agreement which entered into force in November 2016. The primary purpose of the agreement is to keep the global average temperature well below 2°C above pre-industrial levels, while pursuing efforts to limit the temperature increase to 1.5°C. In 2016, New Zealand submitted its nationally determined contribution to move to a net zero emissions economy by 2050, and by 2030 to reduce net greenhouse gas contributions to 30 per cent below gross 2005 levels. This was updated, in 2021 to reduce net greenhouse gas emissions to 50 per cent below gross 2005 levels by 2030²⁸, and again in 2025 to reduce net greenhouse gas emissions to 51-55 per cent below gross 2005 levels by 2035²⁹.

At the United Nations Framework Convention on Climate Change (UNFCCC) Conference of Parties (COP28, December 2023), the incoming coalition government recommitted to achieving a net zero greenhouse gas emissions economy by 2050 by doubling the country's renewable electricity generation. It also signed up to the official list of countries to globally triple renewable energy use and double energy efficiency by 2030.

To meet this target, it is necessary to understand which economic sector the nation's greenhouse gas emissions come from. From returns submitted to the UNFCCC, New Zealand's gross emissions were 78.8 million tonnes of carbon dioxide equivalent (Mt CO₂-e). This was partially offset by land use, land use change and forestry sequestration giving 55.5 Mt CO₂-e.

²⁸ [New Zealand Government, 2021.](#)

²⁹ [New Zealand Government, 2025.](#)

At 31.5 Mt CO₂-e, the energy sector was the second highest contributor making up 40 percent of gross emissions, as shown in Figure 9.

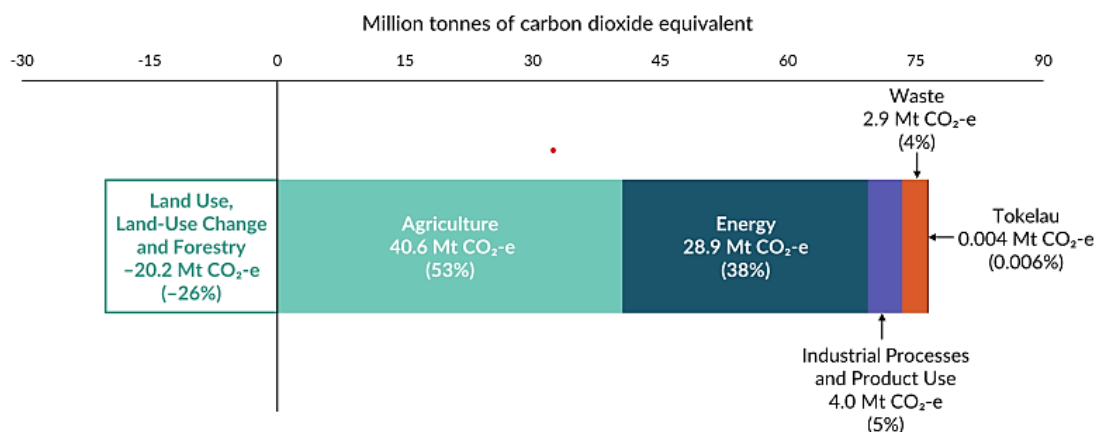


Figure 9: Breakdown of New Zealand's gross greenhouse gas emissions by sector and gas type in 2023³⁰

4.2 Markets and geopolitics

External global and market factors are increasingly shaping the operating environment for Waikato's export-driven economy. These factors include:

- **Market requirements:** the Waikato has a strong primary export sector and is dependent on meeting market expectations to gain access to markets and to achieve a premium price.
- **Trade agreements:** trade agreements increasingly include environmental and climate provisions that require countries to reduce emissions, improve sustainability, and meet low-carbon standards to maintain market access. More than 80 percent (value) of New Zealand's exports go to countries with either mandatory or proposed climate-related disclosures.
- **Supply chains:** oil price shocks affect not only export sectors but also regional industries that rely heavily on road-based logistics, particularly for agricultural inputs such as fertiliser, diesel and chemicals.

4.3 Political context

New Zealand's energy system operates within a complex and shifting political landscape, where government decisions have implications for regions, industry, communities, and iwi Māori. For iwi, decisions on energy matters have wide-ranging impacts, reflecting their overlapping roles as kaitiaki, landholders, investors, communities, and energy consumers. Protection of taonga, wāhi tapu, and wider environmental systems remains the foundation for decision-making, with development supported only where these values are upheld. As political priorities change, so too does the balance placed on security, sustainability, and cost.

Government responses to obligations under the Paris Agreement vary widely, and national energy policy often prioritises different elements of the energy trilemma depending on political priorities, economic conditions, and public pressure. These choices have long-term impacts on the pace and direction of the energy transition and on New Zealand's ability to meet its climate commitments.

In New Zealand, energy has increasingly become a matter of economic risk, drawing government attention. However, successive governments have largely avoided making the bold, structural changes needed to address long-standing issues. Instead, they have made incremental adjustments, without committing to the consequential reforms required to reshape the energy system.

³⁰[Ministry for the Environment, 2025b.](#)

Despite operating under a market-based energy model for over 25 years, no single party has yet taken the lead in driving transformative change.

The shift toward a low-carbon energy system is nevertheless advancing, particularly through the electrification of industrial process heat and transport. This transition will significantly increase electricity demand. MBIE’s 2023 briefing to the incoming Minister of Energy outlined where future generation capacity is expected to come from, showing the gradual shift from today’s fuel mix to a “largely renewable” generation portfolio (Figure 10). The briefing assumed limited growth in hydro and geothermal, as mature sectors, with incremental improvements occurring primarily through technology. It also anticipates the phase-out of fossil fuels and their replacement by new wind, solar, and bioenergy generation.

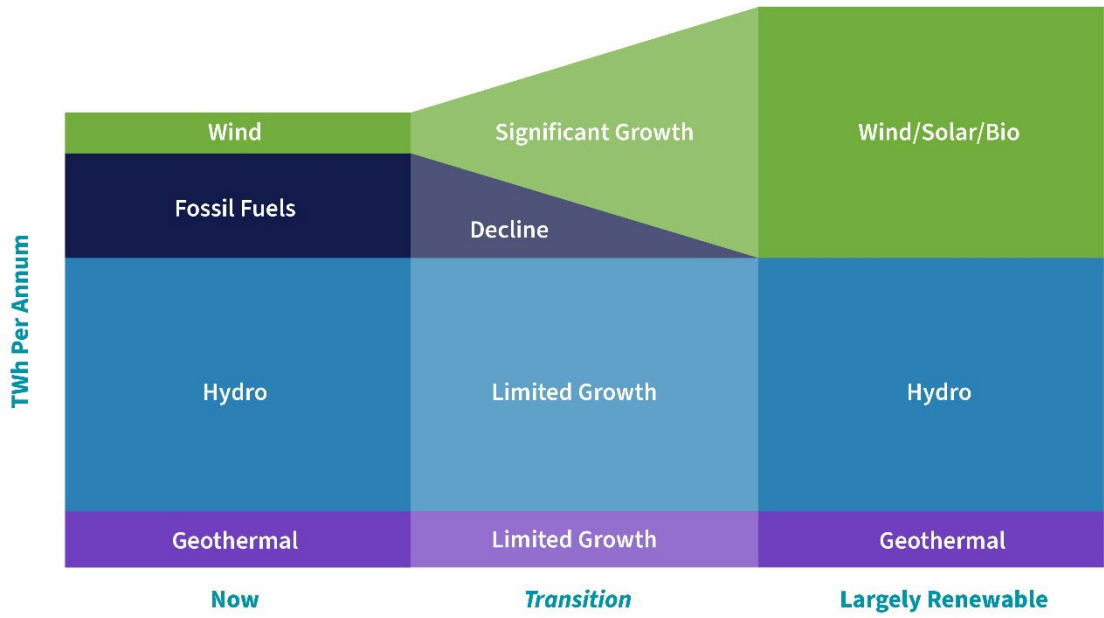


Figure 10: Anticipated transition of electricity fuels in New Zealand³¹

The current Coalition Government has shifted energy policy away from a 100% renewable target, placing stronger emphasis on energy security and affordability. This approach includes a major pivot toward importing Liquefied Natural Gas (LNG), renewed support for oil and gas exploration, and fast-tracking renewable energy infrastructure. The energy policies of coalition parties are summarised in Appendix 1 of the Waikato Regional Energy Inventory³².

Energy related actions initiated by the current government include:

1. Gas supply and infrastructure

- **LNG import facility:** in February 2026, the Government announced a definitive decision to build a large-scale LNG import terminal to address rapidly declining domestic gas supply and provide backup for renewable electricity during dry years. The terminal is expected to be operational by 2027/28 and could be funded via a levy on electricity users.
- **Reversing exploration ban:** the government moved to repeal the ban on offshore oil and gas exploration, aiming to stimulate new investment.
- **\$200M gas security fund:** the government’s 2025 budget committed \$200 million for co-investment in gas fields to mitigate supply risks.
- **National Fuel Response Plan Activated:** On 27 March 2026, amidst global supply chain pressures, the Government officially triggered Phase 1 of the National Fuel Response Plan 2026. This protocol established a multi-tiered alert system to handle potential fuel shortages and outlined future contingency rationing guidelines across five distinct priority bands.

³¹ Ministry of Business, Innovation & Employment, 2023.

³² Dickie, B., & Andrews, K., 2024.

- **Targeted Offshore Fuel Acquisition:** On 30 March 2026, the Government moved to aggressively secure an additional **90 million litres of refined fuel supply** from international markets to shore up the country's strategic reserves.
- **Propose a legislative change to the Gas Act.** The legislative update legally mandates the gas industry to share greater data transparency regarding supply and demand figures with regulators.
- **Gas market transparency** a new gas information framework is being established to provide better data on reserves and production by 2026.
- **Budget 2026 Capital Allocations:** Formally unveiled on 28 May 2026, the national budget committed significant capital toward core infrastructure and resilience:
 - \$1.2 Billion Gas Transition Loan Guarantee Scheme: Implemented to support business fuel-switching away from piped natural gas.
 - \$150 Million Strategic Fuel Reserve Fund: Designated to secure additional national fuel volume resilience.
 - \$294 Million Planning Reform Fund: Allotted over four years to phase out the Resource Management Act (RMA) in favour of a faster infrastructure consenting regime
- **National Infrastructure Plan Response:** On 16 June 2026, the Government formally published its statutory response to the Infrastructure Commission's **National Infrastructure Plan 2026**. The Government agreed to accept all 16 strategic recommendations, including core mandates to accelerate electricity infrastructure investments and standardise spatial planning frameworks

2. Electricity sector and market reform

- **Commissioned Frontier review:** an independent review of electricity market performance was completed by Frontier Economics and released in 2025. Ten key recommendations were identified.
- **Electricity Retail & Billing Protections Launched:** The Electricity Authority Te Mana Hiko launched "Billy," a new independent comparison and switching service. Simultaneously, the regulator banned long back-bills, required clearer information on invoices, and instituted a mandatory "annual best plan check" to shield consumers from overpaying.
- **Public Service Power Purchase Agreements (PPAs) Open:** On 25 February 2026, the Ministry of Business, Innovation and Employment (MBIE) progressed a major component of the Government's Energy Package by announcing long-term Power Purchase Agreements (PPAs). The initiative aggregates the massive electricity needs of the state's three largest energy users—Health New Zealand, the NZ Defence Force, and the Department of Corrections—to offer long-term financial contracts to developers, de-risking commercial investments in new wind, solar, and geothermal builds.
- **Commerce Commission approves coal stockpile:** the Commerce Commission approved Genesis, Mercury, Meridian and Contact to build coal reserves of 600,000 tonnes, to reduce the risk of future electricity shortages.
- **Anti-Competitive Pricing Ban Enacted:** On 26 May 2026, Energy Minister Simeon Brown unveiled a sweeping structural market intervention. The policy bars the big four gentailers (Contact, Genesis, Mercury, and Meridian) from offering more favourable internal wholesale pricing arrangements to their own retail operations than they offer to independent power retailers.
- **Gentailer Transparency Mandates:** Tied to the anti-competitive pricing ban, major energy providers are now legally required to submit comprehensive compliance roadmaps to the Electricity Authority. Companies must formally demonstrate every six months that their consumer retail rates accurately reflect expected electricity cost inputs.
- **Rooftop Solar Consenting Exemptions:** As part of the same consumer energy package, the Government completely removed building consent requirements for installing rooftop solar panels on existing homes and commercial properties.

- **Strengthening the Electricity Authority (EA):** the government announced plans to introduce legislation in 2026 to increase the EA's powers, including raising maximum penalties for code breaches to \$10 million.
- **Electrify NZ Program:** this program aims to speed up and lower the cost of consenting for renewable projects, including solar, wind, and storage.
- **"Fairer" solar buy-backs:** as part of 2025 reforms, major retailers will be required to offer fair buy-back rates for residential solar exports by July 2026.
- **Mandatory time-of-use pricing:** large electricity retailers must offer at least one plan with Time of Use (TOU) pricing by June 2026 to encourage lower off-peak usage.
- **Lines company investment:** the government moved to allow Electricity Distribution Businesses (EDBs) to own more than 50MW of generation assets to improve efficiency.
- **Solar on farms package:** the initiative aims to support farmers in taking the next step towards installing solar and battery systems.

3. Renewable energy and resource management

- **National Policy Statement Amendments in Force:** On 15 January 2026, amendments to the National Policy Statement for Renewable Electricity Generation legally took effect. Handled through the Ministry for the Environment, this statutory framework establishes strict, streamlined national direction for councils to significantly fast-track resource consents for renewable electricity generation, transmission, and local network distribution.
- **RMA Fast-Track legislation:** the Fast-Track Approvals Act 2024 was passed to accelerate consenting for infrastructure and renewable energy projects. Electricity generation and transmission projects are listed in Schedule 2.
- **100% renewable target scrapped:** the previous government's 100% renewable electricity target (by 2030) was removed to encourage a more balanced, commercial investment approach.
- **State Solar Procurement Feasibility Study:** Tied to the February PPA announcement, MBIE officially launched a comprehensive feasibility study aimed at establishing a standardized, streamlined procurement model to accelerate commercial solar panel arrays across government-owned buildings and assets
- **Distributed Solar Grid Reforms:** In March 2026, regulators cleared structural hurdles for residential solar by doubling the maximum default export limit for household connections to 10kW and amending transmission rules to mandate financial network rebates for homes feeding solar energy back into local grids during peak hours.
- **Commercial Rooftop Solar De-Regulation:** On 26 May 2026, the Government completely abolished building consent requirements for installing rooftop solar configurations on existing commercial facilities and residential homes, eradicating bureaucratic bottlenecks for localized solar deployment.
- **Lake Onslow project cancelled:** the large-scale pumped hydro scheme at Lake Onslow was cancelled.
- **Offshore renewable energy (ORE):** legislation is being developed to create a framework for seabed space allocation for wind farms, aiming for enactment in 2026.
- **Geothermal Strategy:** "From the Ground up" was launched in March with a goal of doubling geothermal energy use by 2040.
- **Research for supercritical geothermal:** the Government ring-fenced up to \$60 million to invest in exploring the potential of supercritical geothermal technology. In June it released the final \$55 million to drill the country's first superhot, ultra-high temperature geothermal exploratory well at Rotokawa

4. Other Key Policies

- **Coal-to-biomass transition:** the government is supporting plans to transition the Huntly Power Station from coal to biomass, aimed at reducing emissions.
- **Energy Competition Task Force:** the Electricity Authority and Commerce Commission established the Task Force in 2024 to enhance the electricity market's performance, increase competition, and empower consumers.

- **Reducing sovereign risk:** the government is exploring mechanisms to reduce investment risk for new energy projects.

Electricity market reform is expected to be a major issue in the lead-up to the 2026 general election. The Review of Electricity Market Performance, completed for MBIE by Frontier Economics and released in 2025³³, concluded that substantial changes are needed to support affordability, reliability, competition, and investment in new generation. Although it made ten key recommendations, MBIE's subsequent policy package³⁴ focuses on only a subset of these, through two workstreams: *Invest in energy security* and *Build stronger markets*. This continues the government's market-led approach to the energy sector.

4.4 Regulatory framework

4.4.1 National context

The energy sector is influenced by a range of statutory instruments at the national level. These are set out below.

Climate Change Response Act 2002

The Climate Change Response Act 2002 establishes a legal framework to enable New Zealand to meet its international obligations under the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement. The Act established the New Zealand ETS. The Act was amended in 2019 by the Climate Change Response (Zero Carbon) Amendment Act, which established:

- A new domestic greenhouse gas emissions reduction target
- A system of emissions reduction budgets toward the long-term reduction target
- The Climate Change Commission
- The requirement for a National Adaptation Plan and an Emissions Reduction Plan.

The government intends to introduce a bill to amend the Climate Change Response Act in 2026.³⁵

Emissions Reduction Plan

The Climate Change Response Act 2002 requires that an emissions reduction plan is prepared that sets out policies and strategies for meeting the relevant emissions budget. New Zealand's Second Emissions Reduction Plan 2026-30³⁶ was published in December 2024. Of the eight key policies within the plan, those most relevant to energy are:

- Enabling more renewable energy projects through Electrify NZ
- Recognising carbon capture, utilisation and storage in the NZ ETS
- Targeting a network of 10,000 EV charging points by 2030.

The plan includes a chapter on emissions reduction opportunities for the energy sector, recognising that emissions from energy use make up 37 per cent of New Zealand's gross emissions. Key actions and policies within this chapter are:

- Delivering Electrify NZ to help achieve the goal of doubling renewable energy (including reducing consenting times)
- Enabling energy efficiency and a smarter electricity system
- Enabling carbon capture, utilisation and storage
- Enabling renewable gases and woody bioenergy.

³³ [Frontier Economics, 2025.](#)

³⁴ [Ministry of Business, Innovation & Employment, 2025b.](#)

³⁵ [Ministry for Cities, Environment, Regions & Transport, 2026a.](#)

³⁶ [Ministry for the Environment, 2024.](#)

Resource Management Act 1991

Under the RMA, “the benefits to be derived from the use and development of renewable energy” is a matter that all persons exercising powers and functions under the Act must have regard to.³⁷

The RMA establishes the roles of regional councils and territorial authorities in managing the use, development, and protection of natural and physical resources. Regional councils have primary responsibility for managing access to the potential energy contained in water³⁸ and for geothermal heat and energy.³⁹ The potential energy contained in water is stored in impoundments or dams. Air pressure (wind) and sunlight are not allocatable resources under the RMA, however electricity generation from solar and wind is managed as an effect of land use and regulated based on the effects of the technologies used to access the energy. This is largely a function of territorial authorities, exercised via rules in district plans.

The Resource Management (Consenting and Other System Changes) Amendment Act 2025 came into force in August 2025 as part of the government’s resource management reform programme. This Act introduced amendments to give effect to the government’s Electrify NZ policy to make it easier to consent renewable energy, including extending default resource consent durations and lapse periods for renewable energy activities.

There are three pieces of national direction under the RMA that relate specifically to electricity generation and transmission:

- National Policy Statement for Renewable Electricity Generation 2011
- National Policy Statement on Electricity Transmission 2008
- National Environmental Standards for Electricity Transmission Activities Regulations 2009.

Amendments to each of these instruments were consulted on in mid-2025 as part of proposed packages of new and amended national direction under Phase 2 of the government’s resource management reform programme. The proposals within the national direction packages were intended to contribute to the government’s overarching goals of the resource management reform programme; one of which is “enabling delivery of high-quality infrastructure for the future, including doubling renewable energy”.⁴⁰ The amended national direction instruments came into force on 15 January 2026. A new National Policy Statement for Infrastructure 2025 also came into force on this date.⁴¹

Fast-track Approvals Act 2024

The Fast-track Approvals Act 2024 (FTAA) came into force in December 2024. The purpose of the FTAA is to facilitate the delivery of infrastructure and development projects with significant regional or national benefits.⁴² The Act provides a ‘one-stop-shop’ approach to approvals under the RMA and several other Acts, including the Crown Minerals Act, Conservation Act and Fisheries Act. Under the FTAA, projects must apply for referral to use the fast-track process, which if approved, allows the lodgement of a substantive application for consideration by an Expert Panel. Schedule 2 of the Act includes 149 ‘listed’ projects that can apply directly for consideration by an Expert Panel, without the need for a referral application.

The projects listed in Schedule 2 include 22 renewable energy projects, four of which are located in the Waikato region. These are the Hinuera Solar Farm, Kaimai Wind Farm, Rotokawa Solar Farm and Waikokowai Wind Farm.

³⁷ Resource Management Act 1991, Section 7(j).

³⁸ Resource Management Act 1991, Section 30(1)(d)(iii).

³⁹ Resource Management Act 1999, Section 30(1)(fa)(iii).

⁴⁰ [Ministry for the Environment, 2025a.](#)

⁴¹ [Ministry for Cities, Environment, Regions & Transport, 2026b.](#)

⁴² Fast-track Approvals Act 2024, Section 3.

Resource management replacement legislation

Phase 3 of the government's resource management reform proposal involves replacing the RMA with two new acts: a Natural Environment Act and a Planning Act. The Natural Environment and Planning Bills were introduced to Parliament on 9 December 2025, and the government intends to pass the Bills into law in mid-2026.

The purpose of the Natural Environment Bill is to establish a framework for the use, protection and enhancement of the natural environment, while the purpose of the Planning Bill is to establish a framework for planning and regulating the use, development, and enjoyment of land. The Bills represent a significant shift from the current resource management system. At a high level, key changes include:

- A shift to an overall more enabling system.
- Each Bill contains a list of goals, which set out what the system must achieve and what can be regulated. As proposed, the goals of the Bills do not include specific reference to renewable energy; which is a shift compared to section 7 of the RMA.
- A reduced scope of the system and higher threshold for effects able to be considered.
- An increased role for national policy direction and national standards, which will result in greater standardisation of plans.
- Increased Ministerial powers.
- The Bills do not contain a general clause to give effect to the Treaty of Waitangi/Te Tiriti o Waitangi, rather contain more specific clauses setting out how Māori interests are to be provided for.
- Public participation is targeted at the “top” of the system, in relation to national instruments and regional spatial plans, with less scope for participation in consenting/permitting processes.
- Environmental limits will have a key role in the system; with limits for human health proposed to be set nationally and limits for ecosystem health to be set regionally.

Ongoing resource management reforms introduce uncertainty about the durability of existing protections and decision-making roles established through Treaty settlements. The Strategy responds by emphasising continuity through regional levers, including spatial planning, policy alignment, and relationship agreements, to maintain protection-first outcomes and consistent iwi involvement during periods of reform.

National Energy Strategy

New Zealand's first Emissions Reduction Plan included a commitment to develop a national energy strategy by the end of 2024 to address the strategic challenges facing the energy sector and outline pathways away from fossil fuels⁴³.

However, the national strategy work programme has not progressed, rather there have been incremental reforms, such as minor electricity changes, subsidies to restart oil and gas exploration, and stronger national direction for electricity and infrastructure consenting. These changes have not provided an integrated, long-term direction required for a coherent national-regional energy system.

4.4.2 Regional and local context

Under the RMA, local authorities have a range of roles relating to allocating access to natural resources containing energy and the management of environmental effects from the generation of electricity and its transmission to points of use. The use of energy is also influenced by regional and local policy and plans, particularly in relation to urban form and transport. Key policies and plans prepared at the regional and local levels under the RMA are identified below.

⁴³ [Ministry for the Environment, 2022.](#)

Te Ture Whaimana o Te Awa o Waikato

Te Ture Whaimana o Te Awa o Waikato – the Vision and Strategy for the Waikato River is the primary direction setting document for the Waikato River and its catchment, including the Waipā River. Te Ture Whaimana has unique legislative status in that it is deemed in its entirety to be part of any Waikato Regional Policy Statement under the RMA.⁴⁴ Te Ture Whaimana also prevails over any inconsistent RMA planning instrument, including any national policy statement. Given this status, Te Ture Whaimana is an important document for any energy related freshwater and land use activities affecting freshwater within the Waikato River catchment.

Māori values, given effect through Te Ture Whaimana, provide binding guidance for decisions affecting wai, whenua, and associated energy systems. This document works within that framework where relevant.

Waikato Regional Policy Statement

The purpose of the regional policy statement is to provide an overview of the resource management issues for the region and policies and methods to achieve integrated management of natural and physical resources within the region. Regional and district plans are required to give effect to the regional policy statement.⁴⁵

The Waikato Regional Policy Statement (WRPS) became operative in 2016. Providing for energy demand is identified as one of the six significant resource management issues for the region. While addressing this issue, the WRPS directs that specific focus should be given to:

- How the increasing demand for energy is to be met
- Potential for conflicts between activities to meet energy demand and other land or water uses including natural values
- The need to locate renewable energy generation infrastructure where the resource exists
- The need to maintain the efficiency of, and production from, existing renewable electricity generation activities
- The need for the continued existence, and operation of the Waikato Hydro-scheme as significant national infrastructure
- Security of supply.

Under the WRPS, energy supply-side matters are covered by objectives, policies and method within the Energy, infrastructure and transport chapter, while demand-side aspects, including the integration of land use and infrastructure planning, are covered by the Urban form and development chapter.

Regional plan and regional coastal plan

The Operative Waikato Regional Plan covers the key components of the environment for which the council has functions under section 30 of the RMA, being water, river and lake beds, land and soil, air, and geothermal resources. The plan contains objectives, policies, and implementation methods (including rules) of particular relevance to hydro and geothermal electricity generation, as well as methods of generation that produce air discharges. This includes rules for the take, damming and diversion of water, river and lakebed disturbances and structures, discharges to air and the take, use and discharge of geothermal water.

The Proposed Waikato Regional Coastal Plan – Decisions version contains an Energy and infrastructure chapter, which recognises the benefits of renewable electricity generation and transmissions and enables these activities in appropriate circumstances.

⁴⁴ Waikato Raupatu Claims (Waikato River) Settlement Act 2010, Section 11.

⁴⁵ Resource Management Act 1991, Sections 67(3)(c) and 75(3)(c).

District plans

Through their role in managing land use and development, the district plans of the eleven territorial authorities within the Waikato region have a significant impact on both the supply and demand sides of energy. On the supply side, district plans control the types of electricity generation activities that can occur within different areas of the district. District plan rules for wind and solar farms (or the structures comprising them) are the key regulatory method for these forms of electricity generation under the RMA. District plans also provide rules relating to electricity and gas transmission and distribution lines and associated infrastructure.

District plan provisions influence energy use in numerous ways. Zoning and policy overlays and associated provisions manage the spatial distribution of development and urban form within each district. Urban form and density, along with transportation provisions within district plans, affect the layout of the transport network and the viability of alternative transport modes, ultimately impacting on energy demand and carbon emissions from transport. District plans may also contain provisions for energy-efficient building design or specific technologies, such as EV charging infrastructure.

Spatial plans

The proposed legislation to replace the RMA will require a single regional scale plan that includes a spatial plan chapter. Under the Planning Bill, “existing and future key infrastructure, including corridors and strategic sites and opportunities to make better use of existing infrastructure” is a proposed mandatory matter for regional spatial plans to include.⁴⁶

4.5 Relevant energy parties

The New Zealand energy system involves many parties, each driven by their own mandates, commercial incentives, statutory roles, or community obligations, and these motivations do not always align to deliver balanced outcomes across the energy trilemma. The system’s numerous moving parts can be likened to pieces of a dynamic jigsaw puzzle: without a clear “box top,” there is no shared picture of how they should fit together to achieve coherent national or regional energy and economic goals. Stakeholders operate across both the supply and demand sides of the system, yet no single agency has oversight of the whole, nor the ability to coordinate or integrate the full suite of public policy levers. The mix of parties includes:

- **Central government:** allocation of energy-related natural resources, regulated by MfE and carried out by regional councils under the Crown’s Treaty obligations, while land-use decisions are delegated to territorial authorities through district plans that must align with the Regional Policy Statement. Central government defines the rules, incentives, and long-term direction within which generators, networks, councils, industry and communities must operate.
- **Iwi Māori:** iwi Māori exercise roles as kaitiaki, rights holders, investors, partners, landowners, ratepayers, and communities affected by cumulative impacts, with expectations of early engagement, protection of taonga, and equitable participation in energy development within their rohe.
- **Electricity providers:** New Zealand’s electricity is generated mainly by four large companies. Genesis, Mercury and Meridian Energy operate under a mixed-ownership model in which the government is the majority shareholder, while Contact Energy is fully privately owned.
- **Electricity transmission:** transmission is provided by Transpower, a state-owned enterprise that owns and operates New Zealand’s national electricity transmission system.
- **Lines companies:** sub-national distribution is delivered by 27 electricity lines companies, which connect to the national grid and distribute electricity to homes and businesses through their local networks.

⁴⁶ Planning Bill, Schedule 2, Clause 3.

- **High-pressure gas transmission network:** FirstGas owns and operates New Zealand's network of high-pressure gas transmission pipelines, transporting gas to power stations, other energy retailers', distribution networks, petrochemical plants, hospitals and other major industry.
- **Local low pressure distribution networks:** FirstGas also owns and operates a system of medium and low pressure gas distribution networks in parts of the North Island, which supplies residential and business customers.
- **Te Waihanga, Infrastructure Commission:** Te Waihanga is an independent Crown entity that advises government on national infrastructure needs, priorities and system issues. It reports to a board accountable to the Minister for Infrastructure, and takes a whole-of-system view – developing strategies and producing a five-yearly National Infrastructure Plan to guide long-term investment and planning.
- **Te Mana Hiko, Electricity Authority:** Te Mana Hiko is an independent Crown entity responsible for the governance and regulation of New Zealand's electricity industry under the Electricity Industry Act 2010 – reporting to the Minister of Energy.
- **Te Tari Tiaki Pūngao, Energy Efficiency Conservation Authority (EECA):** EECA is a Crown agency responsible for promoting energy efficiency, energy conservation and the use of renewable sources of energy – reporting to the Minister of Energy.
- **Emissions Trading Scheme (ETS):** the ETS was created through the Climate Change Response Act 2002. The ETS puts a price on greenhouse gases – credits can be earned for activities that absorb carbon dioxide or purchased to offset activities that emit greenhouse gases. Reporting is through the Environmental Protection Authority to the Minister of Climate Change.
- **Commerce Commission:** the Commerce Commission is responsible for enforcing fair trading provisions and regulating sectors with little or no competition such as with energy transmission infrastructure. The Commission reports to the Minister of Commerce and Consumer Affairs.
- **Private fuel companies:** private fuel companies import refined fuel products (petrol, diesel and jet fuel) through coastal ports and distribute them across the country. There are five companies that currently import fuel into New Zealand, including BP, Gull, Mobil, Timaru Oil Services Limited and Z Energy. New Zealand has International Energy Agency (IEA) obligations to maintain oil stock levels.
- **Transport fuel regulators:** transport fuel is regulated by various central government agencies:
 - **Ministry of Transport:** the Ministry of Transport has set CO₂ emissions standards for light vehicles, under the Clean Car Standard, imported into the country.
 - **Waka Kotahi, New Zealand Transport Agency:** compliance of the Clean Car Standard is managed by Waka Kotahi. Under the scheme, vehicle importers are charged for vehicles they import that have CO₂ emission to weight ratios above a set target.
 - **EECA:** the Vehicle Emissions and Energy Economy Labelling programme is administered by EECA. The programme requires importers to display fuel efficiency data.
 - **Ministry of Business, Innovation and Employment (MBIE):** MBIE is responsible for the regulation of fuel quality, ensuring that imported fuel meets specific standards.
- **Economic development agencies:** the Waikato has no standalone economic development agency; instead, WRC undertakes this function for the region.
- **Industry peak groups:** industry peak groups represent the interests of specific sectors by providing advocacy, technical expertise, policy input and coordinated industry voices, and include organisations such as Major Electricity Users' Group (MEUG).
- **Community advocacy groups:** with an interest in energy such as GoEco.

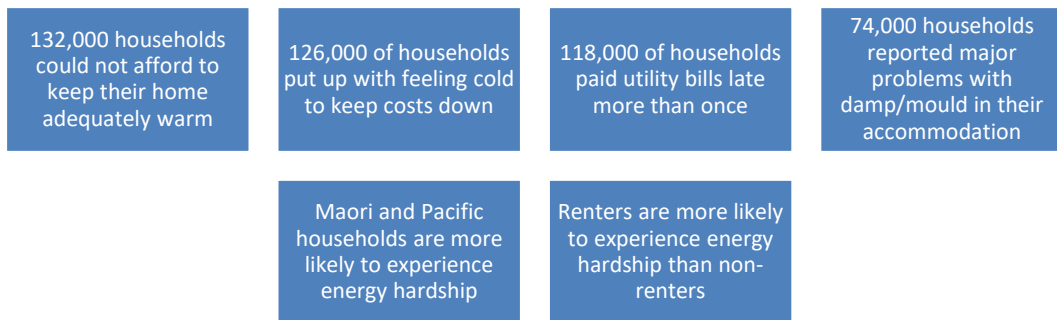
Waikato Regional Council's role

There are three mutually reinforcing roles driving regional council interest. They are supporting regional economic development requiring energy, sustainable use of natural and physical resources containing energy and the strategic integration of energy supply and distribution and use infrastructure with land use across the entire region.

5 People

People experience energy in the Waikato in very different ways, shaped by where they live, their housing, income, and connections to place. For many households, energy is understood through day-to-day realities such as power bills, winter warmth, and the reliability of electricity supply. Iwi Māori, however, also carry responsibilities as kaitiaki of the landscapes, waterways and ecosystems that sustain their communities. These diverse experiences highlight that the region's energy system is not only technical infrastructure, but also a social, cultural, environmental, and economic system that affects how people live, participate, and thrive across the Waikato.

Energy hardship is when individuals, households and whānau cannot obtain adequate energy services to support their wellbeing in their home or kāinga⁴⁷. It remains a complex and persistent issue in New Zealand, shaped by rising energy costs, uneven income growth, and structural inequalities. Research consistently shows that Māori, Pacific peoples, renters, and crowded households face the highest rates of energy hardship. Key indicators for the year ended June 2024 highlight the scale and nature of energy hardship across the country⁴⁸:



High electricity costs, combined with rising rents and food prices, place considerable pressure on household budgets throughout the region. For low- and middle-income households, electricity often makes up a disproportionate share of spending, reducing funds for food, healthcare, and education. This is magnified by the broader cost-of-living crisis, where wages have not kept pace with inflation. In the Waikato region, lower median earnings, lower heating efficiency, and continuing ethnic income gaps amplify vulnerability to energy stress.

Community concerns about energy and environmental impacts were echoed in the 2025 Waikato Residents' Environmental Perceptions Survey⁴⁹. Respondents raised issues such as high electricity costs, the need for stronger incentives to electrify, and the impacts of hydro operations on lake levels and river health, particularly in Taupō. Concerns also focused on air quality, declining water availability under climate change, and risks associated with waste-to-energy incineration. Together, these insights reflect a broader public expectation for a cleaner, more affordable, and more resilient energy system.

Despite the region producing much of the country's electricity, high energy costs, poor housing conditions, and more frequent network disruptions continue to impact whānau wellbeing.

⁴⁷ Defined by Ministry of Business, Innovation & Employment.

⁴⁸ [Ministry of Business, Innovation & Employment, 2025d.](#)

⁴⁹ [Hackell, M. & Stone, L., 2026.](#)

These pressures sit alongside wider demographic changes: a growing and youthful Māori population will shape future energy demand, workforce capability, and participation in emerging low-emissions industries. Urban growth, particularly in centres such as Hamilton, will increase the need for efficient housing, transport, and electricity infrastructure, while rural communities will continue to play an essential role in land-based energy solutions and localised resilience. Lower incomes, rental housing, and uneven digital access further compound inequities, highlighting the importance of practical interventions such as marae-scale renewable systems, papakāinga development, home retrofits, and improved digital connectivity.

Transitioning the energy system is not simply about rolling out new technologies, it requires reshaping the interconnected social, cultural, environmental, and economic systems that determine how energy is produced, distributed, and used. A just energy transition aims to avoid repeating past negative impacts from energy production and use, while also preventing new forms of harm from emerging. This transition is no longer just about building large, standalone technologies—it now involves reconstructing complex socio-technological systems that link energy to water, transport, food production, housing, and the wider economy. This requires integrating both technological and socio-economic dimensions⁵⁰. A just energy transition also recognises that protection of taonga, wāhi tapu, and environmental systems is a precondition for development rather than a trade-off.

Because current and future energy systems are both social and technological, planning must move beyond individual technologies and consider the full mix of energy types, how they can be scaled, and who benefits, or is burdened, by each pathway. There are multiple viable pathways for developing renewable energy, and neither fuels nor technologies alone determine whether outcomes are equitable. Instead, outcomes depend on how new energy technologies are combined with social, economic, and political arrangements.

These strategic choices shape investment flows, electricity prices, and the wider economic impacts of the transition. For example, decisions about whether New Zealand prioritises utility-scale, community-scale, or rooftop solar will strongly influence the structure of the future solar sector. Each option distributes benefits and costs differently. Large-scale solar offers economies of scale and integrates easily into existing grid structures, delivering most revenue to established players. This raises the question of who will control access to affordable reliable sustainable energy supplies, who will benefit and who will be burdened by how the transition unfolds.

From a household perspective, small-scale and rooftop solar can be cheaper because they avoid many of the costs tied to the wider electricity grid. If these systems played a larger role in the energy transition, they could ease pressure on the grid and help lower electricity prices. Greater investment in community and household solar could significantly reduce residential demand, which currently makes up about a third of New Zealand's electricity use⁵¹. However, widespread rooftop solar may also lead some homes to disconnect from the grid, creating stranded assets for electricity distribution businesses and potential safety or quality issues on low-voltage networks. Iwi Māori note that community and marae-based systems can support equity by lowering costs, improving resilience, and keeping value within communities, if grid access, financing, and governance settings enable these models.

5.1 Residential solar uptake

Households who own their home and have resources to fund roof solar are already benefiting from the transition to solar energy. However, housing and rental affordability pose a significant barrier to roof top solar uptake and demonstrate the structural barriers renters face in the energy transition. Renters ability to participate in clean energy transitions is largely determined by landlord decisions rather than their financial capacity or preferences.

⁵⁰ Miller, C.A., Iles, A. & Jones, C.F., 2013.

⁵¹ [Ministry of Business, Innovation & Employment, 2026c.](#)

Housing affordability is a key determinant in household decisions regarding rooftop solar uptake, in addition to the cost of solar installations and electricity prices. Specifically, higher price-to-income and price-to-rent ratios are significantly associated with reduced solar adoption.

This suggests that housing affordability not only limits property owners' ability to invest in solar systems but also exacerbates inequities in access to clean energy, particularly between property owners and renters. This reduces the social license for roof top solar because a large percentage of households are unable to benefit.

5.2 Businesses

New Zealand businesses that rely heavily on fossil fuels, and their workforces, are increasingly facing pressure to electrify operations. At the same time, the rapid expansion of renewable energy will require a skilled and adaptable workforce to build, operate, and maintain new technologies. Job listings already show strong growth across renewable energy roles, demonstrating the sector's momentum.

Locating renewable energy infrastructure within the Waikato presents substantial opportunities for regional job creation. The deployment of renewable energy infrastructure is an imminent opportunity that can deliver stable jobs, reduced pollution and lower the cost of economic activity.

International evidence shows that renewable technologies generate significantly more jobs per unit of energy than fossil fuels. These industries require large workforces for manufacturing, installation, construction, maintenance, and system upgrades, supported by long-term roles in mechanical, turbine, electrical and hydraulic engineering, alongside project and asset management, finance, legal, and supply-chain services. Additional jobs are created indirectly as workers spend wages locally, stimulating broader economic activity.

Renewables, especially solar, wind and bioenergy, will also improve the economics of activities traditionally considered uneconomic, creating new opportunities that are not captured in current modelling. Conversely, rising energy prices have already contributed to business closures, job losses, increased consumer prices, deferred investment and decreased production. High wholesale electricity prices have forced some energy-intensive firms to curtail production, with the closure of Winstone Pulp International (after 45 years of operation) illustrating the vulnerability of regional industries. Elevated electricity costs reduce the capital available for workforce training, modernisation, research and development, and ultimately constrain job creation.

The employment benefits of renewable energy can be strengthened through deliberate regional action. Policies that encourage locating value chains within the region – combined with vocational training, apprenticeships, and targeted support for school leavers – can ensure new opportunities translate into local employment. Social procurement requirements for developers can also help ensure job creation supports communities and aligns with a social licence to operate, while recognising that procurement processes and requirements can present barriers to iwi participation.

Many renewable projects, particularly large solar and wind farms, are well suited to rural areas and communities with lower land values, places that often experience fewer employment opportunities. These projects have the potential to bring high-quality jobs into local economies. Ensuring these communities can participate requires proactive communication, early engagement, and collaboration with training providers to connect local jobseekers with emerging roles.

Integration of low-cost renewable energy with employment and environmental outcomes offers further potential. Partnerships between local government, iwi, Crown Research Institutes and industry can support innovative solutions, for example, biorefinery concepts that convert urban waste or wastewater into useful products such as fertilisers, reducing environmental impacts while creating local economic value⁵². Such integrated approaches demonstrate how renewable energy can reinforce broader regional development and wellbeing.

6 Environment

Protection of taonga, wāhi tapu, and environmental systems guides how energy interacts with the Waikato environment. Renewable energy sources sit within living systems that carry mauri and whakapapa, including wai, whenua, geothermal fields, and wider landscapes. Energy development is supported where protection is upheld and where cumulative cultural, ecological, and hydrological effects are understood and addressed.

Renewable energy sources harness naturally replenishing resources such as solar, wind, hydro, geothermal, and biomass. Their performance depends on environmental conditions and is increasingly influenced by climate change. Flooding, drought, shifting rainfall, wildfire risk, and changing wind and sunlight patterns can disrupt output and damage assets. These factors make climate resilience a core consideration in energy system design, infrastructure planning, and operational management.

Climate change is expected to increase the frequency, severity, and impact of natural hazards across the Waikato region. Projections indicate rising sea levels, more extreme weather, warmer summers, milder winters, and shifting seasonal rainfall patterns. Drought risk is expected to increase in the north and east during spring and summer, with changes in rainfall and wind patterns in the west⁵³. These changes intensify pressures on wai, whenua, and communities, reinforcing the importance of resilient energy systems that support marae, papakāinga, essential services, and regional recovery during extreme events. Marae are widely recognised as safe places during emergencies, further underscoring their critical role in community resilience and response.

The Waikato region is traditionally known for its plentiful water resources. Wai is a taonga with its own mauri and whakapapa, underpinning cultural identity, wellbeing, and environmental health. Te Ture Whaimana o te Awa o Waikato provides binding direction for decisions affecting water and associated systems, including hydroelectric generation, cooling uses, and land-use activities linked to energy development.

Access to plentiful high-quality freshwater has allowed pastoral farming to become established last century and intensified over the last 25 years. It has previously been referred to as our foremost strategic asset⁵⁴. In its simplest terms, the New Zealand export economy is primarily engaged in turning our rainwater into exports and experiences for visitors. Communities also depend on it for their domestic needs and amenity. In this way, Waikato's water is critical to the interests of the wider regional community and the nation.

The region is increasingly facing the prospect of more frequent and severe droughts from climate change. Rising temperatures and less consistent rainfall are expected to increase the incidence and intensity of droughts. Northern and eastern parts of the region are particularly at risk, which will significantly impact agricultural and horticultural industries. Areas like the Hauraki Plains, which relies heavily on reticulated water for farming, will likely experience reduced water availability during prolonged dry periods⁵⁵. Reduced water availability affects farming, industry, hydro generation, mahinga kai, and community resilience. This strengthens the case for integrated water-energy planning that balances energy reliability, environmental limits, and long-term wellbeing.

⁵² [Trenkner, M. et al., 2024.](#)

⁵³ [Mills, W. et al., 2025.](#) ⁵⁴ [Waikato Regional Council, 2017.](#)

⁵⁴ [Waikato Regional Council, 2017.](#)

⁵⁵ [Mills, W. et al., 2025.](#)

Analysis of rainfall over the last 60 years (Figure 11) shows that the most recent decade recorded the lowest average rainfall, compared to previous decades, and this is most pronounced in the Coromandel Ranges and the lowlands north of a line from Hamilton City to Te Aroha. The trend of decreasing rainfall is projected to continue, and the pattern of rainfall delivery is also expected to change. As the atmosphere becomes increasingly energised (hotter), it can hold more moisture, releasing it as intense rainfall. The corollary is that at other times we will be in extended droughts.

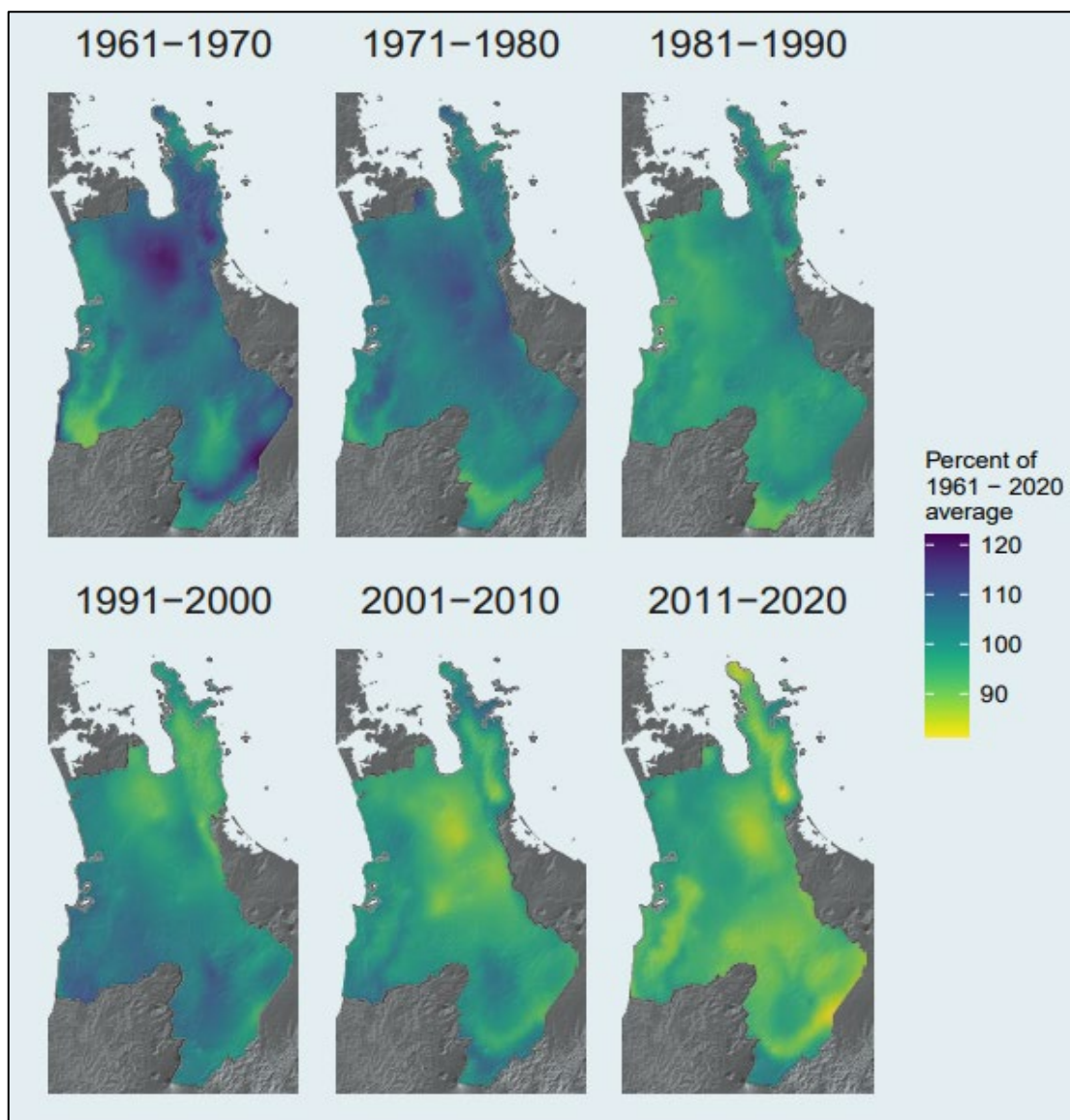


Figure 11: Decadal average rainfall distribution in the Waikato region⁵⁶

Our changing climate not only influences availability of freshwater, but also the way we use water including its use for hydroelectric generation and for cooling industrial and commercial activities⁵⁷. The importance of hydro storage dams will increase, as water can be stored when wind and solar supplies are strong, and then used to generate electricity when there is no solar or wind generation available.

⁵⁶ [Waikato Regional Council, 2023.](#)

⁵⁷ [Waikato Regional Council, 2016.](#)

7 Economy

The Waikato economy and energy system is deeply interconnected with its people, whenua, wai. Economic development is strongest when it enhances the wellbeing of whānau, protects taonga, and enables iwi Māori to participate as partners, investors, kaitiaki and beneficiaries of emerging opportunities. As the region transitions toward cleaner energy, electrification becomes a critical driver of long-term resilience, affordability, and competitiveness. Global experience shows that the more electrified an economy is, the less vulnerable the economy is, reducing exposure to volatile fossil fuel markets, lowering costs, and supporting industries seeking low-emissions supply chains.

7.1 Economic growth agenda

Economic activity requires energy. Because economic activity generally involves the transformation of inputs into outputs – a process that requires energy in some form – economic activity and energy use are typically positively correlated (Figure 12). Achieving national and regional growth objectives therefore depends on sufficient, reliable, and affordable energy supply. High energy costs are considered to be an important headwind for economic recovery in New Zealand, and the reliability and affordability of energy has been identified as a key ingredient of our persistently weak productivity growth⁵⁸.

While energy-intensive growth has generated national wealth, benefits have not always flowed back to communities hosting generation and infrastructure. Growth pathways that prioritise local employment, affordable energy access, and community resilience strengthen both productivity and social outcomes. High energy costs also compound housing stress and energy hardship, reducing workforce participation and undermining long-term productivity.

Elevated electricity prices and high transport costs continue to erode the competitiveness of New Zealand exports⁵⁹. Among other things, OECD (2025) notes the importance of “...accelerating investment in firming capacity, renewable generation, and transmission infrastructure...to ensure a reliable and affordable energy supply.

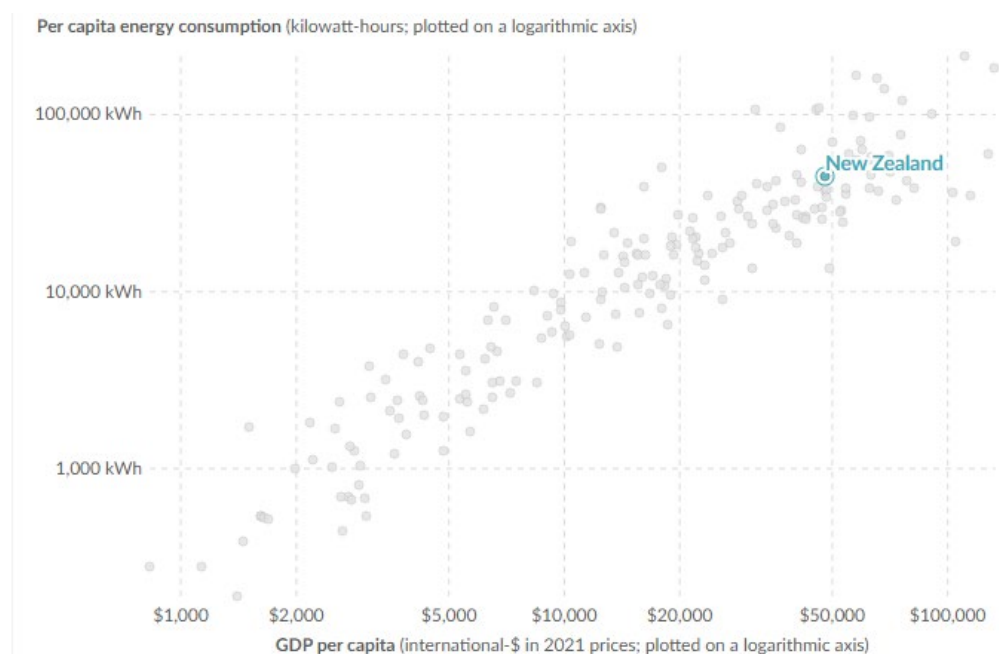


Figure 12: Energy use and GDP per person⁶⁰

⁵⁸ [OECD, 2025.](#)

⁵⁹ [OECD, 2025.](#)

⁶⁰ [Our World in Data, 2024.](#)

7.2 Energy intensity of the economy

In line with global trends in developed economies, New Zealand's energy intensity⁶¹ has trended downwards in recent decades, from a peak of 3.59MJ/\$ in 1992 to 1.97MJ/\$ in 2023 – a decrease of 45 percent (Figure 13). In part this reflects improving technology; productivity improvements over time can reduce the amount of energy required to produce a unit of output. But it also reflects the changing structure of the economy. In 2000, 31.2 percent of New Zealand's GDP was from the relatively energy intensive primary and goods-producing sectors. By 2026, the contribution of these sectors had declined to 22.1 percent of GDP. The Waikato region is less service-sector focused than New Zealand as a whole, but the share of GDP from the primary and goods-producing sectors has declined here too – from 42.9 percent in 2000 to 34.4 percent in 2026⁶².



Figure 13: National energy intensity (MJ/NZ\$)⁶³

The shift to less energy-intensive service sectors is a key factor in the fall in energy intensity of the economy over time, and is likely to remain an important factor in the decoupling of economic growth from energy demand.⁶⁴ Nevertheless, New Zealand's economy is "...heavily dependent on export industries that are highly energy intensive...[and it is]... vulnerable to higher and more volatile energy costs."⁶⁵

7.3 Sources of energy

Energy sources shape how the economy functions by influencing production costs, export competitiveness, and overall resilience. Renewable energy supports long-term economic stability because it has low operating costs, reduces exposure to volatile global fuel prices, and helps exporters meet growing expectations for low-emissions products. It also reduces national expenditure on imported fossil fuels, saving billions of dollars each year (for example \$10.8 billion in 2024), that can be reinvested to support economic growth. These indigenous resources keep more value circulating locally through construction, maintenance, and high-skill jobs, while strengthening energy security. In contrast, fossil fuels carry higher and more volatile costs, most of which leave the economy through imports. Their price fluctuations flow directly into transport, industrial heat, and household costs, affecting productivity, competitiveness, and the cost of living.

⁶¹ Measured as megajoules per dollar of GDP

⁶² [Infometrics, 2026](#).

⁶³ [Ministry of Business, Innovation & Employment, 2026d](#).

⁶⁴ It is noted, however, that from a broader perspective, this may represent a shifting of energy intensity to other countries. For example, shifting energy-intensive activities like manufacturing offshore may decrease energy intensity locally, but there may be an offsetting increase elsewhere.

⁶⁵ [Frontier Economics, 2025](#).

Decarbonising transport offers one of the highest returns on renewable energy investment. Reducing reliance on imported fossil fuels creates opportunities to redirect expenditure toward local jobs, skills development, and resilient regional infrastructure – which can be achieved through the development of energy dense industries. New Zealand spent \$10.8 billion dollars on fossil transport fuels in 2024 (roughly equivalent to the export revenue from the entire meat (\$8.6 billion) and seafood (\$2.1 billion) sectors⁶⁶) just to move goods and products around and for getting around and to and from work individually.

Electricity, whether from renewable or fossil sources, is a critical enabler of economic activity, underpinning digital infrastructure, industrial processes, and future growth sectors like data centres, hydrogen production, and sustainable fuels. Expanding renewable electricity supply lowers long-term prices and supports a transition to low-emissions transport and industry.

Emerging energy carriers such as green hydrogen, ammonia, and advanced biofuels provide new opportunities for economic diversification. These technologies rely on affordable renewable electricity and can support high-value industries, export opportunities, and specialised workforce development.

Regions that produce renewable energy locally are better positioned to support sustainable economic growth and reduce embodied emissions in exported goods.

8 National and regional connections

8.1 National

New Zealand's energy system is deeply interconnected across regional and national scales. Waikato, Taranaki, Bay of Plenty and other regions each hold distinct roles in generation, transmission, industrial activity, and emerging renewable industries, meaning regional choices collectively determine national progress toward affordability, resilience, and decarbonisation. Electricity and gas systems cross regional boundaries, with generation in the Waikato supplying the national grid, gas from Taranaki supporting industrial users across several regions, and national transmission and pipeline networks linking production to demand. At the same time, national policy settings, such as ETS (Emissions Trading Scheme) price signals, vehicle emissions standards, resource management reforms, and investment in renewable infrastructure – directly influence regional development pathways and the viability of new industries.

New Zealand's ongoing lack of a national energy strategy has created a significant gap in national-level direction, undermining coherence, investment certainty, and coordinated progress toward a low-emissions future. Without an overarching framework, there is no clear understanding of how agencies, regulators, energy providers and users should collectively plan for Aotearoa's future energy needs. Instead, system actors operate within fragmented mandates, regulated under different Acts, responding to inconsistent policy signals, or incentivised to pursue commercial goals within a contrived market structure⁶⁷. In this environment, regional strategies become essential. They provide clarity where national direction is lacking, articulate protection-first principles, strengthen iwi partnership pathways, and offer practical mechanisms to guide the transition at a scale where relationships to local resources, communities, and taonga can be properly recognised.

Despite limited direct levers, WRC holds a legitimate interest in energy as it relates to regional wellbeing, economic development, and natural resource management. The Council also influences the allocation of natural resources containing energy and leads spatial planning functions under the RMA. Yet many of the policy levers that most strongly shape Waikato's energy system remain with central government, such as vehicle emissions and import standards, the management of all imported fuels, and the operation of the national electricity market.

⁶⁶ Based on data from Infometrics Ltd.

⁶⁷ [Nelson, A., 2024.](#)

In the absence of national direction, WRC chose to proceed with updating its 2009 Regional Energy Strategy in recognition of the region's pivotal role in the national system, particularly electricity generation, and its capacity to add value through coordinated regional action. This Strategy therefore recognises Waikato's deep interconnections with adjacent regions and with national infrastructure, and sets out recommendations that can contribute not only to regional outcomes, but also to a more coherent, secure, and equitable national energy future.

8.2 Regional

Energy, water, transport, and infrastructure systems cross administrative boundaries. Rivers, catchments, geothermal systems, and transmission corridors require coordinated planning that recognises relationships to place, cumulative effects, and shared responsibilities for protection and resilience. Regional connections are outlined below:

- **Auckland:** Auckland is the country's primary economic hub, with a significant electricity demand. The Waikato region serves as a critical energy corridor, supplying power generated within the region and gas from Taranaki region. As part of the Upper North Island 'Golden Triangle,' Waikato also plays a key role in freight movement between New Zealand's largest import ports and inland logistics hubs. There is a strategic opportunity to extend rail electrification from Hamilton through to the Auckland metropolitan area, strengthening connectivity and supporting low-emissions transport.
- **Bay of Plenty:** The Bay of Plenty provides a critical biomass supply, particularly from Kawerau where co-location provides the opportunity to process biomass into torrefied wood pellets using geothermal heat. The region will also host a new bio-factory opening in 2026, sited at the Bioeconomy Science Institute (formerly Scion) in Rotorua. The bio-factory will provide testing opportunities for new fuels and proteins – including potentially sustainable aviation fuel.
Waikato and Bay of Plenty share geothermal resources within the Taupō Volcanic Zone, creating opportunities for integrated energy development. The area carries a significant electrical load and forms part of the Upper North Island 'Golden Triangle,'. Extending rail electrification across current transport links would strengthen low-emissions connectivity. PowerCo operates as the common electricity distribution business for the western Bay of Plenty, Coromandel and eastern Waikato, supporting regional energy infrastructure.
- **Horizons Manawatu:** Approximately 19 percent of Lake Taupō's inflow originates from the Whanganui and Rangitikei catchments, making this contribution critical to Waikato's economy and to national energy supply through the Tongariro Power Scheme. In addition, biomass resources from forests in Karioi and Tangiwai present significant opportunities for renewable energy development, with closed mills located adjacent to the already electrified North Island Main Trunk (NIMT) rail line — offering strategic potential for low-emissions transport and energy integration.
- **Taranaki:** Taranaki plays a key role in the energy transition, providing gas as a transitional fuel and hosting port infrastructure essential for developing offshore wind projects on the west coast. There is strategic potential for Taranaki to focus on Power-to-X technologies, while Waikato leverages its strengths in grid infrastructure. Offshore wind development in Taranaki will require significant port upgrades to support construction and logistics. Current road transport connections are limited and vulnerable, underscoring the need for improved freight resilience and integrated planning.
- **Hawkes Bay:** The energy and economic links to the Hawkes Bay region are less direct and focus on the interconnectedness within the broader New Zealand national economy through connecting infrastructure, particularly in the movement of primary goods to the coastal port of Napier and the shared electricity network.

PART B – EVIDENCE BASE

9 Renewable energy supply

Renewable energy resources are natural sources of energy, connected to wai, whenua and te taiao, that can be replenished naturally overtime. They provide sustainable alternatives to fossil fuels. Most renewables are closely linked to the sun, meaning their availability can fluctuate throughout the day and across seasons. Renewable energy resources in the Waikato include solar, biomass, wind, hydroelectricity, geothermal and marine⁶⁸. An overview of current resources and opportunities is presented in Figure 14.

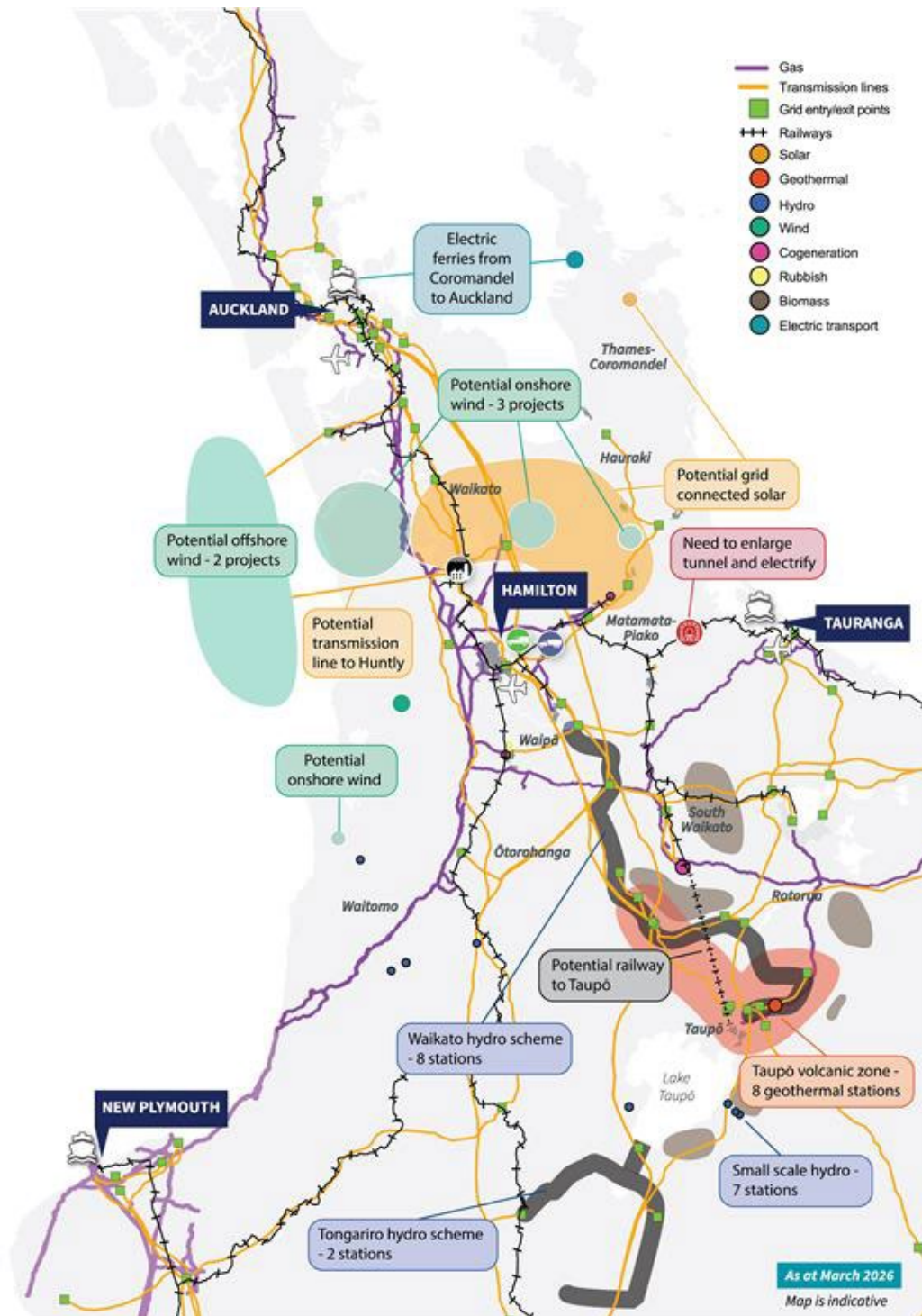


Figure 14: Overview of current renewable resources and opportunities in the Waikato region

⁶⁸ Advantages and limitations discussed in following sections are sourced from: [Energy Efficiency & Conservation Authority, 2026a](#).

9.1 Solar

Solar energy uses sunlight to generate electricity, most commonly through photovoltaic (PV) panels that convert solar irradiance into usable power. Solar PV systems can be installed on homes, marae, public buildings, farms, industrial sites, and as large ground-mounted or floating arrays. Distributed solar can reduce power bills, improve local energy resilience during outages, and provide some protection from rising energy prices. Utility-scale systems can deliver large volumes of new renewable generation quickly, support agrivoltaics through dual land use, and help reduce reliance on fossil-fuelled generation.

Advantages

- **Abundant:** sunlight is abundant and very accessible.
- **Quick to consent:** typically permitted for existing buildings and a commercial land use transition from pastoral to mixed use land.
- **Easy to install:** solar PV is particularly useful for its modularity, ease and speed of installation.
- **Zero operational emissions:** solar causes no direct greenhouse gas emissions.
- **Versatile:** solar panels can be installed almost anywhere from small scale residential, medium scale community to large-scale solar farms.
- **Opportunities for iwi:** solar development can provide meaningful opportunities for iwi throughout the Waikato. Rooftop solar on marae, papakāinga, and community facilities can reduce energy costs and strengthen local resilience during outages.

Limitations

- **Intermittent generation:** solar only generates during daylight hours and peaks in the middle of the day, when power demand is lowest (Figure 15). Storage or demand shifting is needed to maximise value.
- **Winter peaking system:** New Zealand is a winter peaking system, meaning that demand is highest in the winter, when solar output is lowest.
- **Competing renewables:** New Zealand benefits from abundant renewable resources, such as hydro and geothermal, which compete directly with solar for investment.
- **Geography and land use:** at a regional level, Waikato's solar potential is lower than many coastal areas (Figure 16). Large, flat or gently sloping land parcels are preferred for large-scale development. Poorly sited development can affect landscapes, biodiversity, or culturally significant places. Floating arrays can affect navigation, aquatic ecosystems and mahinga kai.
- **Low EROI:** the EROI is lower than all other forms of renewable energy.
- **Grid access and cost:** solar requires significant capital investment making it out of reach for many households. In some areas network capacity is limited and connection charges are high.

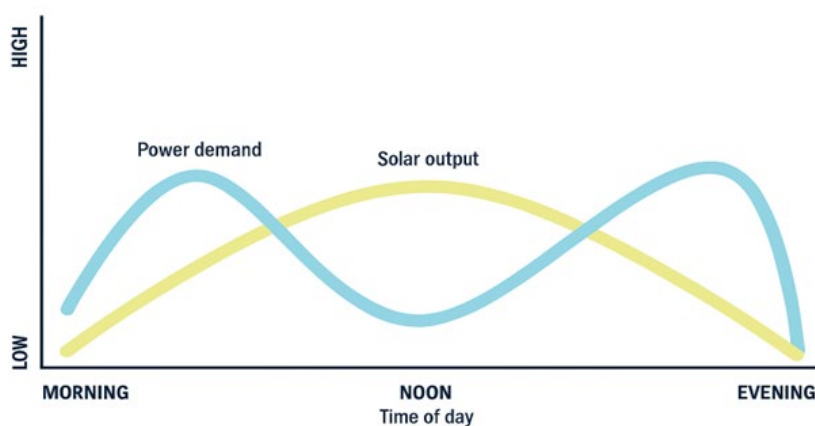


Figure 15: Solar generation versus typical household power use⁶⁹

⁶⁹ [Electricity Authority, 2026a.](#) ⁷⁰ [Chappell, P.R., \[2024\].](#)

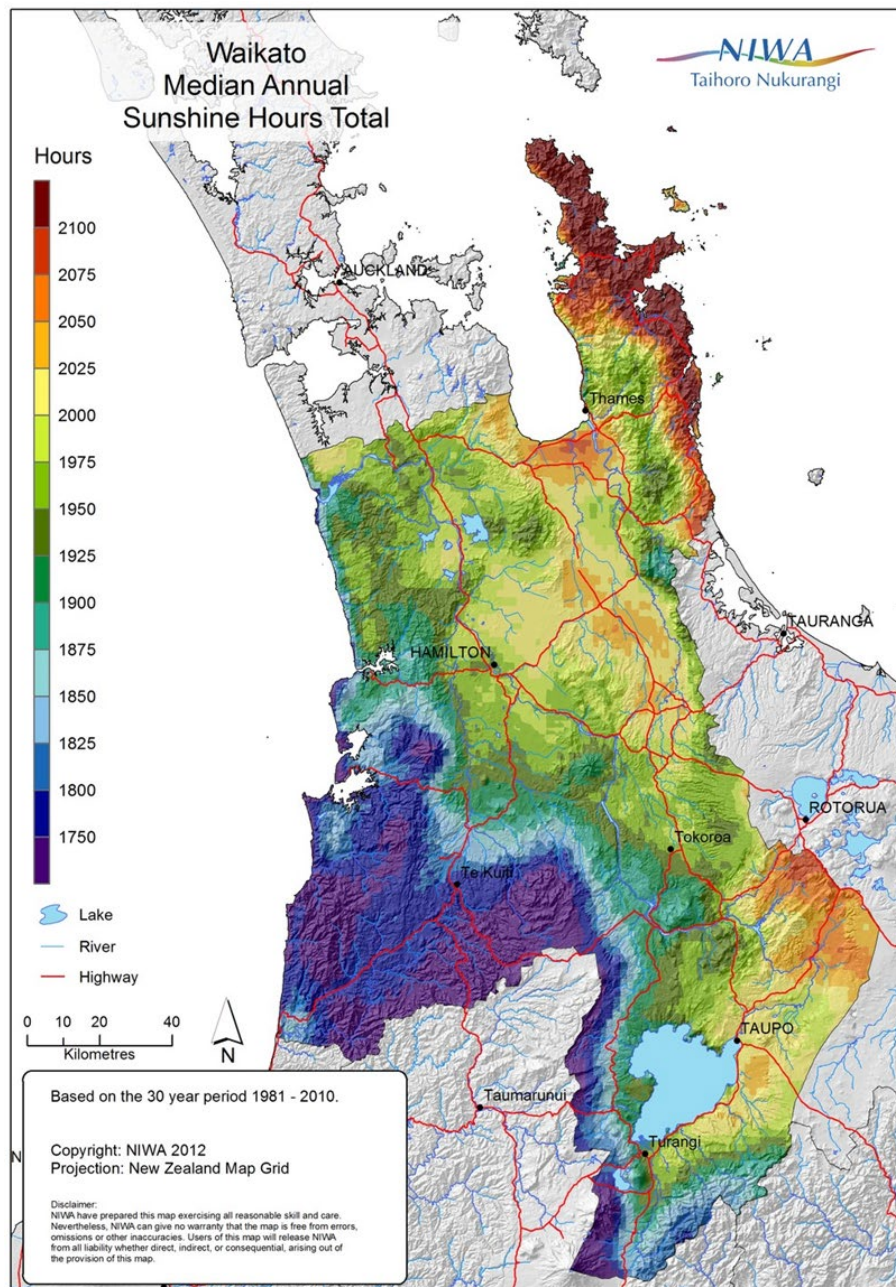


Figure 16: Historic sunshine hours⁷⁰

Opportunities

The Waikato region offers a range of opportunities for solar energy development, supported where it respects tikanga, protects taonga, and are carefully located and operated to safeguard wai, whenua, and culturally significant landscapes.

Residential rooftop solar is one of the cheapest forms of electricity available to households and is the most widespread form of distributed generation in the Waikato region. As of December 2025, there were over 9,700 systems totalling 65 MW in the Waikato, concentrated mainly in the northern districts (Table 2). However, high upfront costs remain the main barrier to uptake. Nationally, only one in 27 homes (3.7 percent) has rooftop solar⁷¹. A typical 3–5 kW system costs around \$8,500–\$11,500, with an additional \$5,000–\$15,000 for a battery⁷².

⁷⁰ [Chappell, P.R., \[2024\].](#)

⁷¹ [Rewiring Aotearoa, 2026.](#)

⁷² [Energy Efficiency & Conservation Authority, 2026b.](#)

Table 2: Installed rooftop solar systems in the Waikato region, December 2025⁷³

Lines Company	Coverage	ICP* count		Total capacity (MW)	
		Residential	Commercial & industrial	Residential	Commercial & industrial
Counties Power	Includes some of Auckland region	2125	175	11.1	6.3
WEL Networks	Waikato / Hamilton	3159	300	18.0	14.0
Waipā Networks	Waipā	1391	135	19.7	4.2
The Lines Company	King Country	285	70	1.5	1.8
Unison	Taupō, includes some of Bay of Plenty region	545	47	3.0	0.6
Power Co	Thames / Coromandel	2249	367	12.1	36.8
Total		9754	1094	65.4	63.7

*Installation control point – unique identifier for each connection

Floating systems and elevated installations for flood-prone land (for example in Ōpōtiki; Figure 17) offer new options but come with technical and ecological challenges.

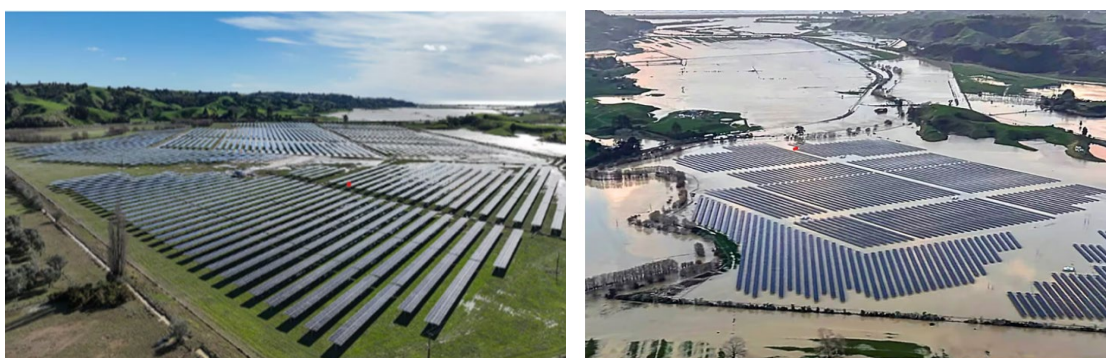


Figure 17: Solar arrays specifically designed for wet environments as above in a flood plain (Bay of Plenty)

There are several small solar farms currently operating in the region, with other larger projects consented, under construction or planned (Table 3).

Table 3: Known operational, consented and proposed solar farms in the Waikato region (as per 2026)

Station	Ownership	Area (ha)	Capacity (MW)	Stage
Taiohi	NewPower Energy	Unknown	33	Operational
Whitianga	Lodestone Energy	Unknown	33	Operational
Oakridge	Kiwi Solar	Unknown	4	Operational
Komata North	Daybreak Energy	6	4.4	Operational
Waerenga	Waerenga Solar Farm Limited and Transpower NZ Ltd	385	190	Consented, generation expected 2027
Rangiriri	Rangiriri Solar Farm Limited and Transpower NZ Ltd	275	146	Consented, generation expected 2027
Tauhei	Harmony Energy and Clarus company	182	202 (MW-peak)	Consented, generation expected late 2026
Morrinsville	Merdian	Unknown	110	Consented, construction to start 2028
Rangimārie	NewPower Energy	Unknown	12	Generation expected Q2 2026

⁷³ [Electricity Authority, 2026b.](#)

Station	Ownership	Area (ha)	Capacity (MW)	Stage
Waiterimu	Waikato Solar Farms Ltd and Transpower New Zealand Ltd	380	140	Fast Track – Referred
Annies Way	Annies Way Solar Farm Ltd	131	75	Fast Track – Referred
Rotokawa	Tauhara North No. 2 Trust	362	105	Fast Track – Listed
Hinuera	Harmony Energy NZ #6 Ltd	152	110	Fast Track – Listed
Lake Whangape	Glenergy Ltd	Unknown	248	Proposed
Ngāruawāhia	Lightyears Solar	Unknown	6	Proposed
Cambridge	Lightyears Solar	40	30	Proposed
Waharoa	Lightyears Solar	Unknown	4.5	Proposed
Ford Road	Fern Renewables	Unknown	Unknown	Proposed

Recommendations:

- Consider targeted funding mechanisms, such as ratepayer-assistance schemes or bulk-buy programmes.
- Support iwi-led and iwi-partnered solar initiatives.
- Use spatial planning to identify suitable areas for utility scale solar.
- Lead by example through WRC's procurement and operations.
- Encourage solar development on homes, marae, papakāinga, community facilities and commercial buildings.
- Support floating solar where appropriate.

9.2 Biomass

Biomass refers to organic material, such as wood, forestry residues, agricultural by-products, crops, food waste, or animal manure, that can be converted into useful energy in the form of heat, electricity, biofuels, or biogas. Unlike solar and wind, that generate intermittent energy, biomass can provide continuous, controllable energy, provided a reliable fuel source is available.

New Zealand's forestry sector supplies a substantial biomass resource. Of the 33.9 million tonnes of wood harvested in 2025, an estimated 3.1 million tonnes of stem-wood residues were available. Historically, wood waste from milling and felling has been used to manufacture biomass products for energy, but a broader range of bio-refined products is now emerging. While wood fibres continue to supply traditional products such as pulp, particleboard, poles, chips, lumber and plywood, trees can also be refined into high-value biochemicals that replace petrochemical inputs. Within the Waikato, most exotic forest resources are concentrated in south Waikato near Tokoroa and Taupō (Figures 18 and 19; Table 4).

Table 4: Above ground biomass estimations of three land cover classes in the Waikato region

Territorial authority	Native Forest (tonnes)	Grass and other (tonnes)	Plantation/exotic forest (tonnes)
Thames-Coromandel District	134,364	24,191	47,432
Hamilton	51	625	18
Hauraki District	34,806	22,878	5,642
Matamata-Piako District	25,234	25,356	1,612
Waikato District	62,839	90,650	41,538
Ōtorohanga District	74,483	49,034	11,786
Rotorua District	9,972	32,600	42,989
South Waikato District	28,533	36,434	150,979
Taupō District	186,176	52,469	199,181
Waipā District	11,419	31,692	2,097
Waitomo District	182,223	96,790	33,951
Total			

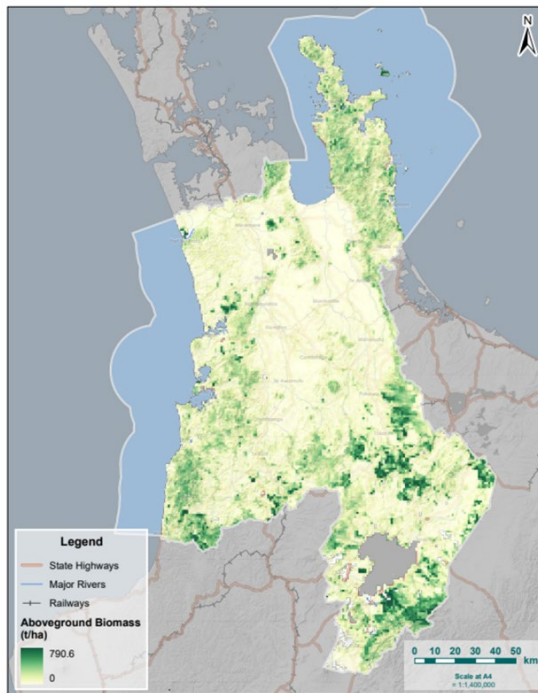


Figure 18: Above ground biomass (tonnes/hectare)

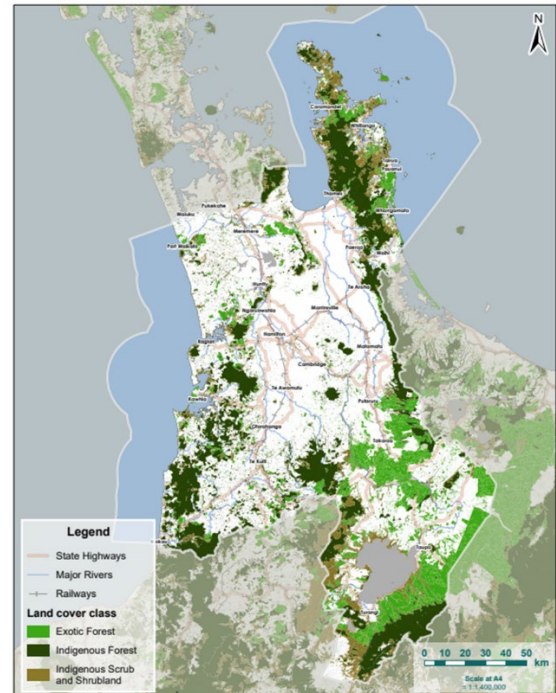


Figure 19: Location of exotic and indigenous forests

Liquid biofuel

Liquid biofuels are produced from renewable plant or animal-based materials such as animal fats, grasses, wood, forestry residues, and algae. Common transport applications include bioethanol, which can substitute for petrol, and biodiesel, which can replace diesel in vehicles, and biocrude oils, which can replace diesel or bunker oil in marine engines and industrial-scale boilers. Biodiesel is also used for residential and commercial space heating. Many countries already blend biofuels with conventional fuels for retail use across Australia, the United States, Canada, Europe, Asia and South America⁷⁴.

Biogas

Biogas (or upgraded biomethane) offers a renewable alternative to natural gas, produced from organic waste streams such as livestock manure, wastewater sludge, industrial effluent, food waste, and crop residues. Once upgraded, biogas is chemically identical to natural gas and can be injected directly into existing gas pipelines. Widespread anaerobic digestion across the country has the potential to generate 13–17 PJ of renewable energy each year while reducing biogenic emissions by up to 95 percent⁷⁵.

Advantages

- **Supply and sustainability:** the Waikato region has a well-developed and successful forestry sector and good plant growing conditions.
- **Continuous and controllable:** biomass provides continuous and controllable energy, complementing intermittent renewable energy.
- **Highly versatile:** it can replace fossil fuels for process heat, electricity generation, or be converted into transport fuels. Most activities where we currently use fossil fuels, can be achieved by using biomass and derivatives.
- **Co-location with geothermal:** the co-location of North Island production forests with geothermal developments creates synergies by using geothermal heat to dry timber.
- **Forest waste use:** forest waste can be used as biomass, turning waste into energy instead of leaving it to decompose into carbon dioxide or methane.

⁷⁴ [Bioenergy Association, 2026a.](#)

⁷⁵ [Energy Efficiency & Conservation Authority et al., 2021.](#)

- **Low emissions and renewable:** biomass can be a low emissions renewable source if sourced sustainably. Replacing coal with biomass in a boiler could reduce overall emissions (CO₂ equivalent) up to 98 percent.
- **Affordable:** biomass can be an affordable energy source, with no grid connections or electrical infrastructure upgrades required.
- **Opportunities for iwi:** Māori land blocks with forestry plantations, farm operations, or access to organic waste streams may be well positioned to supply or own biomass projects.

Disadvantages

- **Life cycle impact:** the sustainability of the resource depends heavily on feedstock supply chains, harvesting methods, and land-use impacts.
- **Storage considerations:** biomass fuel requires a large dry storage and handling area.
- **Supply and transport considerations:** due to the low energy density of biomass (i.e. large volumes are required), it is important to find a supply close to the end use. Long-term contracts are required due to the time needed for carbon sequestration.

Opportunities

Biomass use in New Zealand is expected to increase, supported by strong forestry resources and favourable growing conditions. As a low-emissions and cost-effective fuel, biomass is becoming an increasingly important part of the national energy mix. Its development, however, must follow a protection-first approach that safeguards soil health, water quality, taonga, and higher-value fibre uses, guided by long-term environmental stewardship.

Several biomass initiatives are underway, including new pellet and pine-chemical production at Kawerau (Foresta), food-waste-to-bioenergy and biomethane production in Reporoa (Ecogas⁷⁶), biomass trials at Huntly, a waste-to-energy system being piloted in Reporoa (Cetogenix⁷⁷), and ongoing landfill-gas power generation at Hampton Downs.

Foresta is progressing a pine-chemical and torrefied-pellet plant in Kawerau through the Fast-Track Approvals process, with plans to utilise geothermal steam and begin operating by 2029. Genesis Energy has also successfully trialled biomass at Huntly and intends to secure a full biomass supply for its Rankine units by 2030⁷⁸.

At Reporoa, Ecogas⁷⁹ operates New Zealand's first large-scale food-waste-to-bioenergy facility, which is being expanded with a biomethane upgrading plant to inject renewable gas directly into the national pipeline network. It is estimated that the facility will supply enough renewable gas to power up to 7,200 homes. In addition, the Hampton Downs landfill produces large quantities of gas resulting from the natural decomposition of highly compacted refuse, generating around 40,000 MW of baseload electricity per year⁸⁰.

An emerging clean-tech company, Cetogenix, has developed a waste-to-renewable-energy system known as Ceto-Boost™. The technology uses heat, pressure, and air to break down complex organic wastes into simpler compounds that can be converted into useful products. The process increases biomethane output by approximately 40 percent and reduces organic waste volumes by up to 95 percent, while also destroying pathogens and concentrating valuable nutrients such as ammonia and phosphorus. The system is suitable for organic waste from genuinely renewable sources (such as wood waste) and is designed for easy deployment at municipal wastewater plants, agricultural biogas sites, and industrial facilities. A pre-commercial pilot is now being established at the Ecogas site in Reporoa with support from Ara Ake⁸¹.

⁷⁶ [Ecogas, 2026.](#)

⁷⁷ [Cetogenix, 2026.](#)

⁷⁸ [Genesis, 2024.](#)

⁷⁹ [Ecogas, 2026.](#)

⁸⁰ [Cut Price Bins, 2019.](#)

⁸¹ [Ara Ake, 2026.](#)

Although no biofuel production facilities currently operate in the Waikato region, increasing global and domestic momentum toward decarbonising aviation, particularly the use of sustainable aviation fuels (SAFs), presents a strategic opportunity for future regional development. This opportunity is discussed further in the demand section of the strategy.

In the Waikato, the main producers of biogas include Hamilton City Council’s wastewater treatment plant and Fonterra Tirau’s biodigester, although neither facility upgrades biogas to biomethane. With over 4,000 dairy effluent ponds in the region, there is substantial potential for distributed biogas production to offset fossil fuel use on farms. However, while on-farm anaerobic digestion of dairy effluent is technically feasible, exporting electricity to the national grid is generally uneconomic due to market conditions and the small scale of individual systems⁸². Biogas production also requires strict compliance with safety regulations, as methane is highly flammable. Table 5 provides indicative estimates of New Zealand’s wider biogas potential.

Table 5: Biogas potential in New Zealand⁸³

Category	Feedstock type	Biogas potential (PJ/year)
Municipal waste	Municipal wastewater solids	0.6 to 0.9
	Source-segregated food waste	1.5
Industrial wastewater	Dairy	1.1 to 1.9
	Meat	0.7
	Pulp and paper	0.6
Agricultural waste	Dairy manure	6.8
	Pig manure	0.4
	Poultry manure	1.3
	Crop residue	1.4 to 2.9
Landfill gas	Existing landfill gas capture	3

Recommendations:

- Use spatial planning to identify:
 - Opportunities for biomass hubs near industrial heat users and geothermal developments.
 - Sustainable feedstock availability across the region.
 - Onsite treatment of organic waste streams where scale and logistical considerations are met. For example, significant primary produce manufacturing sites, specified locations identified for production in hubs/nodes with a combination of transport (rail) gas pipelines and labour.
 - Opportunities for SAF production in hubs, such as areas with access to rail, renewable energy, labour and biomass resources.
- Support iwi-led and iwi-partnered biomass initiatives.
- Encourage biogas refineries within energy hubs to support use and distribution through existing pipelines.

9.3 Wind

Wind is a valuable energy resource in New Zealand because average wind speeds are high. Although wind conditions vary by location and weather, the country’s diverse climate means there is usually strong wind somewhere. Figure 20 shows how wind speeds vary across the Waikato region.

Wind turbines generate electricity by using moving air to turn their blades, with output depending on wind strength and blade size. Turbines range from small 1 kW units for homes to large 15 MW machines offshore, and national wind generation varies from only a few megawatts to over 1.2 GW.

⁸² [Dairy NZ, 2015.](#)

⁸³ [Energy Efficiency & Conservation Authority et al., 2021.](#)

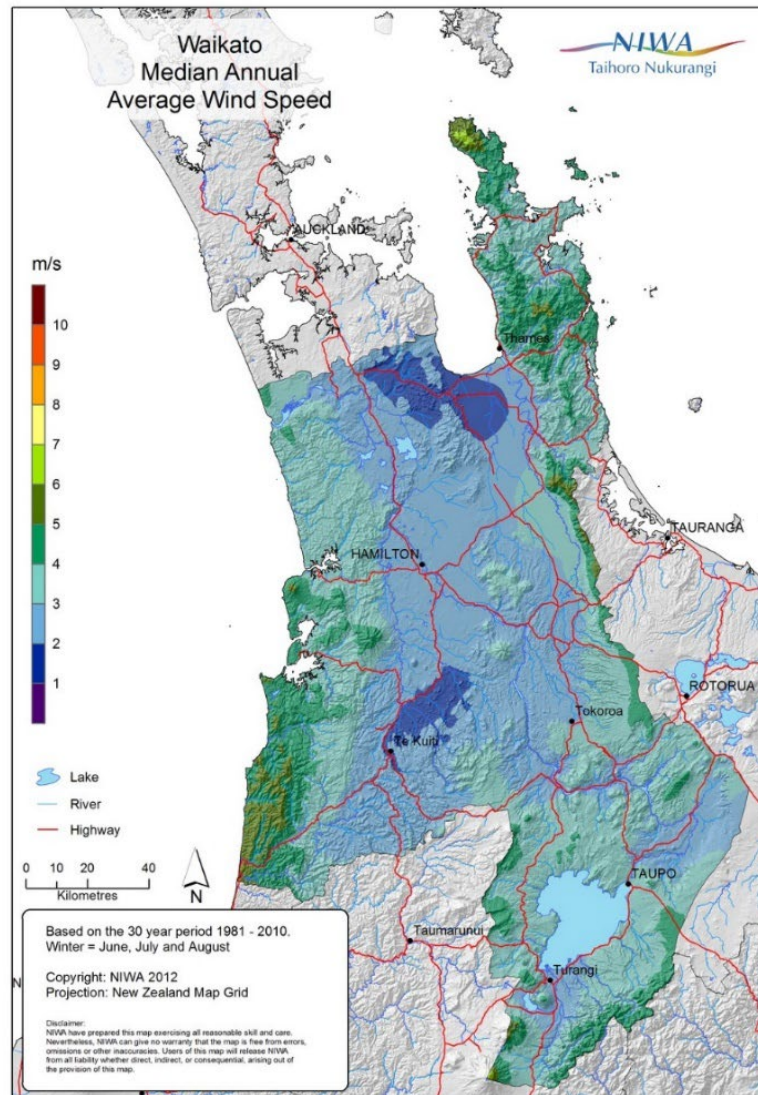


Figure 20: Waikato median annual average wind speed⁸⁴

Onshore

Modern wind turbines use large three-bladed rotors to capture enough energy from low-density air, with blade lengths typically 60–80 metres and hub heights of 90–130 metres. Each turbine requires a substantial concrete foundation and generally produces 2.5–5.5 MW. In 2021, onshore wind supplied about six percent of New Zealand’s electricity, with estimates suggesting this could rise to 20–34 percent⁸⁵.

Offshore

Offshore wind turbines can be much larger than onshore machines, with blades of 120–130 metres and hub heights over 100 metres, producing up to 17 MW each. Their amenity impacts are generally low because coastal noise masks turbine sound and visual effects diminish with distance, though night lighting is still required for navigation safety. Offshore sites can also reduce risks to coastal migrant birds when turbines are placed above typical flight paths. However, offshore farms need extensive seabed foundations, wide spacing, and transmission cables to shore, which can affect vessel movement and seabed activities, and they depend on upgraded ports to assemble and transport large components.

Advantages

- **Abundant** – wind generation is efficient, reliable and abundant.
- **Zero emissions** – wind turbines don’t produce greenhouse gas emissions.

⁸⁴ [Chappell, P.R., \[2014\].](#)

⁸⁵ [Energy Efficiency & Conservation Authority, 2021.](#)

- **Stable electricity generation** – wind is quite stable over a longer period, and wind farm operators can forecast with reasonable accuracy how much electricity they will generate in a year.
- **High EROI** – New Zealand wind generation has a high Energy Return on Energy Invested (EROI), higher than many other electricity generation methods.

Disadvantages

- **Short term output variability** – wind generation can vary significantly over hours and days, making it more difficult to integrate into the electricity system than stable sources like geothermal.
- **Embodied emissions** – construction of wind turbines require significant energy and material input.
- **Visual and sound considerations** – wind turbines can have a visual impact on the environment and create noise.
- **Cultural considerations** – wind turbines can impact culturally significant skylines and ancestral relationships to maunga and ridgelines. Ridgelines and elevated landforms often hold cultural significance, including ancestral narratives, wāhi tapu, and long-standing visual markers. Offshore wind proposals intersect with customary marine areas, navigation routes, fisheries, and coastal whakapapa.
- **Bird populations** – wind turbines can affect birds mainly through collisions and habitat disturbance, with risks varying by species, behaviour and site conditions.

Existing and proposed wind farms

Wind energy offers strong low-emissions generation potential when developed in ways that protect culturally significant landscapes and skylines, and carefully manage noise, visual effects, and impacts on birds. Projects on Māori land can support iwi-led development where barriers to capital, grid access, and equitable benefit-sharing are addressed.

Unlike solar, wind provides higher output during stressed winter periods, supporting seasonal reliability. There is only one grid-scale wind farm currently operating in the Waikato, with seven more proposed, including three offshore projects located more than 22 km from the west coast (Table 6).

Offshore wind viability depends on major upgrades to Port Taranaki and coordinated supply-chain development, including potential trans-Tasman partnerships. Grid capacity and transmission investment remain key constraints, requiring joint planning between WRC, Transpower, lines companies, central government, and iwi. Port upgrades and associated infrastructure are expected to support transparent benefit-sharing, workforce pathways for local iwi, and governance arrangements that reflect impacts on adjacent rohe and coastal environments.

Table 6: Existing and proposed wind farms in the Waikato region

Station (currently operating)	Ownership	Number of turbines	Capacity	Stage
Te Uku	Meridian Energy / WEL Networks	28	64.4 MW	Operational, commissioned 2010
Taumatotara	Ventus Energy	8	48.4 MW	Consented
Kaimai	Ventus Energy	24	150 MW	Fast Track – Listed
Taranaki Offshore Partnership	Copenhagen Infrastructure Partners and NZ Super Fund	70	1,000 MW scalable to 2,000 MW	Proposed
Glen Massey	Vestus	25	150 MW	Proposed
Hapuakohe	Manawa Energy	Unknown	230 MW	Proposed
Waikokowai	Tararua Wind Power Limited	51	650 GWh per annum	Fast Track – Listed

Recommendations:

- Support iwi-led and iwi-partnered wind developments.
- Use spatial planning to identify suitable locations for wind farms, avoiding culturally sensitive landscapes.

9.4 Hydroelectricity

Hydroelectric schemes use gravity-driven water to generate electricity, with output depending on rainfall, elevation, and storage. Hydroelectricity operates within awa that are taonga, carrying their own mauri and whakapapa. Ongoing management of hydroelectricity focuses on protecting waterways, restoring mauri, and upholding Te Ture Whaimana o te Awa o Waikato.

Hydro generation is highly sensitive to sustained periods of low inflows, making seasonal variations in water availability a major operational challenge. Dry winters, once considered 20-year events, are now occurring more often, and resulting shifts in hydro storage levels remain the single biggest driver of electricity price volatility in New Zealand.

Advantages

- **Fully controllable:** water stored in dams can be turned into electricity within seconds, making hydro one of the only fully controllable and dispatchable renewable electricity sources.
- **Reliable:** where enough water can be stored, hydro is reliable and consistent.
- **High EROI:** hydropower has the highest energy return on energy invested out of all energy sources.

Disadvantages

- **Impacts:** while hydro has delivered national benefit, its development has also created enduring cultural, environmental, and social impacts⁸⁶, including altered river flows, habitats, and wāhi tapu, which continue to influence kaitiakitanga and cultural integrity.
- **Dry year risk:** New Zealand has relatively small hydro storage capacity, and rainfall patterns vary greatly from year to year. A significant decline in rainfall over the past 60 years has implications for hydroelectric generation⁸⁷. Iwi Māori have noted that reduced reliability during dry years affects not only electricity supply but also downstream cultural, ecological, and community outcomes.

Existing hydro generation

The Waikato region has two major grid-connected hydro schemes, one above Lake Taupō and one below. The Waikato River scheme, owned and operated by Mercury NZ, comprises eight stations (Figure 21) built between 1924 and 1966 and provides 1,119.5 MW of capacity⁸⁸. With most hydro potential already utilised, future gains will come from maintenance, refurbishment, and technology upgrades. For example, Karāpiro Power Station increased output from its original 90 MW design to around 110 MW. While these schemes deliver significant national benefits, they also concentrate long-term cultural, environmental, and social effects within the rohe, reinforcing expectations that ongoing operation actively supports river health and inclusive participation in management.

⁸⁶ [National Institute of Water & Atmospheric Research, 2010.](#)

⁸⁷ [Waikato Regional Council, 2016.](#)

⁸⁸ [Mercury, 2026.](#)

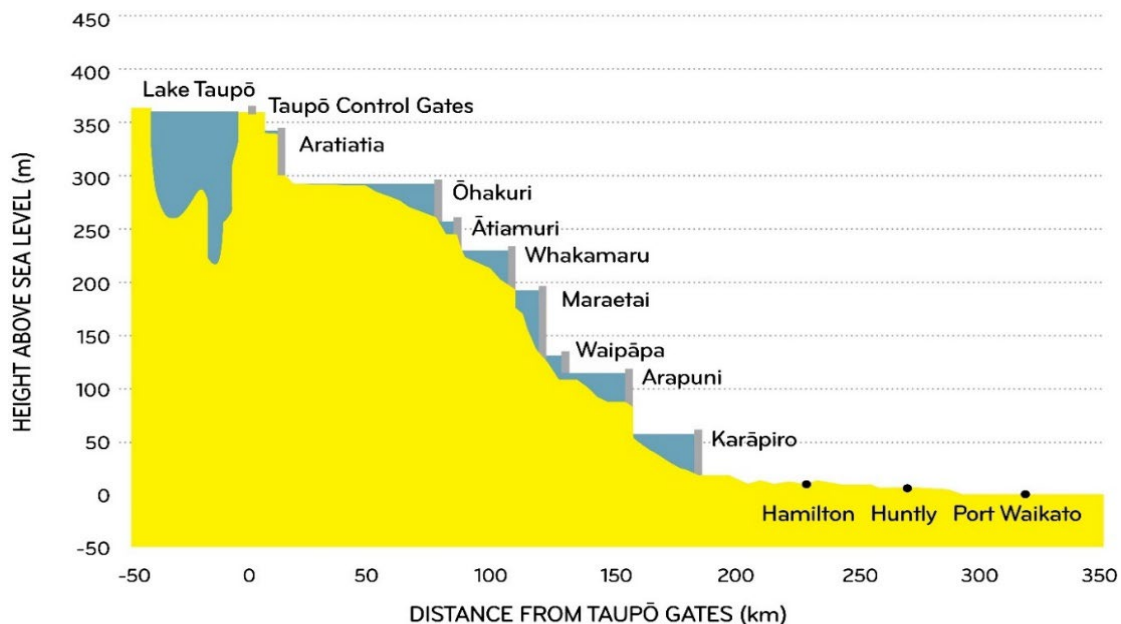


Figure 21: Cross section of the Waikato hydro scheme⁸⁹

The Tongariro Power Development, owned and operated by Genesis Energy, was built in the late 1960s and early 1970s. The scheme includes three hydro power stations – Rangipō (120 MW, underground), Tokaanu (240 MW), and Mangaio (1.8 MW). Water from the Whanganui, Whangaehu, Moawhango, and Tongariro catchments is diverted through dams, tunnels, and canals for generation before entering Lake Taupō (Figure 22). These inter-catchment diversions add around 19 percent to the lake’s annual inflow and have cumulative cultural and environmental effects across rohe boundaries, requiring coordinated governance and periodic review informed by updated science and mātauranga Māori. A proposal exists to raise Moawhango Dam to improve storage and dry-year resilience. Any change to storage or flows is expected to involve early engagement with affected iwi and hapū and to treat protection of taonga as a baseline requirement.

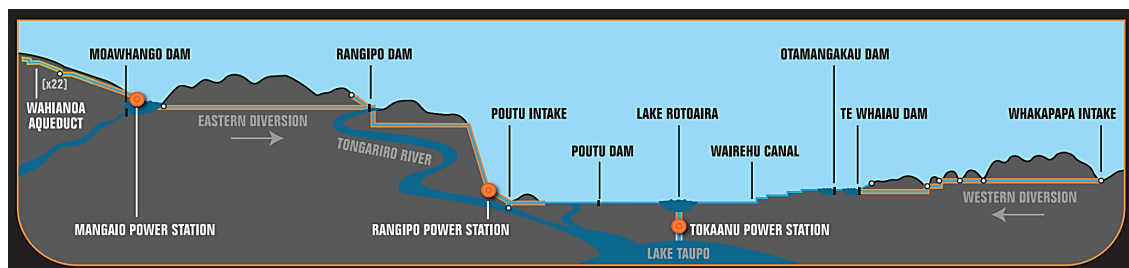


Figure 22: Cross section of Tongariro Power Development scheme⁹⁰

There are five smaller hydroelectric power schemes contributing to the renewable energy mix. Smaller and community-scale hydro may be appropriate in limited settings where ecological effects are low, cultural values are protected, and benefits remain local. Contact Energy operates the Hinemaiaia (A-C) and Kuratau stations with a combined capacity of 11.1 MW, Southern Generation Limited Partnership operates the Te Kuiti scheme (4 MW), and King Country Energy manages the Mokau River and CNI schemes, together providing 6.5 MW of generation.

Opportunities

With limited scope for new large-scale development, future hydro opportunities are expected to focus on optimisation, refurbishment, and small-scale or network-connected schemes. Mercury has upgrades scheduled at Arapuni, Ōhākuri, Maraetai and Ātiamuri over the next eight years⁹¹.

⁸⁹ Supplied by Mercury Energy

⁹⁰ [Genesis Energy, 2026.](#)

⁹¹ [Mercury, 2026.](#)

There is a proposal to raise Moawhango Dam to improve storage and dry-year resilience (see section 10.2).

Recommendation: support communities to meet local energy needs through small-scale hydro.

9.5 Marine energy – wave

Wave energy, a form of marine power driven by wind, remains largely experimental. Waves are classified as ‘sea’ (at generation point) or ‘swell’ (energy transmitted away), with swells on Waikato’s west coast mostly originating from the southwest. This south-westerly origin explains the concentration of coastal ports and the use of coastal space for recreation and aquaculture on the east coast.

Advantages

- Wave energy is consistent and reliable – ocean waves are more forecastable than wind or solar.
- Wave energy makes efficient use of offshore space.

Disadvantages

- Wave motion is complex and three dimensional, making energy extraction challenging.
- Wave energy devices can have adverse effects on marine ecosystems. They can create collision or entanglement risks for marine animals, generate underway noise and electromagnetic fields, and modify benthic and pelagic habitats⁹².
- High installation and maintenance costs are a significant barrier.
- Wave energy resources are concentrated in specific areas, limiting widespread implementation.

Opportunities

Twelve potential sites have been identified on New Zealand’s south and west coasts, including Waikato, but no deployments exist yet⁹³. Research interest is growing, with the University of Waikato investigating the potential for offshore deployment and testing wave energy devices⁹⁴. Initial investigations have identified Kawhia and environs as a potential research site with world class marine conditions along with local engineering, and academic support⁹⁵. Regional development opportunities with global relevance exist, despite the absence of a southern hemisphere testing centre. Any research or trial activity requires early engagement with affected mana whenua, clear arrangements for monitoring, data sharing, and site restoration.

Recommendations:

- Support wave energy trials in conjunction with the University of Waikato, once transmission opportunities exist.
- Support development of experimental devices/structures through provisions in the Regional Coastal Plan.

9.6 Geothermal

New Zealand’s location on the boundary of two tectonic plates gives it abundant geothermal energy. Over 70 percent of the country’s known geothermal resources are found in the Waikato region, concentrated around the Taupō Volcanic Zone (Figure 23)⁹⁶. This includes 15 large systems, of which:

- Seven have been identified as development systems for use including large scale energy developments provided the taken fluid is returned to the same system. Of these, there are two (Horohoro and Mangakino) which have yet to be developed.

⁹² [Copping, A.E. et al., 2020.](#)

⁹³ [Bertram, D., 2021.](#)

⁹⁴ [Bertram, D. et al., 2020.](#)

⁹⁵ Frith, A. & Wilson, R.

⁹⁶ [Dickie, B. & Andrews, K., 2024.](#)

- Two have been identified for limited development where there are fluid driven surface features, (pools, springs, sinter terraces and geysers) which would be compromised (become extinct) without some limit on the amount of daily take.
- Five are protected due to their taonga relationship to iwi Māori and the vulnerability of surface features to fluid use. These systems are irreplaceable.
- A single remaining large system (Reporoa) has been identified as a research system (the default system type for all other yet to be discovered geothermal resources) for its known energy potential, yet proximity and unknown potential connection to surrounding Protected systems. Research activities are expected to include early and funded engagement, transparency on objectives and risks, and clear pathways for participation in governance and monitoring.

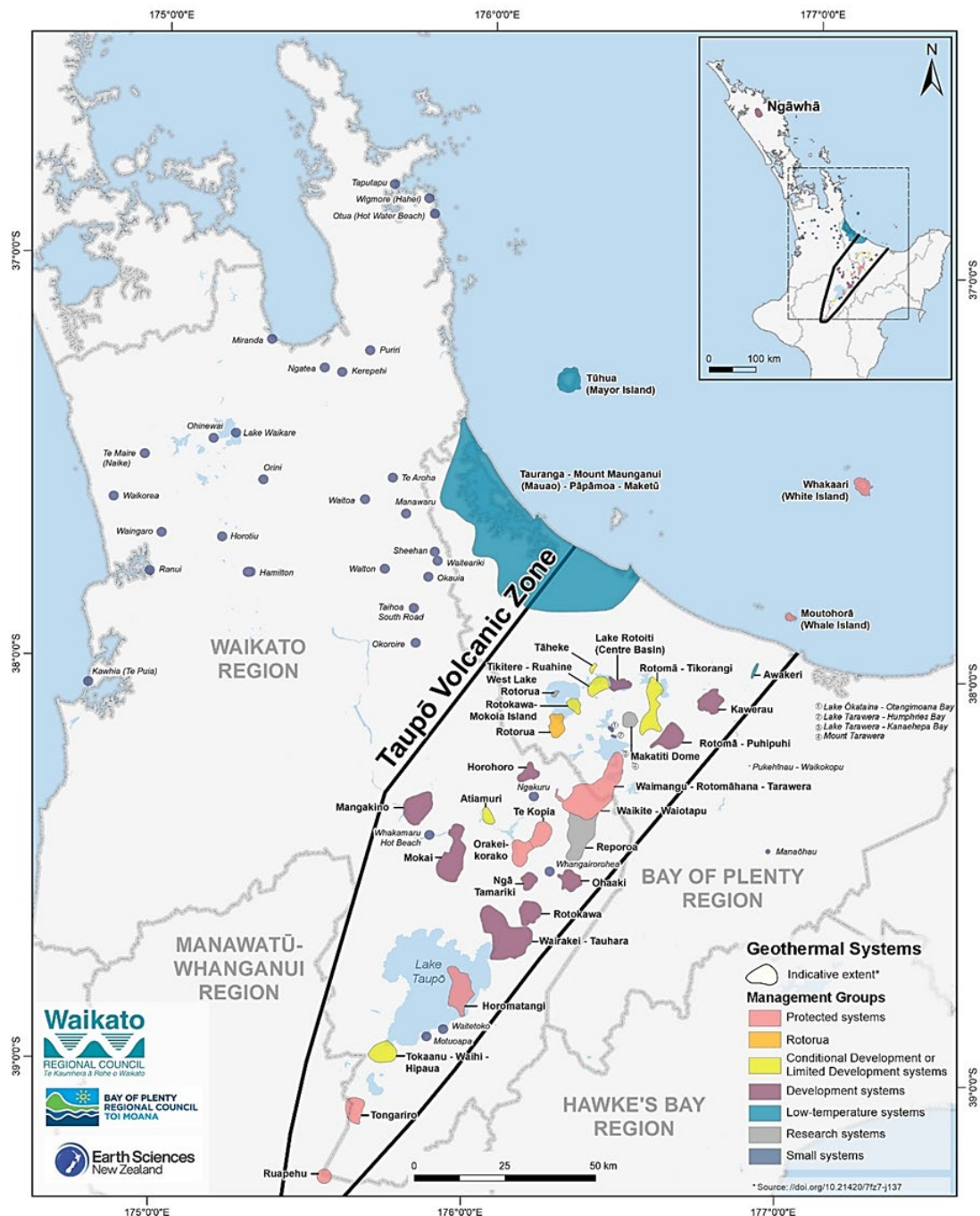


Figure 23: Geothermal systems in the Waikato and Bay of Plenty regions.

The region's (and New Zealand's) first geothermal power station was 'Wairakei A' which first generated electricity in 1958 and is still operating now, nearly 70 years later. New Zealand's most integrated geothermal system is centred around the Mōkai power station, operated by Tūaropaki Power Company in partnership with Mercury Energy.

The geothermal system includes Miraka – the world’s first geothermally powered dairy process company, the geothermally heated gourmet Mōkai glasshouses, and in partnership with Japan’s Obayashi Corporation, Halcyon Power, New Zealand’s first commercial scale green hydrogen plant⁹⁷. Power stations in the Waikato region are shown in Table 7.

Table 7: Existing geothermal power stations in the Waikato region

System	Station	Owners	Size (MW)	Consent expiry
Wairakei-Tauhara	Wairakei A	Contact Energy	127	2058
	Wairakei		5	
	Poihipi		50	
	Te Mihi		166	
	Te Huka 1		24	2045
	Te Huka 2			
	Te Huka 3		51.4	
	Tauhara		174	
Ohaaki	Ohaaki	Contact Energy	53	2048
Mokai	Mokai	Mercury and Tuaropaki Power	113	2024
Rotokawa	Rotokawa	Mercury and Rotokawa Joint Venture	34	2053
	Nga Awa Pura		139	
Ngā Tamariki	Ngā Tamariki	Mercury and Rotokawa Joint Venture	86	2045
	Ngā Tamariki OEC5 expansion		46	2058

*Application submitted for replacement resource consent (duration of 35 years) for ongoing operation

Electricity is generated by directing hot geothermal fluid from wells through a system of pipes and vessels to drive turbines. Beyond electricity, geothermal heat and steam are directly applied in industries such as pulp and paper, wood processing, dairy manufacturing, and greenhouse heating, reducing reliance on fossil fuels. In some cases, this heat is a by-product of power generation, making direct use of geothermal energy particularly cost-effective and efficient energy source.

Iwi Māori consider geothermal fluid as a living entity and a taonga, and have used geothermal systems for cooking, bathing and heating for centuries⁹⁸. Partnering with iwi Māori is an integral part of geothermal development in New Zealand, reflecting both the cultural significance of geothermal resources and the legal responsibilities under the Treaty of Waitangi. Geothermal development commonly occurs on or near Māori land and involves enduring cultural, spiritual, and economic connections. Iwi Māori have emphasised that geothermal resources are ancestral and that decisions on geothermal field boundaries, classifications, and development pathways require transparent, collaborative review with iwi, informed by mātauranga Māori and evolving scientific knowledge.

Access to and use of geothermal fluid and energy is facilitated by a well-established, and internationally recognised⁹⁹ policy and regulatory framework. In 2006, a change to the Waikato Regional Policy Statement and variation to the Waikato Regional Plan modernised the allocation policy for geothermal fluid and energy. These changes enabled significant growth in geothermal electricity generation (Table 8), largely driven by energy producers. Alongside increased generation, consenting times dropped dramatically, from six years for projects such as the Wairakei power station re-consent to just six months. Ongoing application of the framework is expected to continue upholding Te Ture Whaimana, Treaty settlement commitments, and culturally safe practice as system pressures increase.

⁹⁷ [Ministry of Business, Innovation & Employment, 2025c.](#)

⁹⁸ [Ministry of Business, Innovation & Employment, 2025c.](#)

⁹⁹ 2008 Energy Globe Award.

Table 8: National increase in geothermal generation following the geothermal module of the Waikato Regional Plan becoming operative in 2006¹⁰⁰

Year	1980	1985	1990	1995	2000	2005	2010	2015	2020
Generation	1,206	1,165	2,011	2,039	2,756	2,981	5,559	7,479	7,834

Advantages

- **Reliable:** geothermal energy supply isn't dependent on weather conditions, making it consistent and reliable – ideal for baseload uses¹⁰¹.
- **Low emissions:** while electricity generated from geothermal energy produces some greenhouse gas emissions, the average emissions intensity of geothermal electricity is low.
- **Abundant:** the Waikato region has good access to geothermal energy. It has been estimated that New Zealand has capacity to roughly double the current electricity generation from geothermal energy.

Disadvantages

- **Development cost and time:** developing a geothermal power station is an expensive and risky proposition. The resource lies deep underground, requiring advanced techniques such as remote sensing, geoscience surveys, and predictive modelling to understand its behaviour. These preliminary investigations are expensive and inherently uncertain, with system performance only confirmed after development. In addition, significant infrastructure is needed, including production, monitoring, and reinjection wells, as well as surface facilities for power generation and transmission. These risks reinforce the value of early engagement to inform site selection, field management, and long-term stewardship before major investment decisions are made.
- **Specialised maintenance:** the resource needs careful management and monitoring to control reservoir water and pressure levels, and prevent land subsidence and depletion.
- **Emissions:** geothermal fluids contain some greenhouse gases which are transported to the surface when the fluid is extracted. Emissions management is expected to sit alongside protection of surface features, reinjection practices, and monitoring that maintains geothermal system balance.

Central government focus

In the past year, central government has renewed its focus on geothermal energy, recognising its reliability as a renewable resource. Two key initiatives highlight this interest – development of a Draft National Geothermal Strategy and funding for deep geothermal research.

The Draft National Geothermal Strategy, “From the Ground Up” was released in July 2025¹⁰². The Strategy recognises the full potential of geothermal resources, beyond electricity generation. Geothermal heat can be used in a variety of applications, including bathing, aquaculture, horticulture, pulp and paper production, dairy processing, timber drying, and building and water heating¹⁰³. Geothermal fluids also contain minerals like silica and lithium that can be used in industrial applications.

The aim of the Strategy is to extend New Zealand’s position as a world-leader in geothermal innovation, double geothermal energy use by 2040 to support New Zealand’s energy transition, and to strengthen regional economies through collaboration with tāngata whenua and support industrial growth, tourism, and trade. Collaboration with tāngata whenua is integral to implementing the Strategy, particularly where development affects existing fields, protected systems, or areas of cultural significance.

In recognition of the vast energy resources that power our geothermal systems, central government has also allocated funding from the Regional Infrastructure Fund (\$60 million)

¹⁰⁰ [Ministry of Business, Innovation & Employment, 2026c.](#)

¹⁰¹ [New Zealand Geothermal Association, 2026.](#)

¹⁰² [Ministry of Business, Innovation & Employment, 2025c.](#)

¹⁰³ [Ministry of Business, Innovation & Employment, 2025c.](#)

for research into accessing super-hot geothermal energy at depth¹⁰⁴. Five million of this has already been used in design work to drill three exploratory wells into the Rotokawa geothermal system. Additionally, GNS is also contributing under the Endeavour Fund to explore the use of energy from supercritical geothermal fluid.¹⁰⁵

Opportunities

It is estimated that New Zealand has capacity to roughly double the current electricity generation from geothermal energy. There are two large development systems (Horahora and Mangakino) and two limited development systems (Atiamuri and Tokaanu-Hipaua) that have not been developed for heat energy potential.

Te Mihi Stage 2 near Taupō is due to be commissioned in September 2027, adding 101 MW – enough to power around 120,000 homes.

In addition to the defined ‘large’ high temperature geothermal systems, there are at least 31 known sites of low flow, low temperature geothermal sites. These are less well understood and are typically known from surface seeps, springs and occasionally as ‘artificial’ geysers where wells drilled into confined hot aquifers occasionally erupt.

Elsewhere in the region, hot groundwater is periodically being discovered as wells are drilled for access to ground water. Low and moderate temperature groundwater has the potential to offset electricity for small and community scale heating wherever it occurs. Low-temperature geothermal applications can support marae, papakāinga, and community facilities where use aligns with tikanga, protects local systems, and improves resilience and affordability.

Recommendations:

- **National geothermal strategy:** actively engage with central government on the National Geothermal Strategy.
- **Support new research:** support new research that enables access to untapped geothermal resources, both low temperature use and deep high temperature (super-critical).
- **Transparent information:** actively support open information to allow new operators to invest in undeveloped systems.
- **Food production:** encourage use of geothermal for food production and glass houses.
- **Spatial planning:** make provision for existing and future industries that use geothermal heat by locating them close to known geothermal development areas and limited development systems.

10 How energy is stored

Energy storage captures produced energy for later use. Energy storage can take many forms – large scale options currently include batteries, pumped hydro, hydrogen and biomass.

Since 2020, New Zealand has experienced three energy crises, underscoring the fragility of the current system and the urgent need for more robust energy storage solutions. These challenges are intensified by the growing share of intermittent renewable generation—particularly wind and solar—which must be integrated with both current and future electricity demand cycles. A renewable-heavy system is highly weather-dependent, increasing vulnerability to outages, especially in rural areas and marae. Compounding this is the fact that New Zealand’s electricity system is not designed to accommodate significant oversupply. Storage is therefore essential to support both local resilience and national security, and to integrate increasing amounts of variable wind and solar generation. Repeated crises highlight the importance of localised generation and storage, particularly for marae and critical community facilities, to reduce exposure to system-wide failures.

New Zealand also faces a persistent ‘dry-year problem’, where low rainfall and reduced snowmelt leave hydro lakes unable to meet electricity demand. This shortfall, around 5 TWh, has historically been covered by fossil-fuelled generation.

¹⁰⁴ [Collins J., 2024.](#)

¹⁰⁵ [Earth Sciences New Zealand, 2026.](#)

However, continued reliance on coal and gas is incompatible with a 100 percent renewable electricity future and shifts environmental and financial burdens onto future generations.

Traditionally, the electricity grid has been supported in wet years by hydro generation, supplemented by thermal firming from fossil gas and coal. During dry years, fossil fuels have played a greater role. These two fuel types behave very differently: coal- and gas-fired steam turbines are slow to start, lack flexibility, and cannot provide the rapid response capability required to manage variability in demand and supply. This stands in contrast to the fast response of gas turbine and hydroelectric generation. The limitations of fossil firming reinforce the need for new storage solutions that are flexible, scalable, and capable of providing dependable capacity in a renewable-dominant system. Low emission options to address this include battery, pumped hydroelectric energy storage (PHES), hydrogen, and biomass (see sections below).

10.1 Battery

Battery storage plays an increasingly important role in supporting a reliable, flexible, low-emissions energy system. Small-scale batteries (like those in electric vehicles (EVs)) and large-scale Battery Energy Storage Systems (BESS) can respond instantly to changes in supply and demand, helping stabilise the grid and improving resilience for marae, papakāinga and rural communities with less reliable electricity.

Lithium-ion batteries are becoming increasingly cost-effective, and despite their relatively short discharge duration, are well suited to managing daily load cycles, storing low-cost midday solar generation and releasing it during higher-priced morning and evening peaks. Lithium-ion systems can perform high-value daily cycles 300–500 times per year while maintaining acceptable performance and economic returns.

New battery types are also emerging: sodium-ion batteries offer a safer, more sustainable option for stationary storage, while iron-air batteries can provide multi-day storage using abundant, low-cost materials¹⁰⁶.

Battery energy storage systems (BESS) is a large-scale energy storage facility that stores and releases energy to the electricity grid. They play a critical role in modern energy systems by providing flexibility, reliability and resilience, especially as more variable sources like wind and solar enter the system. They charge when supply is high and discharge when supply is tight, helping to stabilise the system.

An emerging use of the growing number of electric-vehicle batteries is to supply power to buildings during high-price periods or outages through vehicle-to-load (V2L) capability. When aggregated at scale, these batteries can also support the wider electricity system through vehicle-to-grid (V2G) services, providing resilience and enabling users to benefit from price arbitrage.

A recent report¹⁰⁷ found that shifting from imported fuels to electricity could save around \$2.9 billion a year, but only if EV charging is carefully managed to avoid adding to peak demand. Smart charging and V2G can improve efficiency and reduce costs, with the greatest potential coming from large, centrally managed fleets such as milk tankers, which have predictable charging patterns and strong incentives to decarbonise supply chains. V2G enables EVs to supply power back to homes or the grid, creating significant economic benefits, up to \$2,000 per light vehicle and up to \$25,000 for some heavy vehicles each year. Unlocking these benefits will require coordinated action, consumer-friendly participation, compatible technology, and pricing structures that reward flexibility. In particular, nationwide “type-of-use” pricing—offering lower network charges for remotely managed EV charging—will be essential to enable widespread V2G uptake and capture its full value.

¹⁰⁶ [Form energy, 2026.](#)

¹⁰⁷ [Concept Consulting, 2025a.](#)

Opportunities

There are currently four operational or committed BESS projects in the Waikato region, with a further four proposed (Table 9). The first stage of the Huntly BESS is scheduled to be completed in 2026, with a further 300 MW in the pipeline out to 2035. There are two projects proposed in Whakamaru – close to Transpower’s Whakamaru North Substation.

Table 9: Existing, committed and proposed BESS in the Waikato region¹⁰⁸

Location/connection point	Owner	Capacity (MW)	Status
Whangamata	Northpower	2	Existing
Rotowaro	WEL Networks	35	Existing
Rotohiko (Huntly)	NewPower Energy	35	Existing
Huntly	Genesis Energy	100 (stage 1)	Committed
Whakamaru	Mercury Energy	200-300	Consented
Waihou*	Harmony Energy	100	Proposed
Hinuera*	Harmony Energy	68	Proposed – Fast track
Whakamaru North	Eku Energy and Helios Energy	300	Proposed – due for operation in 2029

*BESS + Solar

Recommendations:

- Advocate for a National Energy Strategy that includes nationally consistent type of use pricing to encourage and provide for distributed EV participation in grid and network support.
- Collectively use opportunities such as adjustments to electricity market regulatory settings, to advocate for nationally applicable settings that encourage and provide for distributed EV participation in grid and network support.
- Use spatial planning to identify opportunities for BESS close to networks and the grid.

10.2 Pumped hydroelectric energy storage

Pumped hydroelectric energy storage (PHES) works by pumping water uphill when electricity is cheap or plentiful, then generating electricity by releasing it during high-demand periods. It is becoming increasingly important for managing dry years, integrating more wind and solar, and improving grid stability.

National investigations through the New Zealand Battery Project¹⁰⁹ identified potential large-scale storage options, including Lake Onslow (although this option was halted – and since revived privately) and around Lake Taupō¹¹⁰.

Preliminary work by the University of Waikato has identified at least two viable pumped hydro reservoir sites around the Upper Waikato River – one near Lake Whakamaru and another south of the Kinleith mill at Tokoroa.

Smaller, distributed pumped hydro schemes remain a live option, but there are many challenges to overcome before such technology can be consented, such as land use changes, inundation of rivers and streams, and altered hydrology which can affect wetlands and biodiversity.

Lake Taupō

Sites identified by the New Zealand Battery Project east of Lake Taupō are shown in Figure 24. One option would utilise the headwater catchments of the Ngaruroro River to store water from Lake Taupō. These headwaters are located in the Hawkes Bay region, which often has a strained water supply. Also identified were sites to the south and western side of Lake Taupō, within the Waikato region. These sites are more advanced, with the potential repurposing of the Tongariro power development assets owned and operated by Genesis Energy. The Azim Gorge option (above Lake Moawhango) consists of three dam locations and could add in excess of 1,000 GW hours storage.

¹⁰⁸ [Transpower, 2025.](#)

¹⁰⁹ [Ministry of Business, Innovation & Employment, 2026b.](#)

¹¹⁰ [Wilkins, M. et al., 2021.](#)

Proposals drawing on headwater catchments raise intergenerational concerns about water security, downstream effects, and cross-regional equity. Any further consideration requires collaboration across affected iwi, hapū, and councils.

The Tongariro Power Scheme consents authorising the diversion of waters from the Whanganui and Rangitikei catchments expire in 2039. These will require re consenting, with key considerations including the river’s relationship with tangata whenua and the impacts of diversions on catchment resilience and life-supporting capacity in the face of increasing climate change pressures. Reconsenting provides a critical opportunity to reassess cumulative effects, restore mauri, and strengthen iwi involvement in governance, monitoring, and decision-making.

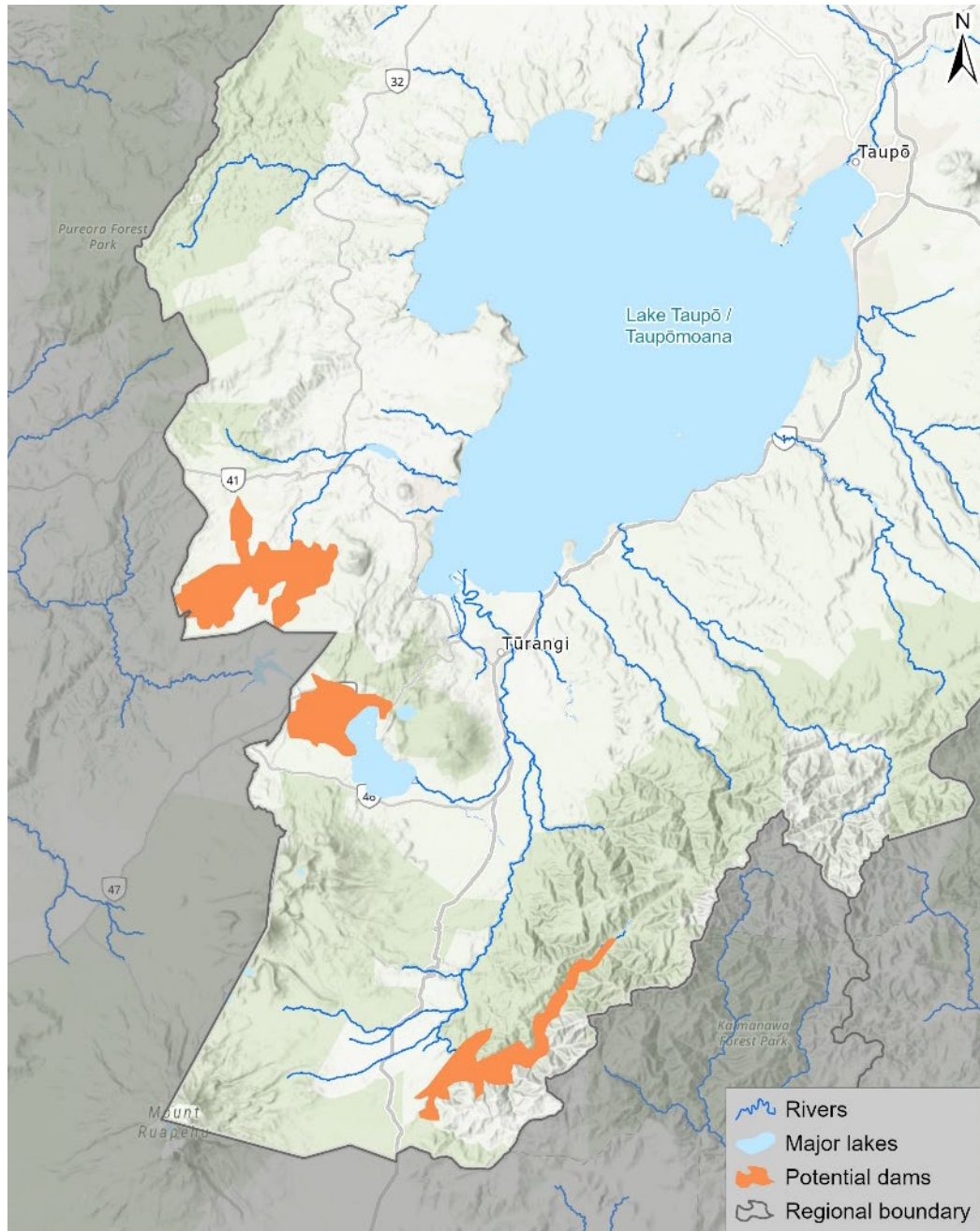


Figure 24: Potential pumped hydro-electric storage dam sites (‘main dams’) identified in the vicinity of lake Taupō

Lake Whakamaru

The University of Waikato has made preliminary investigations into potential locations for pumped hydroelectric reservoirs using the elevated terrain around the Upper Waikato River. The geology creates opportunity for at least two sites (Figure 25), one close to Lake Whakamaru and a second south of the Kinleith mill at Tokoroa.

Together they would have an energy storage capacity of at least 28 GWh or provide renewable peaking capacity of 600 MW continuously for two days¹¹¹.

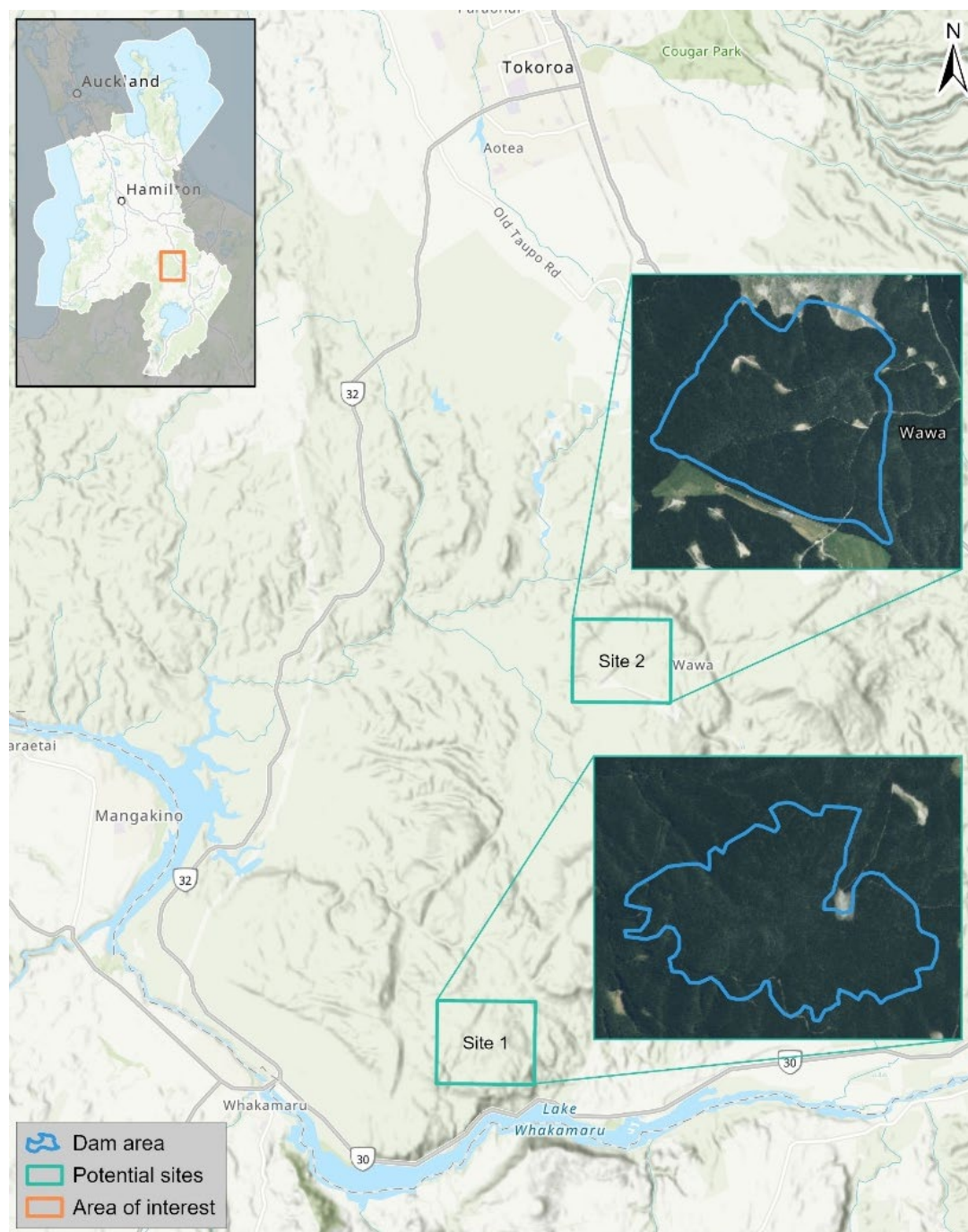


Figure 25: Potential pumped hydro-electric storage dam sites identified by the University of Waikato

Recommendation: work with parties to investigate opportunities for pumped hydro in the region and identify locations in spatial plans.

10.3 Hydrogen and derivatives

Hydrogen is an emerging energy carrier with potential applications for emissions reduction, industrial heat, and transport.

Hydrogen is found in compounds like water, and when converted into the H₂ molecule it acts as an energy carrier rather than a primary energy source. Because the hydrogen molecule doesn't exist naturally on its own, it must be produced by separating it from other elements using energy. This can be done using water, fossil fuels, or biomass. Once produced, hydrogen can be used for energy storage, as a chemical feedstock such as for fertiliser, or as a fuel.

¹¹¹ University of Waikato. Unpublished research proposal.

The energy stored in hydrogen is released either by burning it, similar to natural gas, or by using fuel cells, which combine hydrogen with oxygen to generate electricity and produce water as the only by-product.

Power to X

Power-to-X are technologies that turn renewable electricity into alternative energy carriers or products. The process generally involves electrolysis, synthesis, storage and use. The simplest power-to-X pathway is power-to-hydrogen (green hydrogen). In more complex pathways, green hydrogen contributes to other outputs such as green ammonia and sustainable aviation fuel (SAF). There are an increasing number of projects that are looking at dedicated power-to-X solutions¹¹².

Green hydrogen

Green hydrogen is produced by electrolysis, a process that uses renewable electricity to split water into hydrogen and oxygen. Green hydrogen production intersects with wai as taonga and requires careful consideration of water sourcing, cumulative effects, and alignment with Te Ture Whaimana. Green hydrogen is a clean energy carrier that is already playing a role in Waikato's transition to a low-emissions economy.

Green hydrogen is already emerging as part of Waikato's low-emissions transition, with early regional projects underway by Hiringa Energy¹¹³ and partners.

Ammonia

Ammonia (NH₃) is a liquid energy carrier made from hydrogen. Unlike hydrogen, which does not occur naturally and is difficult to store, ammonia is already part of the natural nitrogen cycle and can be transported using existing infrastructure built for the ammonia-based fertiliser industry (estimated at 240 million tonnes annually¹¹⁴).

Ammonia can be synthesised from green hydrogen¹¹⁵ combined with nitrogen from the air forming green ammonia¹¹⁶. It can replace fossil-fuel-based urea production, and because it can also be burned as a fuel, it can provide energy storage for electricity generation and replace diesel and bunker fuel in maritime application.

There are currently three ammonia-powered commercial vessels in operation, with two more under construction¹¹⁷. Maritime use of zero-carbon ammonia as a fuel is still emerging, but full-scale trials show it can reduce CO₂ and other greenhouse gas emissions by up to 90 percent.

However, ammonia as an energy carrier raises specific considerations around safety, transport, and environmental risk, particularly for coastal and port-adjacent communities. This is because of its toxicity and corrosiveness, leading to storage and handling risks. This is in part being addressed through new solid ammonia storage technology¹¹⁸.

Very few ports in the world can refuel ships with ammonia, and most existing port facilities are not set up to safely store or handle it. Because ammonia is toxic and low-density, it needs specialised pipes, double-layered tanks, and well-ventilated storage. Building this infrastructure from scratch is expensive and requires close coordination between ports, regulators, and industry¹¹⁹.

¹¹² [Worley, 2022.](#)

¹¹³ [Hiranga, 2024.](#)

¹¹⁴ [Statista, 2024.](#)

¹¹⁵ Produced from renewable electricity e.g. geothermal, wind, hydro or solar PV.

¹¹⁶ [Thyssenkrupp, n.d.](#)

¹¹⁷ [The Maritime Executive, 2025.](#)

¹¹⁸ [Germany M, 2025.](#)

¹¹⁹ [Nautilus Shipping, 2025.](#)

Sustainable Aviation Fuel

Aviation fuel is the energy source that most directly links the Waikato and New Zealand as a whole to global markets. Because of New Zealand's geography, long-haul aviation is essential for national success, supporting tourism, high-value and perishable exports, and corporate connectivity. Aviation is also one of the most challenging sectors to decarbonise.

Sustainable Aviation Fuel (SAF) is the umbrella term for non-fossil, drop-in fuels that can directly replace Jet A-1¹²⁰. SAF includes bio-SAF made from crops and e-SAF produced from green hydrogen and captured carbon.

Bio-SAF is the least sustainable variant contributing to deforestation and competition with food supplies. e-SAF (also known as e-kerosene or power-to-liquid SAF) is produced from green hydrogen and carbon, and can be sustainably scaled-up to meet the sector's long-term energy requirements¹²¹. To avoid competition with the need to decarbonise other sectors, green hydrogen can come from new renewable generation or off-peak supply, while carbon can be sourced from biomass-based industrial flue gases or direct air capture. Bio-SAF is a mature technology and currently dominates global SAF consumption, while e-SAF remains at pilot and demonstration scale¹²². However, both options are significantly more expensive than conventional Jet A-1: biofuels cost two to five times more, and e-SAF can be up to twelve times the cost. As a result, SAF currently accounts for only around 0.3 percent of global jet fuel use.

The aviation industry is in the very early stages of its decarbonisation journey. It cannot wait for next-generation propulsion systems, such as electric or hydrogen aircraft, to become commercially viable. Instead, the sector has adapted existing financial and fuel-supply systems so SAF can be used immediately as a drop-in fuel that can be blended with Jet A-1 without redesigning aircraft or engines. This includes recognising that SAF is not yet available at all airports through a "book-and-claim" system, which separates the physical fuel from its environmental attributes. This chain-of-custody model allows airlines to purchase the emissions benefits of SAF even if it is not physically available at the airport they operate from¹²³.

Channel Infrastructure and Fortescue Future Industries have announced plans for a 300 MW green hydrogen-to-e-SAF facility at Marsden Point, which could produce up to 60 million litres per year and supply Auckland Airport via the existing aviation fuel pipeline¹²⁴. For e-SAF to meaningfully contribute to the Waikato region's low-emissions transition, appropriate distribution infrastructure will be essential to supply Hamilton Airport. This could involve transporting fuel from out-of-region production hubs (Taranaki or Marsden Point) or developing new e-SAF production capacity within the Waikato. Potential sites include designated renewable-energy hubs such as Huntly, Tokoroa, or Taupō, where suitable conditions for energy-intensive industry already exist.

Recommendations:

- Recognise that e-SAF produced outside the region will require transport corridors and ensure these are identified and provided for through regional spatial planning.
- Create opportunities to produce e-SAF at energy hubs, where appropriate.
- Advocate for a pipeline between Tokoroa renewable energy zone or use rail tanker stock.
- Advocate for a secure supply chain for biomass for e-SAF production centres.
- Advocate for iwi energy projects in the green hydrogen space.
- Recognise the need for water as a raw ingredient in the production of green hydrogen and provide for it in resource management planning documents and water allocation strategies.

¹²⁰ Also known as Aviation Turbine Fuel (ATF) or 'avtur'.

¹²¹ [Port of Rotterdam & Rotterdam The Hague Airport, 2024.](#)

¹²² [International Energy Agency Bioenergy, 2024.](#)

¹²³ [DHL, 2026.](#)

¹²⁴ [Channel Infrastructure NZ, 2023.](#)

10.4 Biomass

Pelleted biomass provides an efficient and consistent energy source across residential, commercial, and industrial applications. With moisture content of only five to ten percent, compared with up to 85 percent for traditional firewood, processed wood pellets deliver consistent, high-temperature combustion suitable for modern heat plants and industrial applications. Advanced forms such as torrefied or steam-expanded pellets can even substitute directly for coal and withstand outdoor storage.

New biorefining technology, powered by renewable geothermal steam, is being demonstrated at Kawerau by Foresta¹²⁵, which plans a modular rollout of up to nine plants nationally, with potential future expansion into the Waikato region. Targeted products include turpentine, rosins and torrefied wood pellets.

Turpentine and rosins can replace petroleum-derived industrial chemicals for products such as adhesives, cleaners, paints, inks and flavouring. Torrefied wood pellets provide a low-emissions alternative to coal, offering higher energy content, the ability to be ground into smaller particles, water-resistance, outdoor storage capability, equivalent energy performance to coal, lower capital requirements for conversion, emissions reductions of up to 95 percent (CO₂-e) per tonne, and higher calorific value¹²⁶.

Trials at Huntly Power Station (one of New Zealand's largest industrial carbon emitters) have proven the viability of using torrefied pellets in place of coal¹²⁷. To support this transition, Genesis Energy aims to secure 300,000 tonnes a year of torrefied biomass by 2028, reducing the station's reliance on coal. In February, Genesis Energy and Foresta signed an agreement to progress negotiations to supply torrefied biomass at Huntly Power Station¹²⁸.

Wood pellets are also being used by Fonterra to provide process heat at its Te Awamutu dairy factory. In 2020, the factory was converted from coal to compressed sawdust pellets through a long-term supply agreement with Nature's Flame in Taupō, which also uses geothermal heat in pellet production. The conversion has delivered a 98.4 percent reduction in greenhouse gas emissions, alongside lower sulphur dioxide emissions, reduced ash toxicity, a four percent efficiency gain, and fewer daily truck movements. The pellets do, however, absorb moisture and therefore require covered storage and careful handling¹²⁹.

¹²⁵ [Foresta, 2026a](#).

¹²⁶ Amount of heat released during combustion.

¹²⁷ [Genesis Energy, 2023](#).

¹²⁸ [Rennie, R., 2025](#).

¹²⁹ [Energy Efficiency & Conservation Authority, 2020](#).

11 How we use energy

Energy demand reflects the essential services society depends on – heat, light, transport and industrial / commercial activity. It is not a demand for energy itself, but for the services energy enables. Understanding how and where these services drive energy use is central to planning an affordable, resilient, and low-emissions system.

In addition to the region's traditional energy-using industries, two emerging sectors have the potential to significantly stimulate regional economic growth and strengthen Waikato's strategic role within the national economy. The first is the production of hydrogen fuels and other manufactured energy carriers, collectively known as Power-to-X (discussed in section 10.3). The second is the rapidly expanding demand for digital infrastructure – cloud computing, data storage, and artificial intelligence, which is driving the growth of large-scale data centres.

11.1 Industrial / commercial process and space heating

The Energy Efficiency Conservation Authority (EECA) has recently published its Waikato Regional Energy Transition Accelerator (RETA) report¹³⁰. The report outlines the steps required to improve energy efficiency and strengthen security of supply – addressing two key elements of the energy trilemma.

The report consolidates information on current fossil fuel use for process heat in the Waikato, alongside electricity network and biomass availability, to:

- Provide process heat users with coordinated, region-specific information to support informed decisions on fuel choice and transition timing.
- Increased confidence among fuel suppliers to invest in enabling infrastructure (including electricity and biomass).
- Identify region-specific issues, opportunities, and recommendations.

The scope of the report is limited to the transition pathways of current energy users and does not assess the long-term viability of those activities (e.g. consolidation or relocation of processing sites).

The report identifies 91 major fossil-fuel process-heat sites across the Waikato, spanning dairy, meat, timber, food and beverage, and commercial sectors such as schools, hospitals and accommodation providers. These sites all operate large (>500 kW) fossil-fuelled process-heat equipment. Thermal electricity generation, such as the Huntly Power Station, is excluded. The Waikato has the highest concentration of fossil-fuel-dependent process-heat sites in the country, highlighting significant opportunities for regional transition. The location and relative scale of these 91 sites are shown in Figure 26.

¹³⁰ [Energy Efficiency & Conservation Authority, 2025.](#)

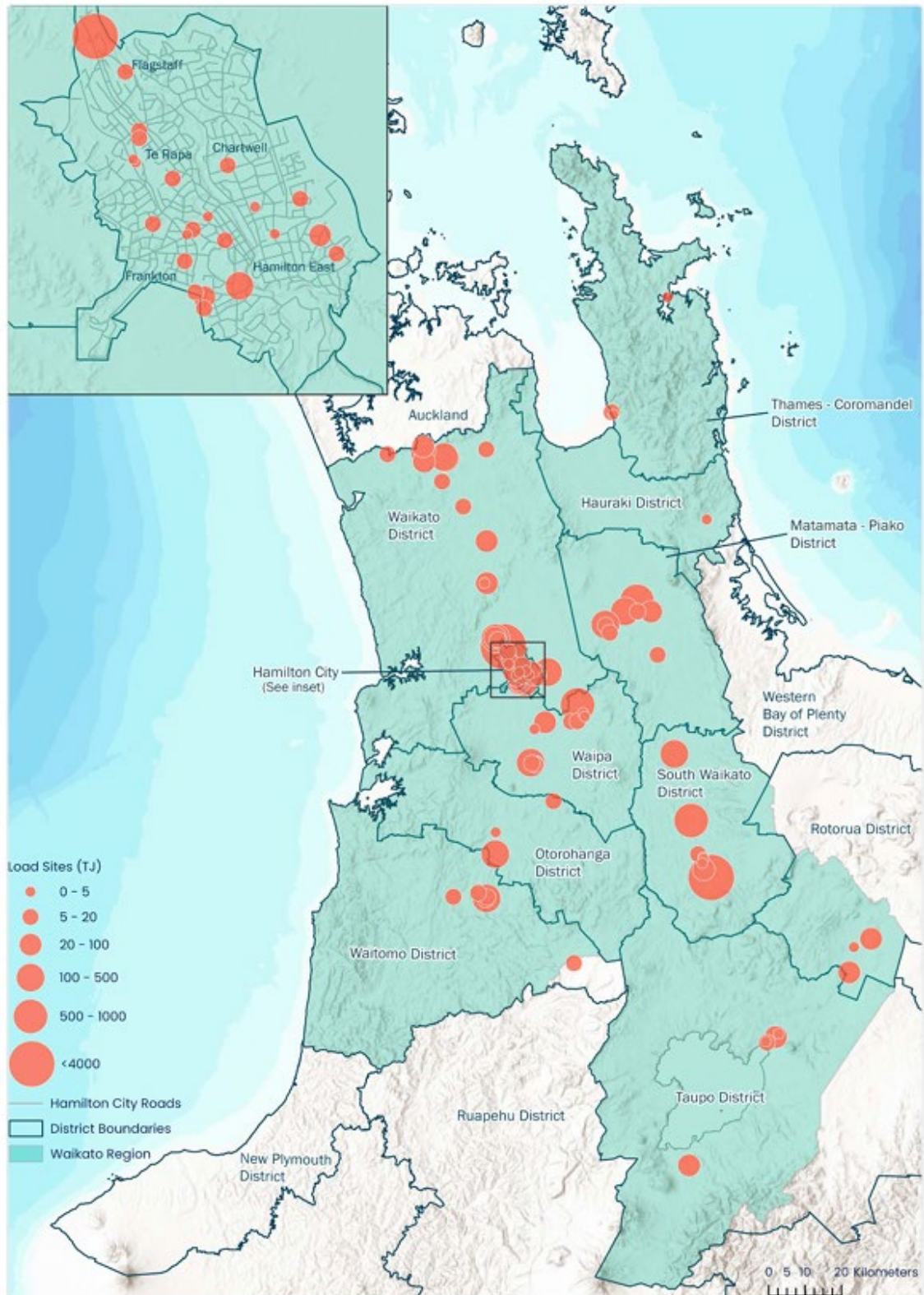


Figure 26: Current process heat demand sites in the Waikato region

In 2022, these sites, collectively consumed 12,204 TJ of process heat energy, predominantly in the form of fossil gas, and produced approximately 730 kt per year of CO₂e emissions (Table 10). The region's export economy is dominated by the dairy sector, making dairy processing sites the single largest transition opportunity.

Table 10: Summary of Waikato RETA sites fossil fuel process heat demands and emissions

Sector	Sites	Thermal capacity (MW)	Fuel consumption (GWh/yr)	Thermal Fuel consumption (TJ/yr)	Thermal emissions (Kt CO ₂ e/yr)
Dairy industry	15	587	1,776	6,393	396
All other industry	47	496	1,516	5,457	315
Commercial	29	95	98	354	19
Total	91	1,178	3,390	12,204	730

In addition to the opportunities, the EECA report identified pathways for existing industries to reduce demand by increasing efficiency and to decrease emissions by switching fuel to renewable sources. In providing pathway options it recognises the integrated national electricity grid (with transition to heat pumps) but with respect to transition to biomass, relies on supply sourced indigenously within the region. This may not always be applicable where it may be economic to source biomass from outside the region.

Recommendations:

- Advocate for financial support to industry to transition from fossil fuels e.g. reinstatement of the GIDI fund.
- Advocate for a secure supply chain for biomass for process heat conversion sites.

11.2 Transport

Reducing transport emissions will be key in transitioning to a low emissions economy. This will consist of a combination of reducing transport demand, switching to renewable fuel sources, and changing the way we travel, including from cars to public transport and active travel, and for freight, from trucks to rail and coastal shipping.

11.2.1 Rail

Rail lines between Auckland, Hamilton and Tauranga, link the import and export ports of the 'golden triangle'¹³¹. The North Island Main Trunk (NIMT) rail line runs 138 km from Auckland (Waitematā Station) to Hamilton (Frankton Junction). The first 52.3 km to Pukekohe is electrified at 25kV AC, as is a short section near Frankton Junction. Beyond Hamilton, the East Coast Main Trunk extends to Tauranga, through the Kaimai tunnel – this section remains unelectrified. The Kaimai tunnel gives rail a significant advantage over road.

This corridor is New Zealand's economic engine, with high freight volumes and passenger flows. Electrifying transport within this corridor is critical to reducing emissions and improving efficiency. Priorities include electrifying rail within this corridor, including the Kaimai Tunnel, supporting mode shift from road to rail and improving resilience for moving biomass and renewable feedstocks.

Beyond the Hamilton–Auckland main trunk and Hamilton – Tauranga sections, electrification should extend to central North Island forest towns and industrial nodes. This would enable efficient, low-emissions transport of forestry residues for bioenergy, support inter-regional supply chains, and strengthen connectivity for emerging energy-intensive industries. It would also contribute to market demands to reduce scope three (supply chain) emissions of export produce.

The current network allows consolidation of dairy exports from Waikato factories (Waitoa, Te Rapa, Lichfield, Hautapu, Te Awamutu), Whareroa (Taranaki region) and Pahiatua (Horizons region). Forestry products can already be brought north from Tokoroa through to Hamilton or to Tauranga. Extension of electrification options to the entire North Island rail network would allow export industries to benefit from a reduction in transport emissions.

¹³¹ [KiwiRail, 2025.](#)

Rail transport produces significantly lower carbon emissions than road transport. Over the past 12 months, the use of rail freight has avoided more than 418,000 heavy truck movements and 50,000 tonnes of carbon dioxide equivalent emissions¹³².

Other benefits of rail include – reduced travel times and congestion (without rail, road networks would be crippled), lower road maintenance (heavy trucks are responsible for most of the damage to New Zealand roads), and improved safety outcomes (avoids road crashes)¹³³.

A recent KiwiRail study¹³⁴ investigated a range of zero/low emissions fuel options to reduce greenhouse gas emissions and therefore also reduce supply chain (Scope 3) emissions associated with export produce. The report concluded, that while a broad range of options were investigated¹³⁵, the most promising option was a combination of Battery Electric and selective extension of overhead line electrification. Electrification can be achieved using new hybrid locomotive technology¹³⁶ as in Figure 27.

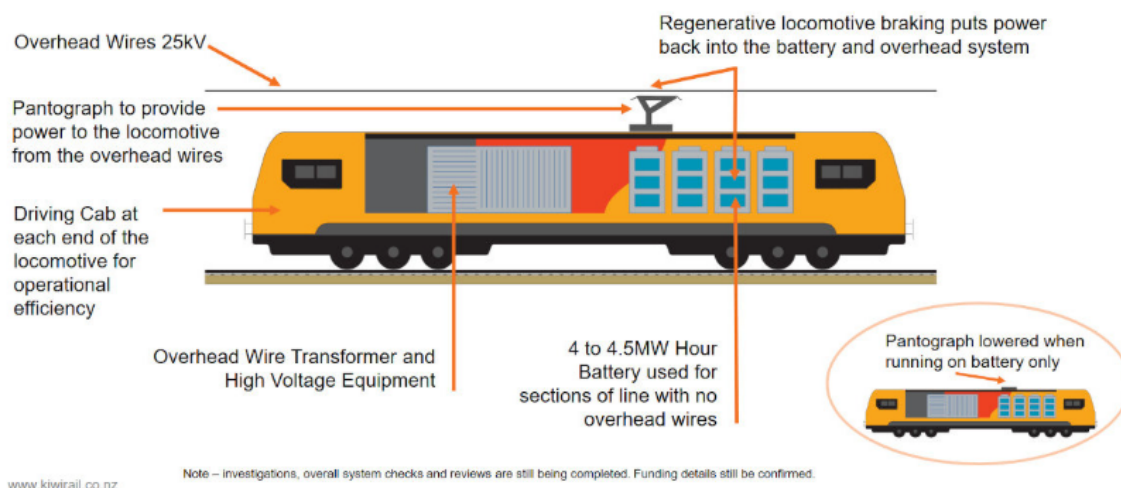


Figure 27: Overhead and battery electric locomotive

Currently, charging economically is the largest uncertainty surrounding the choice of battery-electric locomotives. This is a consequence of the sparse nature of the New Zealand electricity grid transmission and lines distribution network, the high-power demand of fast charging batteries of the size required for locomotives and this high demand being in rural and regional New Zealand. In-motion charging was initially considered, however, for technical and cost reasons would not work. Trickle charging of on-board batteries would be available from sections with overhead wires as would regenerative braking¹³⁷. This means that high voltage fast charging would be needed at terminus locations until full electrification can be achieved. Installing overhead catenary wires is disruptive and costly and may not be appropriate everywhere.

In addition to charging constraints, there are physical track related constraints including two single track sections on the otherwise double tracked Hamilton to Auckland line, across the Ngāruawāhia bridge and the Whangamarino wetland.

The line to from Hamilton to Tauranga and then onto Kawerau is also single track with 11 passing sections. This line includes the Kaimai tunnel which, with a diameter of between six and 6.4 metres, is large enough to be electrified but the disruption would be significant. The tunnel is 8,890m in length and being single track would require the average 30 freight trains movements daily to be redirected onto road.

¹³² KiwiRail pers. comm. June 2026

¹³³ [Ernst & Young, 2024.](#)

¹³⁴ [KiwiRail, 2024b.](#)

¹³⁵ Biofuel, Hydrogen, Electricity, Battery-Electric locomotives, Conventional Overhead Line Electrification, Fuel efficient diesel

¹³⁶ Rushbrook, W., 2025.

¹³⁷ McKeon M., 2025.

This is equivalent to 850 truck and trailer movements per day which would need to use State Highway 29 for the duration of any upgrade conversion. In 2021 the electrification of Hamilton to Mt. Maunganui line was costed at \$426million¹³⁸ but it is unclear if this also includes the cost of road travel.

The Kaimai tunnel currently imposes significant constraint on the potential for future passenger services. The tunnel lacks necessary telecommunication and fire suppression capabilities as may be required to establish a rail safety case. The tunnel currently offers lower emission (than diesel truck and trailer) freight shifting an annual five million tonnes which is the equivalent of removing approximately 300,000 truck and trailer movements from SH29 annually (850/day). The tunnel significantly eases congestion on SH29 and reduces road maintenance costs caused by heavy vehicle wear.

A hybrid network could look like Figure 28 and may be an interim step to full electrification which would allow reciprocal fast intercity rail between Auckland, Hamilton and Tauranga. This would require a new dual track tunnel estimated at \$1billion, which could be met by reprioritising national roading infrastructure priorities.¹³⁹

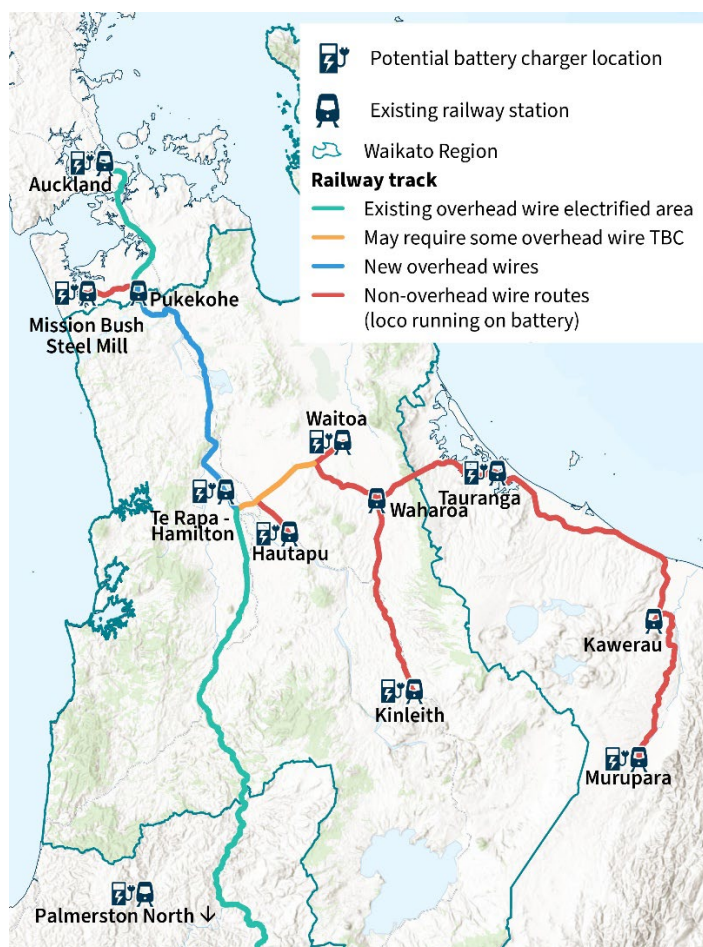


Figure 28: Potential electrification of the golden triangle using battery electric hybrid locomotives¹⁴⁰

Recommendations:

- Use spatial planning to identify:
 - Opportunities to electrify rail corridors linking central Waikato freight hubs (inland ports) at Te Rapa, Titanium Park and Ruakura with wharves in Tauranga and Auckland.
 - Provision for energizing rail overhead wires for charging locomotive battery.
- Double track the entire North Island Main Trunk through the Whangamarino wetland.
- Provide for a new double track tunnel through the Kaimai ranges.
- Advocate for hybrid battery electric locomotives as an interim step and full electrification of the Golden Triangle for both freight and passenger rail.

¹³⁸ [Beca, 2021.](#)

¹³⁹ [Infrastructure News, 2024.](#)

¹⁴⁰ Rushbrook, W., 2025.

- Increase the number of passing loops to enable more frequent rail services.
- Support the expansion of Te Huia to strengthen regional connectivity and reduce reliance on private vehicles.

11.2.2 Road

The technology for switching the road fleet from fossil fuels to low / no carbon emission alternatives is proven and available. As with other sectors, transition is not a technical issue, but one of cost. Even when freight businesses are committed to emissions reductions government support is needed to overcome regulatory and cost barriers.¹⁴¹

The best approach is three pronged:

- Mode shift to rail.
- Leveraging the region's strong renewable electricity generation for light vehicles/last-mile logistics.
- Green hydrogen for heavy/long-haul transport.

Mode shift should be the first option in the transition of the road transport sector. This will become increasingly beneficial as rail freight is electrified. Rail uses approximately one-quarter of the energy of heavy trucking to move the same weight. Even with current fossil fuels, rail freight between logistics hubs has a significant energy and cost and emissions reduction benefit (on average 60 percent fewer emissions) over heavy road transport (Table 11)¹⁴². A single freight train replaces approximately 40 trucks¹⁴³.

Table 11: Greenhouse gas emissions with mode and fuel type¹⁴⁴

Transport Mode	Emissions (gCO ₂ e /tonne-km)
Rail (electric)	7
Rail (diesel)	29
Road (Tractor-trailer / linehaul)	108
Road (straight truck / urban)	400

Neither hydrogen fuels, nor battery electric propulsion will cover all road transport needs. Just as petrol and diesel engines have different advantages and therefore transport applications, hydrogen is better in some uses and battery electric vehicles in others (Table 12). The situation is also complicated in that hydrogen may either be combusted directly with little modification and act as a diesel extender or combined with air in a fuel cell creating electricity. Direct use and combustion of hydrogen may assist the transition by providing a reduction in imported fuel reducing greenhouse gas emissions by between 30 and 50 percent.

Table 12: Performance characteristics of hydrogen compared to diesel in the heavy long haul freight role¹⁴⁵

Characteristic	Fuel Cell Electric (FCEV)	Diesel
Refuelling time	15-20 minutes	~ 15 minutes
Operational Range	400 – 720 km (depending upon model)	600 – 1,000 kms
Payload capacity	High, (hydrogen systems are lighter than batteries)	Industry standard
Tail pipe emissions	Zero	~ 2.68 kg CO ₂ / litre
Annual CO ₂ savings	-300 tonnes / Line haul truck	N/A (Base line)
Fuel efficiency	1kg H ₂ ~ 5 L Diesel	1 l Diesel ~ 0.2 kg H ₂
Road User Charges	Exempt until June 2027	Full Heavy vehicle rate
Current Infrastructure	Te Rapa station (Hamilton) and Halcyon Power at Mokai	Existing network

¹⁴¹ [Ministry of Transport, 2024.](#)

¹⁴² [KiwiRail, 2026.](#)

¹⁴³ [KiwiRail, 2024a.](#)

¹⁴⁴ [Samuelson R & Wang H, 2021.](#)

¹⁴⁵ [Hiringa, 2026.](#)

The use of hydrogen powered trucks for freight that cannot be transported by rail creates resilience to external geopolitical shocks in price and supply and reduces supply chain greenhouse gas emissions for products carried. This security and green premium is countered by the current increased cost of hydrogen fuel. Hydrogen fuel is currently produced from town supply water and network provided grid electricity. Economies of scale could bring down the cost in the future.

For heavy line haul freight applications, green hydrogen allows the benefits of emission reduced transport without the payload restrictions caused by heavy batteries. Essentially, a fuel cell powered vehicle is an electric vehicle with its own onboard power station. Green hydrogen would be suitable for long range freight trucks of 40 tonnes or more, log carriers and dairy tankers.

Light Passenger cars, light commercial vehicles (vans/utes), and urban delivery trucks can transition to battery electric vehicles as they are efficient, have lower cost, and are widely available with good range for city, low noise/emissions.

The government supports the use of renewable energy for road transportation including allocating financial resources to provide an additional 10,000 EV charging stations.

Electrification of passenger bus services is also identified in the Regional Public Transport Plan (RPTP) for emissions reduction with only zero-emission public transport buses to be purchased from 2025. This is in line with the government's target of decarbonisation of the public transport bus fleet by 2035¹⁴⁶.

Recommendations:

- Advocate for shifting more freight from road to rail.
- Work with regional partners to identify sites to deploy high-capacity (>300kW) charging hubs to ensure regional coverage, reduce range anxiety and identify these sites in the proposed spatial plan.
- Partner with local freight logistics companies to trial fuel cell electric trucks.
- Use spatial planning to identify charging/refuelling stations to avoid congestion points.
- Recognise the need for EV charging infrastructure in rural townships.
- Utilize smart charging technology to ensure EV charging coincides with high solar/wind generation and low network demand, partnering with local lines companies (WEL Networks, Waipa Networks).
- Continue with and accelerate the transition of Waikato Regional Council's bus fleet to zero-emission (as per the RPTP 2022-2032), focused on high-usage routes in Hamilton.
- Advocate for and support logistics companies installing rapid chargers at Waikato-based depots, enabling vehicles to charge during loading/unloading.
- Accelerate the rollout of hydrogen refuelling stations along the Waikato freight routes including State Highways 1, 2 and 3.
- Produce "green hydrogen" onsite at refuelling stations using electrolyzers powered either by Waikato's renewable electricity (hydro/geothermal) or off-peak wind and solar.
- Support the adoption of "dual fuel" (hydrogen and diesel) engines to transition existing diesel trucks to lower emissions immediately while new FCEV trucks become more accessible.
- Advocate for funding for truck operators to switch to Fuel Cell Electric Vehicles (FCEVs) that can travel 500km+ and refuel in 15–20 minutes.
- Develop and support investment in accessible, reliable public and active transport networks, especially between and within major centres. Consider opportunities for partnerships with entities that can deploy relevant infrastructure at lower cost and risk.
- Use existing communication channels with agencies, businesses and communities to grow active and public transport.
- Use existing communication channels with agencies, businesses and communities to promote, encourage and normalise the uptake of low-emissions vehicles.
 - Support reinstatement of subsidies for EVs.
 - Helping commercial and private vehicle owners to understand the total cost of ownership of low emissions vehicles and the environmental benefits.

¹⁴⁶ [Ministry of Transport, 2026.](#)

- Approaching large fleet owners to better understand the challenges and opportunities they face in transitioning to low emissions vehicles.
- Continue to transition WRC's fleet to low emissions fuels and support opportunities to assist others with funding challenges. For example, the use of a ratepayer assistance scheme.
- Create a supportive environment for charge point operators (CPOs) considering investing in the region. This could include:
 - Enabling access to suitable tracts of land.
 - Expediting consenting processes.
 - Identifying high-priority sites and corridors for EV charging based on traffic flows, regional growth expectations and engagement with electricity network owners on capacity constraints. Also recognising that EV charging infrastructure is accessible in rural townships.
 - Funding support for CPOs to the extent practical.
- Support road network initiatives, such as:
 - Working with Road Controlling Authorities to set speed limits that promote safe travel and lower emissions motoring.
 - Considering the opportunities for zero-emissions traffic areas in the region. This would only be practical in more dense urban areas where priority could also be given to pedestrians, public transport and active transport.
 - Engaging with forthcoming opportunities to contribute to the development of congestion charging in the region to consider how lower emissions vehicles and transport modes could be incentivised.¹⁴⁷

11.2.3 Maritime

While the Waikato region does not have any wharves for heavy international shipping, we have the ability to develop fuels for shipping application.

Apart from the offshore ironsand terminal at Taharoa, seven nautical miles southwest of Kawhia Harbour, there are no major coastal ports in the region. Maritime activities focus on the estimated 160,000 recreational boats (marine and lakes), charter vessels and ferries. Powered marine craft typically use petrol (recreational) and diesel, (commercial fishing, ferries and charter boats). Historical estimates of marine fuel use have been combined with vehicle transport estimates as most of the recreational fleet are trailer boats and there is no coastal port.

The total annual tonnage of commercial marine diesel used in the Waikato region is unknown, however, data suggests it is a significant component of the region's transport emissions and maritime operations, particularly regarding mussel farming and coastal freight¹⁴⁸.

The region does have the potential to transition commercial maritime activities to low and no carbon fuels in the future and potentially contribute to the manufacture of substitutes for heavy fuel, oil used in coastal shipping. See section 10.3 on Energy Storage (Ammonia).

Although the maritime transport of ammonia is a mature technology, the greatest obstacle to using ammonia as a marine fuel is its high toxicity and corrosive characteristics. Overcoming these would require specialised bunkering and presents a danger from leaks in the confined spaces of a ship's engine room. These challenges and the issue of transport to point of use would need to be addressed.

Bunkering of ammonia marine fuel would occur at the wharves, typically Auckland and Tauranga, requiring transport from point of manufacture (either within the region at identified renewable energy hubs for green ammonia) or out of region. The production of green ammonia requires electricity and water and nitrogen from the air. This may be best suited to the Taranaki region where offshore wind speeds are better than Waikato's west coast, but the electricity grid is not able to transmit the multiple gigawatts available without considerable investment.

¹⁴⁷ E.g., revenue from congestion charging could be recycled towards investment in active transport, public transport and/or other low emissions transportation initiatives.

¹⁴⁸ [Irvine, R., Robinson, M., & Carboni, A., 2007.](#)

Transport of green ammonia from or through the region to point of use ports may need to be by rail or pipeline or coastal shipping.

The most promising transition of marine fuel may come from electrifying small to medium scale commuter ferries and aquaculture service vessels. In the case of the latter, the technology is proven; Norwegian salmon farms are reducing emissions by cutting fossil fuel consumption by up to 80 percent.¹⁴⁹ In the case of ferries, a local business (Vessev¹⁵⁰) is building on America's Cup foiling technology and is trialling a nine-metre, ten passenger, foiling catamaran on the Hauraki Gulf¹⁵¹. Vessev's current flagship VS-9 "Kermadec" cruises at 25 knots or 45km/hour, with a range of 90 kilometres carrying ten passengers (Figure 29).



Figure 29: Vessev's current flagship VS-9 "Kermadec"

Recommendations:

- Use spatial planning to identify:
 - Wharves and charging infrastructure requirements for electric commuter ferries linking Coromandel coastal towns with wider Hauraki Gulf including Auckland city.
 - A maritime hub in Thames/Kopu.
 - Wharves and charging infrastructure required for electrification of service vessels for offshore wind projects.
 - Locations for commuter ferry wharves that provide connections between the Waikato, Waiheke Island and the wider Auckland region.
- Commission work to investigate the transport of green ammonia.
- Determine estimate for fuel usage from commercial and recreational boating.
- Explore the economic development opportunity to build on existing Hamilton trailer boat heritage and extend to attracting export manufacture of energy efficient vessels in identified energy hubs.

11.2.4 Air

The New Zealand government recognises aviation as a 'hard to abate' sector¹⁵². It has developed an Aviation Action Plan with the ambition of reducing use of fossil fuels and transitioning to clean energy, in line with New Zealand's target of net zero carbon emissions by 2050.

Around 45 countries, including all our top ten trading partners, are currently implementing or are considering sustainable aviation fuel (SAF) policies including minimum SAF blending or usage mandates. There is no equivalent policy in the New Zealand Aviation Action Plan. This is considered a problem by the sector¹⁵³ as using SAF and more efficient aircraft can reduce the industry's carbon footprint for international or long-haul flights.

Hamilton International Airport has the lowest frequency of flights based upon population as there are no services to and from Auckland, which is serviced by road.

¹⁴⁹ [ABB & Bellona, 2019.](#)

¹⁵⁰ [Vessev, 2025.](#)

¹⁵¹ [NBR, 2026.](#)

¹⁵² [Interim Aviation Council, 2025.](#)

¹⁵³ [BusinessDesk, n.d.](#)

With a historic baseline of 400,000 passengers through the airport annually since 2005, the airport has undergone an increase of 71,000 in the second half of 2025. Most of this is due to trans-Tasman flights starting - 55,000 from Jetstar flight to Gold Coast and Sydney – and the rest from domestic travel. This trend is expected to continue with associated increases in fuel requirements over the next five to ten years with the Titanium Park industrial area expansion and the potential for increasing international flights particularly for high value exports.

There is no one new or emerging technology best suited for transitioning the aviation sector as the efficient options depend upon the usage. There is only one option “drop-in SAF” that can be used on existing aircraft design with in-wing fuel tanks. All other options require changes to the structure of the aircraft. This is because although hydrogen is light, it is bulky and even in liquid form requires four times the storage volume of Jet A-1. This means hydrogen-powered aircraft (especially narrowbodies) will likely need longer fuselages or blended wing bodies to house tanks without sacrificing passenger space.

SAF was identified as a significant requirement and an opportunity by Air New Zealand at the 2025 Climate Change and Business Conference. SAF is almost chemically identical to conventional jet fuel and has lower carbon emissions over its lifecycle. Its adoption, however, is constrained by high costs (two to five times that of fossil jet fuel) and the need for dedicated refuelling infrastructure at all airports. Currently, SAF is not economically viable, nevertheless, SAF represents the future of aviation and can be refined within the region and transported via existing rail to Auckland International Airport and with a siding of a few kilometres to Hamilton Airport which would also link Titanium Park with Ruakura and the remainder of the rail network. Accelerating the use of e-SAF at Hamilton Airport will require a co-ordinated approach across infrastructure, policy and industry partnerships¹⁵⁴.

New technologies such as electric aircraft may have potential to reduce operating costs, thereby improving the economic viability of some regional routes. Air New Zealand is positioning itself as a world leader in adopting next-generation propulsion, specifically for its regional network and is already trialling the feasibility of using electric propulsion for the limited freight role. It is currently conducting a technical demonstration programme with the BETA ALIA CX300, an all-electric aircraft (Figure 30).



Figure 30: Air NZ Beta Alia CX300 at Hamilton International Airport¹⁵⁵

The sector has the technology to significantly reduce greenhouse gas emissions now using SAF, however this is financially prohibitive and the quantities are not available. Billie More, New Zealand Airports CEO stated that “Air connectivity will increasingly depend on the airlines ability to access SAF”¹⁵⁶. Given the present (limited) and anticipated (expanded) role of aviation in the region, a future combination of battery charging, hydrogen fuelling and SAF will be required.

¹⁵⁴ [NZ Airports Association, 2026.](#)

¹⁵⁵ [Manuel, P., 2025.](#)

¹⁵⁶ [BusinessDesk, n.d.](#)

The situation with hydrogen is more challenging meaning that all destinations will need to be capable of hydrogen refuelling at the same time. This will require a co-ordinated national air transport strategy.

Table 13 identifies the propulsion suitability for different aircraft size and use.

Table 13: Propulsion suitability for different aircraft size and use

Propulsion type / fuel	Aircraft size and capability	Typical use case	Range Capability
Battery electric	Small (1-19 passengers)	Air taxis, flight training, urban hopping (eVTOL)	<200 km
Hydrogen Fuel cell	Regional (20-80 passengers)	Short regional hops (e.g., Dash 8 or ATR-72 class).	Up to 1,000 km
Hydrogen combustion	Narrowbody (100 – 200 passengers)	Major domestic and Tasman routes.	~3,500km
Hybrid electric	Regional to narrow body (50 – 180 passengers)	High-frequency short-haul commercial routes.	Short to medium
Bio SAF and e SAF	Widebody (250–500+ passengers)	Long-haul international flights	Unlimited (Global)

Recommendations:

- Advocate for the use of SAF in aviation to accelerate / complement sector export industry targets.
- Use spatial planning to identify green hydrogen production sites near Hamilton International Airport to power hydrogen fuelled future medium range aircraft.
- Support industry leaders and advocate to central government for a National SAF mandate to provide SAF at New Zealand airports
- Advocate for the extension of electrified rail network to allow e-SAF movement to Hamilton International Airport.

11.2.5 Ground effect marine

Ground effect marine is a type of craft that operates a few meters off the water's surface and couples the high speed of an airplane with the low operating cost of a boat. The concept of ground effect maritime transport is not new and has been developed over the last 80 years, however a resurgence has occurred driven primarily by new electric propulsion technology, ability to actively control hydrofoils allowing the hull to clear the water in a wider range of sea states, and military application¹⁵⁷.

The aerodynamic advantage of the 'ground effect' includes significant operational efficiencies, increased load capability, and greater range and speed. When the hull is out of the water, drag drops by an order of magnitude. Ground effect flight is approximately 30–50 percent more efficient than conventional flight, and approximately 8–15 times more efficient than high-speed hull displacement.

Ocean Flyer¹⁵⁸ is a New Zealand company that plan to operate high-speed seaglidors in the Hauraki Gulf starting mid-2026. It is starting with an initial five craft building up to a fleet of 25 with the intent of providing fast cost-effective passenger and freight services to coastal regions, such as routes between Whangarei, Auckland and Coromandel.

The proposed craft Viceroy Seaglider¹⁵⁹ is 100% electric, seats 12 passengers or 1.6 tonnes of freight over a range of 300km on a single charge at a cruise of 300km/hour (Figure 31). Fast charging facilities will be required at intended terminals and docking facilities.

¹⁵⁷ [Finnerty R, 2023.](#)

¹⁵⁸ [Ocean Flyer, 2026.](#)

¹⁵⁹ [Regent, 2026.](#)



Figure 31: Impression of Ocean Flyer Regent Seaglider on Hauraki Gulf

Recommendation: use spatial planning to identify passenger and freight docking, charging facilities and routes for ground effect passage between Coromandel townships and Auckland region.

11.3 New industries: data centres

Digital services are integral to a modern economy and to everyday life. Data centres are locations for storing and processing data and are becoming core infrastructure for the digital economy. The speed of service provision, or the lag time between a data request and its supply, is known as data latency. Low latency is important for on-the-move connectivity, whether for human communication or machine-control commands, and is achieved by siting data centres close to business need. The difference between traditional and modern data centres is shown in Table 14.

Table 14: Comparison of traditional versus modern concentrated data centres

Feature	Traditional data centre	Hyperscale data centre
Scale	100's of servers	100,000s to millions
Primary user	Single company (internal)	Millions of external customers
Efficiency (power usage effectiveness)	Higher power usage effectiveness (PUE) (less efficient ~1.6–2.0)	Lower PUE (more efficient ~1.1–1.2)
Energy sourcing	Local grid (no control over supply)	Aggressive use of Renewable Power Purchase Agreements

Data centres are morphing into the engines of the digital economy, driven by the extra computing power required by artificial intelligence and the need for real-time data processing. Examples include autonomous vehicles and electricity grid management that must cope with matching not only variable demand but also variable supply profiles from increased renewable generation.

All data centres share three core infrastructure requirements:

- **Information and communication technology:** racks of computers, servers, routers, switches and other technology necessary to store, retrieve, process and dispatch services quickly, often in near real time. New Zealand is connected to the rest of the world by five international submarine data cables, with a sixth under construction. All connect to the United States west coast¹⁶⁰. A further six landing sites are under consideration (Table 15).
- **Cooling systems:** the power requirements of modern processing chips create significant heat which, if not addressed, could push computer systems beyond their operating temperature range. While there are no aggregated cooling data for local systems, many data centres cool the air surrounding the servers and, with current technology, can use up to 300,000 m³/year/MW. This would tend to direct new data centres into those parts of the region with allocatable water. Water requirements and cooler temperatures make Southland an ideal location for hyperscale data centres.

¹⁶⁰ [TeleGeography, 2026](#).

- **Power supply:** access to reliable, uninterrupted electricity supplies, typically provided by a combination of grid input and local back-up generation and battery storage.

Table 15: New Zealand's current and proposed data connections

Network	1st NZ landing
Current	
Southern Cross Cable Network to Australia (NSW), Fiji and United States (Hawaii and San Francisco) (2 cables)	Whenuapai and Takapuna
Southern Cross NEXT to Australia (NSW), Fiji, Kiribati, Tokelau and United States (Los Angeles)	Takapuna
Hawaiki Trans-Pacific Cable to Australia (Sydney), Pago Pago, Tonga, and United States (Hawaii and Oregon)	Mangawai Heads
Tasman Global Access to Australia (Narrabeen)	Raglan
Under construction	
Honomoana (early 2026) to Australia (Melbourne and Sydney), Tahiti, United States (San Diego)	Silverdale / Orewa
Tasman Ring Network (2027) to Australia (Melbourne and Sydney)	Auckland, New Plymouth, Greymouth and Invercargill.
Under consideration	
Calikiwi (Energy Estates Digital) to United States (Silicon Valley and Hawaii), Fiji.	Mangawai Heads, Whakatane, Napier, Timaru and Invercargill.

Current deployed electrical capacity of New Zealand data centres is 104MW, which is the maximum installed draw, while actual electrical consumption is determined by the amount of services provided rather than the installed capacity alone. Future anticipated requirements are for this to triple to 315MW by 2030¹⁶¹, however this may be an underestimate if economic growth is stronger than expected or if data processing becomes an export opportunity. Each data centre's actual energy consumption is related to the customers' use of computing equipment.

Creation of data centres close to the point of data use is increasingly becoming an important factor into the future. This addresses data latency issues critical for real-time operations, reduces risk by improving resilience to natural hazards, accidental damage and geopolitically motivated actions, and increasingly addresses Indigenous data sovereignty concerns¹⁶².

Data sovereignty is not just a legal or technical issue; it is also culturally significant. For Māori, data is not just a commodity but a taonga, and data sovereignty is an emerging priority. Investors and operators must engage meaningfully with iwi and hapū to ensure that data infrastructure development respects Indigenous rights and aspirations. This includes co-designing governance models and ensuring Māori benefit from digital infrastructure development.

There are energy and therefore emissions-reduction efficiencies as traditional in-house server rooms shift their digital activities to the cloud. A hyperscale data centre has all the benefits of scale but also concentrates the risks, which for New Zealand has mixed outcomes. On the one hand, being a politically stable island archipelago away from conflict zones gives New Zealand clear strategic and geopolitical advantages¹⁶³. This is enhanced by abundant renewable energy required to power new high-performance chips and to cool them (Figure 32). The downside is that, as a nation, there is varying regional exposure to natural hazard risks. For this reason, large data centres are not built on flood plains or across fault lines.

To take advantage of the nationally low geopolitical risks and the regionally low seismic risk of the Waikato, and the Hamilton basin in particular, data (both a feedstock and a product) must be able to flow freely within the region, between regions, and internationally.

¹⁶¹ [NZTech, 2025](#).

¹⁶² [MinterEllisonRuddWatts, 2025](#).

¹⁶³ [Newton, K., Hobbs, R., McQueen, M. & Nicholson, B., 2026a](#).

For this to occur, secure data connections are the final prerequisite for the creation of new industries for and out of the region.



Figure 32: Racks of experimental servers, set up to determine upper operating temperature limits. HP Labs Palo Alto.

There is an increasing demand for low-carbon data driven by three distinct categories:

1. **Corporate environmental, social and governance commitments:** major hyperscale technology companies, including Microsoft, Amazon, Google and Meta, have set ambitious net-zero targets.
2. **Business-to-business (B2B) corporate demand:** for many medium to large businesses, digital infrastructure is in the top three carbon-emission sources that they are increasingly required to report.
3. **Individual end-consumer demand (social pressure):** increasing awareness among younger demographics, who prefer social media brands with sustainable practices, in turn forces consumer-facing technology companies to demand low-carbon data solutions to protect their brand equity.

There are already 56 data centres in New Zealand, with nearly half of these in Auckland and a further 20 planned nationally. Four are currently in Hamilton¹⁶⁴, alongside plans for wider facilities that build upon the region's natural attributes, clean energy and emerging data advantages.

Spark and the University of Waikato, the institution that brought the first direct internet connection to New Zealand in 1989¹⁶⁵, have an agreement to manage the University campus data centre as part of Spark's strategy to build data centre capacity and enhance connectivity and resilience in the region. Spark's university location is an edge centre, bringing data storage closer to end users and responding to the growing demands of Hamilton businesses¹⁶⁶.

The Datacom Kapua Centre in Te Rapa is one of the region's largest facilities, with capacity to expand to over 1,500 racks requiring 14MW of power.

¹⁶⁴ [NZTech, 2025.](#)

¹⁶⁵ [Houlker J, 2011.](#)

¹⁶⁶ [Spark, 2024.](#)

11.3.1 What a responsible and sustainable data centre should look like

New Zealand and by inference, the Waikato region have the rare opportunity to build a substantial and sustainable new industry¹⁶⁷. Any future data centres should be designed and governed against an integrated performance framework, rather than a single headline metric. The 2025 United Nations Environment Programme (UNEP) Sustainable Procurement Guidelines identify a broad technical set of criteria spanning:

- PUE
- Water usage effectiveness (WUE)
- Carbon usage effectiveness (CUE)
- Renewable energy factor
- Cooling efficiency ratio
- Refrigerants
- IT equipment utilisation
- Energy reuse
- Lighting efficiency
- Server efficiency
- Serviceability
- Waste management¹⁶⁸

This is important because a facility can improve one metric while worsening another. NEXTDC's FY25 Environmental, Social and Governance Report is useful because it shows how a mature operator reports multiple indicators together, including a portfolio PUE of 1.44, WUE of 2.25 and CUE of 1.04, rather than presenting energy efficiency in isolation¹⁶⁹.

Energy and carbon performance should be treated as a system-design issue from the start, not simply as an operational afterthought. The World Bank and International Telecommunication Union (ITU) note that data centres require steady 24/7 power and that shifting wholly or partially to renewable energy is the most effective way to reduce climate impact, although matching round-the-clock demand with variable renewable generation can be challenging.

A best-practice facility therefore pairs highly efficient electrical architecture with a credible low-carbon electricity pathway, such as long-term renewable procurement, on-site generation where feasible, and active energy optimisation. Good design should not only ask whether enough grid capacity exists, but also whether the proposed load can demonstrate a transparent decarbonisation pathway and ongoing reporting against recognised metrics¹⁷⁰.

Cooling is now one of the defining sustainability issues for modern data centres because AI and high-performance computing are sharply increasing rack densities and heat loads and the industry is moving towards direct liquid-to-chip cooling in a significant shift away from traditional air-based cooling. This is material because more targeted cooling can reduce reliance on whole-room cooling systems and lower dependence on refrigerants.

For future Waikato projects, this points toward designs that prioritise liquid cooling readiness, hot- and cold-aisle management, continuous environmental sensing, and a willingness to operate at validated higher temperature envelopes rather than defaulting to over-cooling¹⁷¹.

Water stewardship needs to be considered alongside cooling design, particularly in regions where growth in digital infrastructure could compete with other water users.

¹⁶⁷ [Newton, K., Hobbs, R., McQueen, M. & Nicholson, B., 2026b.](#)

¹⁶⁸ [UN Environment Programme, 2025.](#)

¹⁶⁹ [NEXTDC, 2025.](#)

¹⁷⁰ [World Bank Group, 2023.](#)

¹⁷¹ [Infocom Media Development Authority, 2026.](#)

UNEP¹⁷² now treats WUE as a core procurement and assessment criterion, rather than a secondary environmental disclosure, and the World Bank/ITU guide notes that cooling strategies should be adapted to local climatic conditions and water availability¹⁷³.

A sustainable data centre should clearly demonstrate expected water use, why the proposed cooling approach suits the site, what monitoring will be installed, how leaks and drift losses will be controlled, and what contingency measures will apply during drought, water restrictions or other supply constraints. Water should be considered early in project planning and assessment – proposals should disclose cooling technology, projected water intensity, source reliability and alternative design pathways that reduce dependence on potable water.

Materials and embodied carbon also need early attention. Sustainability assessments should look beyond operational performance to include site selection, modular expansion, sustainable materials and reuse of existing assets. Modular design can support future growth without creating idle capacity, while sustainable, recycled or reused materials can reduce a data centre's greenhouse-gas footprint. Responsible projects should explain staging, structural and fit-out material choices, whether low-carbon concrete or steel options have been assessed, and how the proposal avoids building unused white space too early.

A mature sustainable data centre must also perform well at the IT layer, because efficient buildings can still host inefficient digital infrastructure. Assessment criteria should include IT equipment utilisation, active-state server efficiency, idle-state efficiency, power management, serviceability and waste management. Key strategies include virtualisation, real-time performance monitoring, efficient server management and timely upgrades, all of which help align digital infrastructure performance with wider sustainability objectives.

European examples¹⁷⁴ show what this looks like in practice:

- Combined free cooling with highly efficient airflow management
- LED lighting with motion detection
- Heat recovery
- Even AI-adjusted air-handler fan speeds to improve performance

The practical implication for the region is that the 'best outcome' is not just an efficient shell, but a facility with transparent operational telemetry, strong utilisation management, and the ability to demonstrate that low-value idle loads are being designed out of the system

Circularity should be built into both construction and operations. The World Bank/ITU guide explicitly identifies e-waste management as one of the six critical dimensions of a green data centre and argues for a lifecycle approach spanning design, manufacturing, procurement, operations, reuse, recycling and final disposal.

UNEP's guidance also includes serviceability and waste management as core technical criteria, signalling that equipment should be maintainable, recoverable and replaceable without needless waste. This is particularly relevant to public-sector influence, because councils can use procurement and consenting expectations to normalise requirements around decommissioning plans, packaging reduction, reuse pathways, and disclosure of waste diversion performance

Resilience, governance and social licence are also part of what sustainable 'good' looks like. The World Bank/ITU guide treats climate resilience as the first of its six dimensions and states that risk assessments should guide site selection, redundancy planning, weather-resilient design, and back-up and recovery plans. A sustainable data centre is therefore not merely efficient; it is also demonstrably resilient, auditable, secure and capable of continuing service during disruption.

In the Waikato setting, this aligns closely with natural-hazard screening, resilience of electricity and fibre connections, and meaningful engagement with iwi and hapū where developments intersect with issues of land, water and data sovereignty.

¹⁷² [UN Environment Programme, 2025.](#)

¹⁷³ [World Bank Group, 2023.](#)

¹⁷⁴ [European Commission – Joint Research Centre, 2023.](#)

11.3.2 Current New Zealand consenting position for data centres

At present, data centres are generally authorised through generic planning and building pathways rather than a dedicated national data-centre-specific consenting regime. Proposals requiring resource consent must be assessed against relevant district and regional plans, supported by an assessment of environmental effects, any required specialist reports, and early engagement with council, tangata whenua¹⁷⁵ and affected parties, while building consent sits alongside this as a separate process under building legislation. In practice, data centre proposals are usually assessed through the same land-use, water, discharge and building pathways as other large industrial or infrastructure developments, even though they can involve unusually high demands for electricity, cooling, resilience and connectivity.

11.3.3 International best practice for consenting and implementation

Internationally, best practice is moving beyond a simple ‘is this activity permitted here?’ test and toward an explicitly managed framework for sustainable digital infrastructure. We can emulate this in the Waikato and leap-frog learnings from other jurisdictions. The international lesson is that best practice consenting does not stop at zoning and resource effects; it sets clear performance expectations up front, requires transparent environmental reporting, links approvals to infrastructure readiness, and uses procurement, standards and certification to lock in better long-term outcomes.

11.3.4 Additional implementation considerations for the Waikato region

International best practice can be imported into the regional context in the design phase of new projects by requiring a sustainability and resilience package at concept stage rather than relying on general statements of intent. At a minimum, the package would include disclosure of:

- Forecast PUE, WUE and carbon pathway
- Cooling methodology and water source
- Site hazard and resilience assessment
- Evidence of renewable electricity strategy
- Staged delivery and embodied-carbon approach
- Circularity and e-waste plans
- Commitment to monitored operational reporting once the facility is live

This would move the region closer to the more mature international direction now emerging, while still working within New Zealand’s current consent framework.

Recommendations:

- Understand the data requirements of Waikato data centres and ensure that the regional spatial plan identifies areas of low natural hazard risk.
- Ensure the regional spatial plan recognises the need for secure data cables and makes provision for these.

12 How energy is managed and distributed

Managing electricity demand is becoming increasingly important as New Zealand transitions to a low-emissions economy. Electrification of transport, industry, buildings and heat is placing new pressure on a system already shaped by seasonal hydro variability and rising peak loads. Current modelling indicates that total electricity demand is expected to grow by 35 to 82 percent by 2050¹⁷⁶. Ensuring that electricity remains affordable, reliable and sustainable will depend not only on building new renewable generation, but also on how effectively demand is managed, through smarter pricing, flexible technologies, energy efficiency, and distributed generation.

¹⁷⁵ [Ministry for the Environment, 2021.](#)

¹⁷⁶ [Ministry of Business, Innovation & Employment, 2024.](#)

12.1 Electricity

12.1.1 Transmission and distribution

New Zealand's electricity sector is a critical part of the country's energy system, supplying homes, businesses, and industry through a nationally coordinated network of generation, transmission, distribution, and retail services. It is a vital energy carrier that must be generated before it can be transmitted or stored. The sector is structured by the separation of these functions (Figure 33):

- **Generation:** generation companies generate electricity at power stations and inject electricity into transmission lines (grid-connected generation) or distribution lines (embedded generation). Most electricity is generated by four companies – Contact Energy, Genesis Energy, Meridian Energy and Mercury Energy.
- **Transmission:** the national grid transports electricity from power stations to large industrial users and local substations. The grid is owned, operated and maintained by Transpower, a state-owned enterprise. Transpower acts as a system operator, managing the demand and supply in the wholesale market, ensuring that supply meets demand. The existing transmission network in the Waikato is shown in Figure 34.
- **Distribution:** lines companies (distribution companies) provide and maintain power lines that carry electricity via power poles and lines from the national grid to homes and businesses. Lines companies ensure their customers receive electricity at a particular level of quality and reliability. There are six electricity distributors in the region – Counties Energy, PowerCo, The Lines Company, Unison Networks Ltd, WEL Networks and Waipa Networks Ltd.
- **Retail:** retail companies buy electricity from generators on the wholesale market and on-sell that electricity to businesses and households. Sales are measured by installation control points (ICPs) through which electricity travels to the consumer.

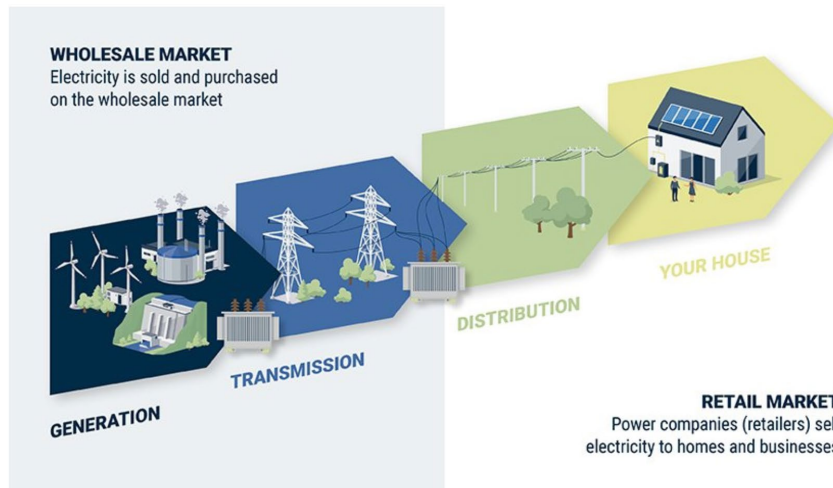


Figure 33: overview of the electricity supply chain in New Zealand¹⁷⁷

The current networks are configured to distribute electric power from the national grid from substations to homes, schools and businesses. Transformers at the substation change the electricity current and voltage to make it suitable for local wires and consumption. The electricity enters homes through meters, where it is measured, and into power outlets, where it is ready to be used. The greatest advantage of a grid is that everything is connected. It is also its greatest weakness. The ability for local areas to be self sufficient in their energy needs and have the ability to export and import additional amounts when the need arises or the economics are favourable also imparts energy resilience in times of emergency.

¹⁷⁷ [Electricity Authority, n.d.b](#)

The system was originally designed to separate these functions, encourage competition within generation and retail, and protect consumers from the monopoly parts of transmission and distribution. The intent was for energy prices to reflect the real cost of producing electricity and building infrastructure. However, most generation and retail businesses are now owned by the same companies. This allows gentailers to balance their financial performance across both sides of the business – using retail profits to offset low wholesale returns, and vice versa. Critics often point to this vertical integration as a weakness of the current system.

Electricity is a ‘just-in-time’ energy carrier, meaning it must be consumed as it is generated or generated when required. This creates challenges for grid and network operators, particularly as reliance on renewable energy grows. Renewable supply, such as wind and solar, is inherently variable, while electricity demand fluctuates daily, weekly, and seasonally. The transmission system must balance these variations and maintain sufficient capacity to meet peak demand. One solution is to store surplus renewable electricity for later use through battery systems, improving flexibility and resilience.

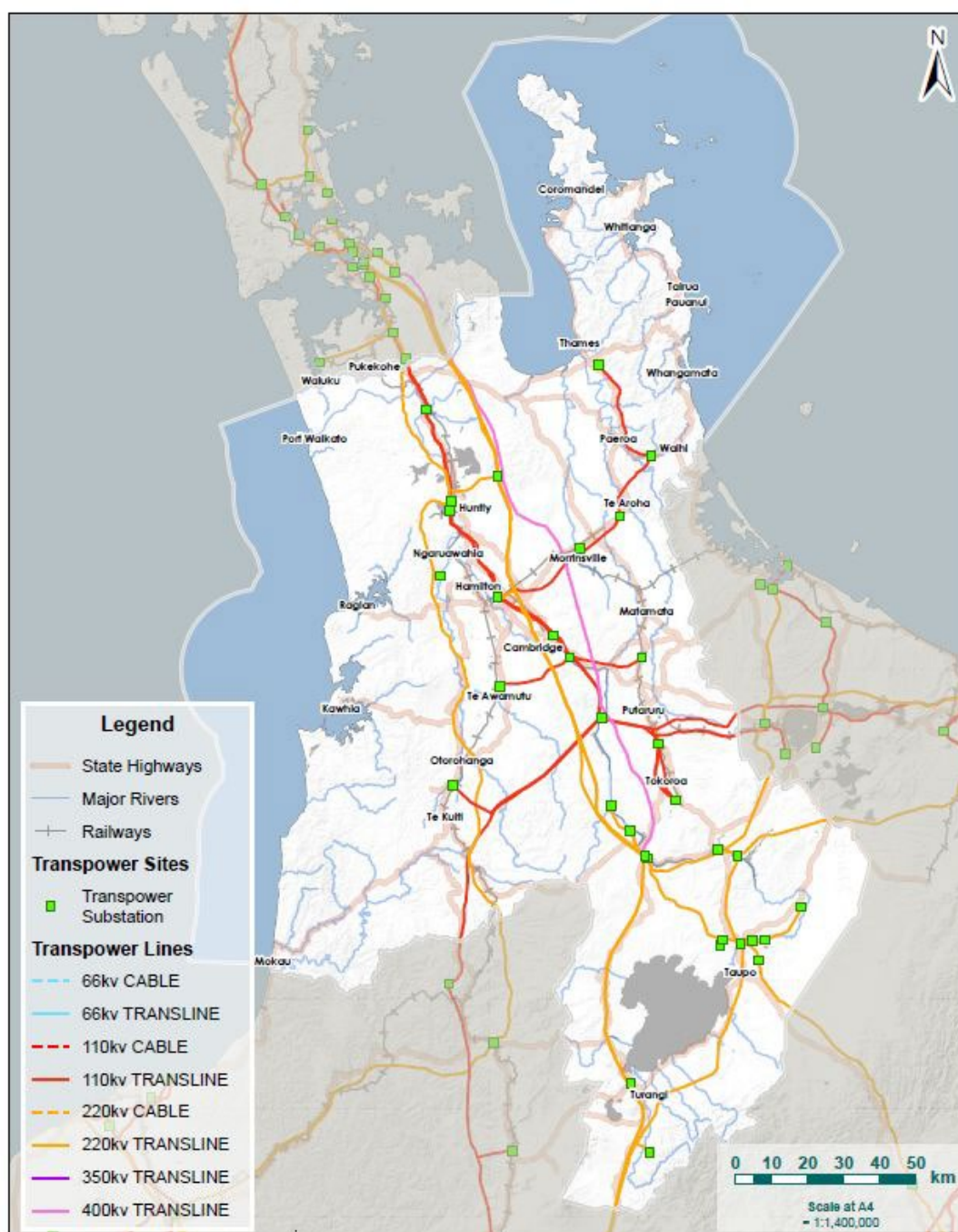


Figure 34: Waikato region transmission network¹⁷⁸

¹⁷⁸ [Transpower, 2025.](#)

12.1.2 Future electricity transmission requirements

The transition to a low emissions economy is totally dependent upon the ability to affordably move energy around the country. ‘There is no transition without transmission’¹⁷⁹ recognises the system requirement of using electricity and in particular the need to:

- Ensure grid developments are funded and pursued in anticipation of new renewable supply to avoid delay through first mover disadvantage.
- Locate critical electrical infrastructure away from the effects of an increasingly climate affected landscape such as flood plains and areas prone to landslides.
- Recognise that component parts do not last indefinitely and just to continue to work as intended require maintenance and modernisation.
- Ensure policy settings are congruent with the need to provide energy connectivity within the region and beyond.

Future electricity transmission requirements in New Zealand are being shaped by the country’s transition to a highly electrified, low-emissions economy. The power system is expected to transform from a centralised to a decentralised system, where more energy sources are located outside the main grid and therefore, challenge existing industry operating boundaries. An increase in variable and intermittent energy sources, such as wind and solar, are expected to meet the increasing demand for electrification of transport and process heat. Changes are also expected in the switch from passive to active consumers who can feed excess generation into distribution networks and manage their electricity usage. This is summarised in Table 16.

Table 16: Our current power system and the changes expected by 2030¹⁸⁰

Key trends	Current	2030
Decarbonised: transition to 100 percent renewables	• 85 percent renewable electricity • Mostly synchronous generation • Security of supply managed by market • Thermals to meet peaks and dry years • Small amount of DER	• 100 percent renewable electricity • More asynchronous and inverter-based generation • Will energy-only market manage security of supply? • New solutions needed for peaks and dry year • Increased reliance on DER
Decarbonised: more electrified economy	• High reliance on electricity in the economy • Electricity not relied on heavily for transport • Few, traditional demand growth sources	• Very high reliance on electricity in the economy • Electricity relied on heavily for transport and industry • Many different demand growth sources
Distributed: more distributed electricity system	• Small amount of DER • Limited performance requirements in the Code but small penetration means this is not yet an issue • Limited use of demand-side and battery technology to manage peaks	• Millions of DER to manage peaks in real-time • Multi-directional power flows • More consumer participation and more market players • Potential issues caused by inverter-based DER
Digitised: increasing digitisation and use of digital tech	• Increasing data and data management requirements • Gradual use of automation for control and switching • Increased use of data-driven decision making	• Increased complexity and volume of data • Expectation from operators and customers that controls, and communications will be automated and data-driven • Opportunities to improve consistency and efficiency

¹⁷⁹ [Nillesen P & Marse J, 2024.](#)

¹⁸⁰ [Transpower, 2022.](#)

The development of large-scale offshore wind generation in New Zealand will require significant investment in transmission infrastructure to accommodate new capacity. Transpower's modelling of six scenarios identifies South Taranaki and the West Coast of Waikato as the most viable locations for offshore wind. Of these, Waikato offers the most cost-effective option in terms of grid upgrade requirements, whereas large-scale wind in Taranaki would need to be consumed locally or require significant transmission investment. A balanced approach, splitting generation inputs between Waikato and Taranaki, would help reduce overload risk in the central North Island and strengthen overall grid resilience.

Transpower's updated connection enquiries data shows a surge in interest for new grid connections, reflecting strong market pressure to electrify. As of December 2025, there were 323 enquiries nationally, representing 46,548 MW of proposed generation, battery storage, or load, compared to single-digit enquiries prior to 2019. This surge signals a structural shift nationally toward electrification and highlights the need for strategic planning, grid investment, and policy settings to manage rapid growth and ensure resilience.

There has been some movement in enquiries for grid connections in the Waikato region since the preparation of the Waikato Regional Energy Inventory (Table 17).

Table 17: Enquiries for grid connections in the Waikato region

Waikato Administrative region	Numbers 12/2025	Change from 04/2024	Size (MW) 12/2025	Change from 04/2024
New enquiries (MW)	61	-12	7166	-1,822
Wind	7	-5	2008	-2,493
Hydro	3	+2	170	+48
Geothermal	2	0	170	-70
Solar	29	0	2816	-423
Battery storage	6	+3	1350	+1,000
Other (incl. thermal)	3	-4	47	XX
Substations	2	0	340	+210
Transport	1	0	20	-20
Data centres	1	+1	50	+50
Other load	7	-3	195	-171

The region retains the interest of generators as a significant contributor to anticipated national activity with 19 percent of enquiries representing 15 percent of the energy size. This is below the interest shown in April 2024 (25 percent of the power from 20 percent of national enquiries). The main changes are a reduction in wind generation of 2,495 MW which is interpreted to include the withdrawal of Blue Float Energy in October 2024 (2,000MW offshore wind north of Whaingaroa Harbour) citing seabed mining conflict (relating to interests in South Taranaki), regulatory uncertainty and commercial viability.

Of note is the increase in large scale battery energy storage with a doubling of project interest from three to six projects but a 385% increase in the capacity from 350MW to 1,350MW.

Recommendations:

- Maintain an up to date understanding of connectivity requirements for the Waikato region.
- Actively support the development of embedded and distributed generation across the region.
- Make provision within spatial plans for electricity supply and distribution infrastructure to ensure it is identified, protected and supported for future growth.
- Support and advocate for long term planning for grid expansions and upgrades.

12.1.4 Electricity prices

New Zealand's electricity pricing system is complex, which often confuses the debate about what is driving high costs. Although some argue prices haven't risen much, households have faced large real increases over the past 25 years, even as commercial and industrial users have seen reductions¹⁸¹. International comparisons hide this because New Zealand started from a low base compared to other countries.

¹⁸¹ Ibid p.22-25

These comparisons are often used to convince us that we are paying a similar price to other comparable countries which is true but obscures the point that New Zealand consumers have experienced significant rises in the price of electricity that contribute to the cost-of-living pressures New Zealanders are currently experiencing.

Prior to the reforms that established the current system, government policy kept residential electricity prices lower than those for businesses, but this has since reversed. In a market system, residential consumers have significantly less bargaining power than commercial and industrial users¹⁸². Gentailers often blame higher household prices on morning and evening peaks, however this is not strictly true because most consumers are on fixed-price contracts. Fixed contracts insulate consumers from price variability, but it also means that consumers are unable to take advantage of the variability by shifting their demand when prices are high. Critics argue that the system delivers high profits to low-cost generators and limits demand-side participation.

Time-of-use pricing or smart metering, would better reflect real-time costs and encourage people to reduce peak demand, potentially lowering overall system costs. Time-of-use pricing sets predetermined electricity rates for different periods of the day, typically divided into peak, shoulder and off-peak times that reflect demand on the network. Prices are higher during peak periods and lower when demand is low, encouraging consumers to shift usage to off-peak times. This helps reduce pressure on the system, lowers generation costs, and can deliver savings for consumers. Effective uptake relies on smart appliances or automated controllers that can defer use to cheaper periods.

Most households, however, remain on fixed flat-rate plans, which provide no incentive to shift demand or support more efficient use of the network. Broader adoption of flexible pricing would encourage demand-side participation, improve load balancing, and reduce the need for costly new generation and grid upgrades.

The Electricity Authority is amending the Electricity Industry Participation Code 2010 to strengthen incentives for retailers to provide time of use plans and require increased rewards for consumers supplying power during peak times.

12.1.5 Managing demand

Demand management is a cost-effective way to lower overall energy system costs by reducing or shifting electricity use. It includes technologies, actions and programmes that help consumers use less energy or move their demand to different times of the day.

Demand can be reduced outright or shifted to off-peak times, which is often cheaper than building additional supply. Demand management is also important for making the best use of the variable supply of distributed solar and wind by shifting load to off peak times.

Balancing energy supply and demand is challenging, and around 20% firming capacity is needed to meet peak demand. New Zealand relies on coal, oil and gas to back up hydro during cold winter peaks, but this dependence exposes the country to volatile global markets, geopolitical risks, and rising fuel costs that undermine affordability. Demand management provides an alternative approach by shifting energy use, reducing demand at peak times and increasing it when supply is plentiful, to ease pressure on the system and reduce reliance on fossil fuels.

Demand management also includes reducing grid demand through local generation, such as on-site solar for industrial processes or rooftop solar that lowers household grid use and enables storage or productive use elsewhere.

New Zealand has a long history of demand management. Ripple control, used since the 1950s, allows distribution businesses to temporarily switch off electric hot water systems during peak periods. Demand management policies were also pursued in the 80s and 90s in response to the energy crisis.

¹⁸² [Wilson, 2015](#), p.33.

However, demand management efforts declined with market liberalisation and deregulation of energy sectors globally, as energy conservation was seen as conflicting with profitability.

Dry years highlight the system's vulnerability: when hydro lakes are low, electricity prices rise sharply, affecting households and energy-intensive industries. Since 2020, economic growth across energy-intensive industries has declined and several plants have closed, citing high energy costs as a contributing factor. Recent closures include Tasman Mill, Penrose paper recycling mill, Karioi Pulp Mill and Kinleith Mill¹⁸³.

Sustained high prices reduce economic activity, deter new industries, and worsen cost-of-living pressures. Climate change is expected to increase the frequency of dry years, raising the risk of prolonged high prices unless demand is managed more effectively.

12.1.6 Market and regulatory framework

New Zealand's electricity market is unique in having no price cap or capacity market, relying instead on high scarcity prices to fund long-run investment¹⁸⁴. Unlike many countries where governments finance major renewable and storage projects, New Zealand passes these costs directly to consumers (through electricity bills)¹⁸⁵. This model has contributed to underinvestment in new supply because sector settings prioritise shareholder returns over reinvestment.

Market changes for distributed energy

The key challenges to distributed energy are regulatory, governance and pricing issues rather than technology. Experts argue the market will need redesign to accommodate high-renewable, low-marginal-cost systems and real-time trading¹⁸⁶. Smart grids are a key enabler of distributed renewables, by using real-time data to optimise electricity distribution.

Smart meters

Smart meters and batteries expand demand-side management, but regulatory settings are not keeping pace with technological change. Current industry governance, market and regulatory frameworks risk slowing the roll-out of distributed renewables and limiting demand-side management.

Flexibility for variable generation

The expansion of rooftop solar, utility-scale solar, and wind generation will increase supply variability, as these technologies require firming capacity during periods of low sunlight and low wind. If distributed renewables such as rooftop solar were deployed at scale, New Zealand's hydropower system could take on a greater firming role, supporting reliability by smoothing variability in daily and seasonal generation.

12.1.7 Distributed renewables

Distributed generation resources supply energy locally, by using technologies to generate electricity close to where it's used. Distributed generation technologies include solar panels, solar farms, wind turbines, grid-scale batteries and micro-hydro schemes. Distributed generation is connected directly to local networks rather than supplying the national grid¹⁸⁷.

The balance between electricity demand and supply is central to how the sector operates. The expansion of distributed renewables creates new opportunities to support demand management by generating power closer to where it is used.

Distributed renewable energy can provide low-cost electricity for households, communities, and businesses while reducing demand on the grid.

¹⁸³ [Hobbs, et al., 2025.](#)

¹⁸⁴ [Philpott A, Miller A & Read G, 2019.](#)

¹⁸⁵ [Hobbs, et al., 2025.](#), p. 26.

¹⁸⁶ *Ibid*, p. 9.

¹⁸⁷ [Electricity Authority, n.d.a.](#)

By generating power near users, technologies such as rooftop solar, farm-scale hydro, and community-owned wind or solar farms can supply energy locally and export any surplus back into distribution networks.

These systems are cost-efficient and highly flexible due to their short construction times and relatively small scale. Aside from installation costs, the energy they produce is essentially free. Distributed solar, wind, and hydro can serve both urban and rural areas and strengthen resilience during extreme weather events by maintaining supply when grid connections are disrupted. Because electricity does not need to travel long distances, network losses are reduced and overall system costs can be lower.

Shifting some electricity supply to distributed sources also reduces demand for centralised generation, which can ease wholesale prices. This can be especially beneficial for low-income households, who typically use more electricity due to less-efficient homes and spend a higher proportion of their income on energy.

Recommendations:

- Advocate for financial support to help industry transition away from fossil fuels, for example, reinstating the GIDI fund.
- Require a building WoF for energy efficiency so that renters have clear, reliable information about a home's performance when choosing where to live.
- Advocate for incentives to provide higher-quality and energy-efficient homes.
- Explore options such as bulk-buy programmes and ratepayer schemes to help home-owners upgrade to energy efficient homes.

12.2 Gas

New Zealand's gas transmission network is a strategic asset owned and operated by First Gas Limited (Figure 35). It connects onshore and offshore production fields in Taranaki to major industrial users and urban centres across the North Island via high-pressure pipelines. Gas pipelines are limited to the North Island with the region occupying a strategic position as a corridor between Taranaki and all regions of the Upper North Island Strategic Alliance (UNISA)¹⁸⁸.

¹⁸⁸ [Upper North Island Strategic Alliance \(UNISA\)](#) incorporates Northland, Waikato and Bay of Plenty Regional Councils, Auckland Council, Whangarei District Council and Hamilton and Tauranga City Councils. With 53 per cent of national population generating 52 per cent of GDP

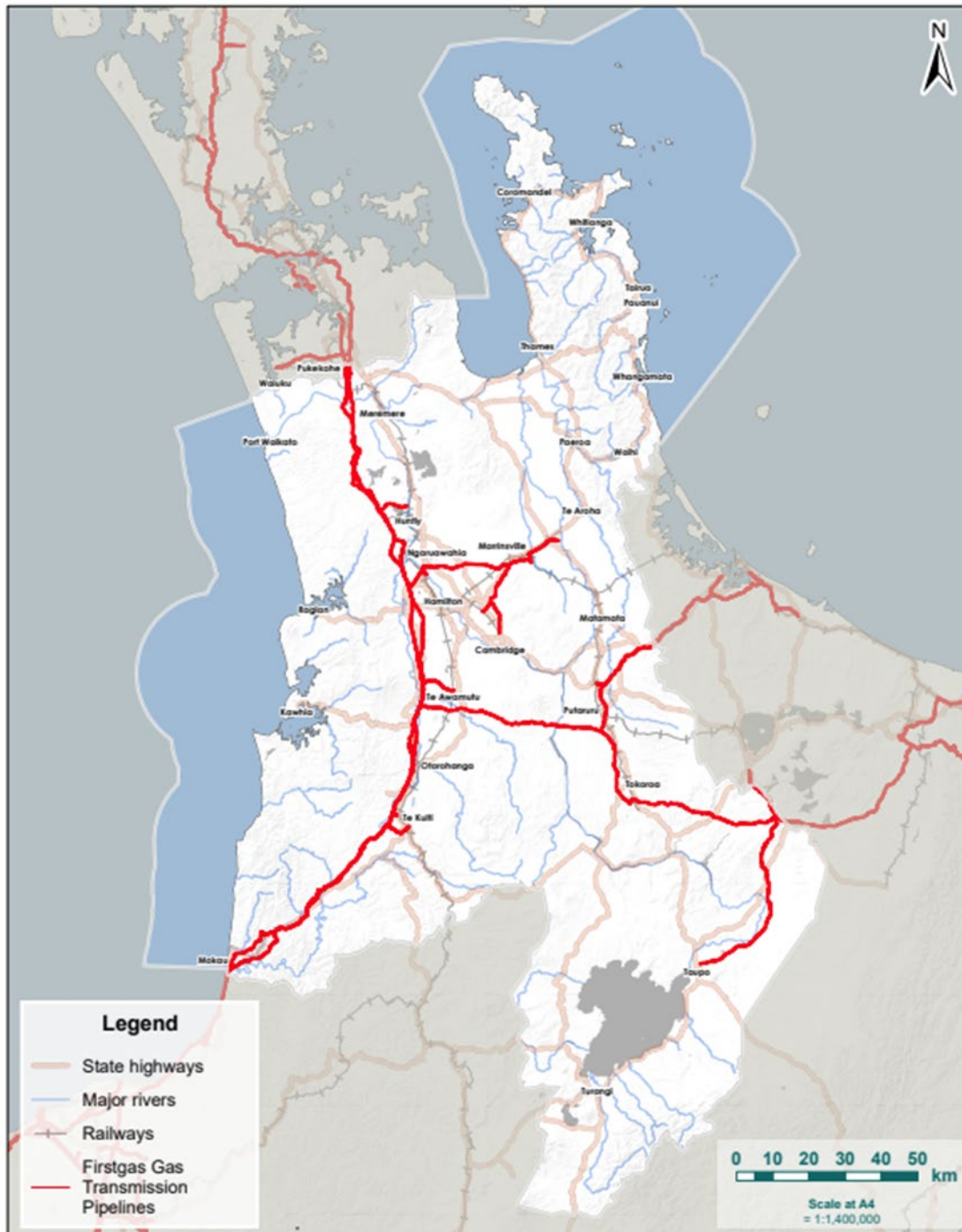


Figure 35: Gas pipeline infrastructure in the Waikato region

The gas pipeline infrastructure is a valuable resource that may offer the opportunity in the future to transmit an increased percentage of biogas products should these be produced. This is already proposed for the Ecogas organics processing facility at Reporoa with plans to refine biogas to bio-methane and inject directly into the national gas pipelines by the middle of 2024.

Depleted oil and gas reservoirs have proven ability to store gas as they have done so for millions of years. A gas transmission infrastructure that directly connects offshore reservoirs to potential, technology-dependent, onshore carbon capture facilities may have some future strategic value. Experimental work is already in progress¹⁸⁹ to understand and trial capture of carbon dioxide from geothermal systems used for electricity generation and sequester this in the geothermal reservoirs.

Recommendation: make provision in spatial plans for facilities that inject renewable energy derived hydrogen and biogas into existing natural gas distribution networks.

¹⁸⁹ University of Canterbury Research programme, 2024. Carbon dioxide removal that includes geothermal and bioenergy sources.

13 Exploring future energy pathways

The future of Waikato’s energy system will not follow a single, predictable path – there is no single silver bullet. Instead, the transition will resemble a dynamic pathway, shaped by choices we make today, in response to global market forces, policy, incentives, technological innovation, and climate realities.

To understand possible futures, three scenarios were developed and modelled – not as predictions, but as plausible pathways reflecting different policy and market conditions. Each scenario is internally consistent and is applied using the same underlying population and economic projections, allowing differences in outcomes to be attributed to assumptions about energy policy, technology uptake, and investment behaviour rather than to external drivers.

The scenarios range from an incremental, market-led change, a security-focused static pathway, to a coordinated and proactive dynamic transition (Figure 36). Together they show the spectrum of likely futures.

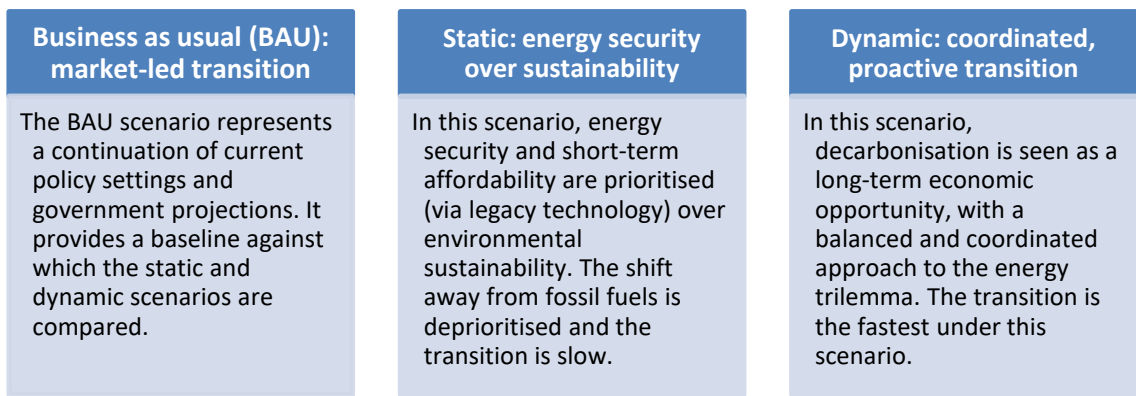


Figure 36: Future energy scenarios developed and modelled for the Waikato Regional Energy Strategy

13.1 Scenario descriptions

13.1.1 Scenario 1 – Business as usual

The business as usual (BAU) scenario represents a continuation of current policy settings and government projections and serves as a reference pathway against which alternative futures are compared. It reflects existing legislation, confirmed policy commitments, and central projections for key drivers of energy demand and supply.

The ETS price follows the Government’s most recent projections trajectory¹⁹⁰, rising through to 2030 due to short-term projected unit supply constraints. After 2030, the price is projected to gradually fall due to increased supply from forests planted in recent years.

Technology uptake and fuel switching are largely market-driven, responding to relative cost changes arising from higher gas prices and continued improvements in the cost and efficiency of electric alternatives.

Electricity demand and new generation build follow central projections, with investment in renewable electricity occurring in response to observed market signals rather than in anticipation of future demand. Moderate consenting costs and delays cause renewable build to be slower than optimal.

Domestic gas supply is assumed to continue declining due to ageing fields and limited successful new development¹⁹¹. This tightening supply places upward pressure on gas prices. Under BAU conditions, gas continues to play an important role as a flexible backstop for electricity supply and as a fuel for existing industrial users, but with steadily declining demand over time.

¹⁹⁰ [Ministry for the Environment, 2025. Annual updates to New Zealand emission trading scheme limits and price control settings for units 2025.](#)

¹⁹¹ [Hobbs, et al., 2025.](#)

Industrial demand continues to fall through a combination of fuel switching, curtailment, and exit by less profitable gas-intensive users

Transport demand and activity are based on Ministry of Transport projections, with electric vehicle uptake proceeding at projected rates. There is no significant change to travel behaviour or mode shift.

Aside from the ETS, a significant non-market intervention in this scenario is the Industrial Heat National Environmental Standard, which requires existing coal-fired boilers to be phased out by 2037. Outside this requirement, the energy transition proceeds gradually.

Key drivers of emissions reductions include:

- Uptake of electric vehicles, including electric trucks. Transport policy and the transport system largely remains dominated by road transport.
- Declining domestic gas production due to fields reaching the end of their useful lives. This drives the closure of Methanex's methanol production activities in Taranaki.
- The phase out of coal use in boilers¹⁹² and increasingly limited use of coal for electricity generation at Huntly power station due to growth in renewable electricity generation from solar, wind and geothermal sources. The electricity system reaches 98 percent renewable power by 2047, with the Waikato region's electricity generation reducing from the present to 36 percent to 28 percent of the total.
- Investment in renewable power is significant (total renewable generation rises from 38 TWh in 2025 to 72TWh in 2050) but somewhat measured – in response to wholesale market signals and electricity demand drivers.
- Biomass is not used at scale for power generation, but industrial heat users switch to biomass to fuel boilers.
- Improved energy efficiency in newly constructed homes and buildings, alongside growth in rooftop solar and agri-solar.
- The aluminium smelter at Tiwai remains operational in this scenario, backed by long term contracts.

13.1.2 Scenario 2 – Static

In this scenario, short- and medium-term concerns about energy security and energy affordability – driven by recent “dry years” for hydro power generation and disappointing domestic gas production output – result in the sustainability limb of the energy trilemma being significantly sidelined.

The government's energy policies focus on shoring up the security of fossil fuel supplies (replacing “like for like”) – e.g., gas for power generation in dry years and industrial heat, coal for power generation in dry years.

Diversification away from fossil fuels for the long term through investment in renewable electricity and fuel switching is deprioritised. Policy remains highly reactive and a national energy strategy taking a long-term view (that might have outlined a nationwide renewable energy target) is not finalised.

The government underwrites investment in an Liquefied natural Gas (LNG) import terminal and incentivises domestic gas exploration onshore and offshore. Coal mining in both the Waikato region and other parts of New Zealand expands due to the renewed focus on energy security and affordability. Coal demand is also boosted by the reversal of the National Environmental Standards to ban new coal boilers and phase out existing boilers. Increased confidence in gas and coal supplies means that the Huntly power station and gas generators continue to operate to 2050.

¹⁹² [Ministry for the Environment, 2023.](#)

The renewed focus on fossil fuel investment – entailing long lead projects like LNG imports and expanded gas exploration underwritten by the government – deters both domestic and foreign investors in renewable power generation. The lack of a national energy strategy target for renewables is also a contributing factor.

In the long run, New Zealand's energy prices fail to benefit from renewable power cost declines compared to overseas peer nations. This is due to the costs associated with investment in LNG (and associated volatility in global LNG prices), investment in domestic fossil fuels and associated long lead times. The opportunity of enhanced economic performance through cheaper energy costs through greater investment in renewables and electrification is missed compared to the other scenarios.

The ETS remains the primary policy lever through which decarbonisation is encouraged by placing a price on carbon emissions. However, the carbon price is kept low due to unconstrained forestry supply and measures that undermine the integrity of and participant confidence in the ETS (e.g., high industrial allocation). International climate obligations are met more through the purchase of overseas emissions units rather than domestic abatement than in other scenarios. This scenario fails to address increasing market requirements for low carbon produce, either in the direct manufacturing of product or supply chain emissions. This scenario exposes the region's export industries to potential CBAM actions included in recent free trade export agreements.

Decarbonisation incentives to complement the ETS are not pursued, as are initiatives to regulate, encourage and educate in relation to energy efficiency, energy conservation and decarbonisation. The prospect of increased coal and gas supplies also deters end users (e.g., for process heat and/or space heating) from investing in more efficient lower carbon technologies such as heat pumps, locking them into less efficient processes and higher lifetime total costs of ownership. Energy efficiency in newly constructed homes and buildings does not keep up with international best practices either.

Transport policy and the transport system largely remains heavily dependent on road transport. Investment in public transport, rail and personally active transit initiatives is not prioritised ahead of roading. Government policies towards electric vehicles (EVs) are ambivalent, resulting in global vehicle manufacturers considering New Zealand to be a lower priority in a world where EVs are in relatively high demand. EV uptake is further discouraged in New Zealand through relaxed vehicle emissions standards and consumers favouring the beguilingly low upfront cost of used internal combustion engine vehicles that are increasingly unwelcome in other markets.

New Zealand lags other countries on climate change action and environmental sustainability in general. Exports suffer and as a consequence, demand for dairy produce declines as both consumers and large brands perceive New Zealand milk as not sufficiently aligned with sustainability benchmarks.

Despite the availability of LNG and some new domestic gas fields, Methanex exits New Zealand due to the high costs of the gas. The aluminium smelter at Tiwai point remains open, backed by legacy hydro power and the market advantage of a high quality, low emission product. New Zealand misses out on opportunities to diversify and expand its industrial base – e.g., data centres or Power to X seeking large quantities of affordable renewable power are deterred by high wholesale power prices and a relatively slow cadence to renewable generation investment.

Communities are less resilient and energy independent due to poorer uptake of rooftop and agri-solar. This occurs due to less support from lenders, electricity suppliers (e.g., buyback rates) and electricity distributors (e.g., lack of streamlined connection processes).

13.1.3 Scenario 3 – Dynamic

In this pathway, society envisages decarbonisation and the path to net zero carbon as a major imperative. Governments and citizens alike also view the journey as a long-term investment in more affordable, sustainable and secure energy supply.

Climate policy is thus proactive, bipartisan and takes a long-term view and is aligned to meeting affordability and security energy goals.

Market signals (through the ETS), technological advancements and consumer preferences set the pace of the energy transition in tandem with complementary measures. Consistent ETS auction price corridors provide durable signals to invest in decarbonisation, backed by regulatory settings that encourage emissions reductions at the source over afforestation or purchase of international carbon units. This also reduces the spectre of CBAM actions.

Key drivers of emissions reductions include:

- Investment in renewable power is large (from 38 TWh in 2025 to 96 TWh in 2050) and anticipatory of demand growth, backed by supportive consenting processes and a willingness from central government to promote revenue stability to large investors, including new entrants.
- Biomass is used at scale for power generation at Huntly, and industrial heat users switch to biomass to fuel their boilers.
- Small scale renewable energy development is supported by local and central government via incentives leading to strong growth in rooftop solar, agri-solar and community solar projects.
- Declining domestic gas production due to fields reaching the end of their useful lives.
- Transport policy and the transport system gradually diversifies away from road transport to include greater focus on active transport, shared transport, rail and coastal shipping.
 - Spatial planning evolves to give greater priority to opportunities to integrate active transit and public transport.
 - The aviation sector (backed by sustainable fuel mandates to keep New Zealand's tourism sector competitive with expectations of peer nations and major tourism markets) sees use of electric planes for short domestic routes and some biofuel and hydrogen for longer domestic routes.
 - The proportional uptake of electric vehicles, including electric buses and trucks is strong but the total vehicle fleet plateaus and declines as people see more opportunities to take advantage of active modes and shared transportation. The freight industry also makes greater use of electrified rail and shipping over road transport.
 - Fossil fuel imports are 34 percent of 2025 levels by 2050.
- Improved energy efficiency in newly constructed homes and buildings is prioritised with energy efficiency as the "first fuel" of choice, alongside retrofitting existing infrastructure.

The affordability of electricity is further supported through national consensus on standards, regulations and commercial arrangements for demand flexibility (e.g., smart EV charging, vehicle-to-grid technology, hot water load control, etc.) that generate savings for consumers and reductions in transmission and distribution investment costs.

The large investment in renewable energy attracts more data centres to New Zealand, by parties who value affordable, reliable and sustainable electricity.

This scenario may also result in stronger demand for New Zealand exports, as some consumers and brands increasingly value alignment with sustainability benchmarks. However, this potential effect is not explicitly modelled, to avoid confounding changes in commodity demand with the economic impacts of the energy transition.

Green hydrogen is produced in New Zealand primarily for very heavy transport, long-distance transport, and aviation, where direct electrification is less feasible. For modelling purposes, large-scale hydrogen production is assumed to occur outside the Waikato region, reflecting the likely co-location of production with major renewable resource areas, ports, and export or distribution infrastructure. Regional impacts are captured through higher electricity demand.

A summary comparison of each scenario is shown in Table 18.

Table 18: Comparison of energy transition scenarios

Dimension	Business As Usual (BAU)	Static	Dynamic
Overall framing	Continuation of current policy settings and central government projections;	Energy security and affordability prioritised over sustainability; transition slows	Decarbonisation treated as a long-term economic opportunity with coordinated action
Climate policy stance	ETS is the primary decarbonisation lever; no new policies	Weak commitment to emissions targets; decarbonisation sidelined	Proactive, bipartisan climate policy supported by complementary measures
ETS price trajectory	Rises until 2030, then gradually declines	Remains low	Rising ETS price provides a strong, reliable signal
Renewable electricity investment	Market-led build responding to demand; moderate consenting delays slow deployment	Renewable investment deprioritised; consenting uncertainty deters new projects	Large, anticipatory renewable build supported by streamlined consenting and revenue stability
Electricity system outcomes	Renewables grow steadily; gas remains a firming fuel	Continued reliance on gas for security; higher long-run electricity prices	Affordable high renewable penetration with storage, transmission and demand flexibility
Gas supply and use	Domestic supply declines; gas prices rise; demand falls gradually through switching and exit	Expanded gas development and LNG imports; gas use sustained longer	Gas pro-actively displaced by electricity and biomass
Coal use	Coal phased out of boilers by 2037 under Industrial Heat NES	Coal boilers remain; coal mining expands; Huntly continues operating	Coal phased out of boilers and Huntly switches to biomass
Industrial heat and efficiency	Gradual fuel switching driven by relative costs; limited efficiency improvements	Minimal efficiency gains; continued reliance on gas and coal	Biomass and electrification dominate; energy efficiency prioritised
Transport demand and behaviour	Transport demand follows MoT projections; limited mode shift	Higher private vehicle demand	Greater mode shift to rail, active and public transport
EV uptake and vehicle efficiency	EV uptake in line with projections; gradual efficiency improvements	Low EV uptake; weak emissions standards; slow efficiency gains	Strong EV uptake; declining vehicle fleet size; improved efficiency
Energy efficiency in buildings	Incremental improvements in new builds	Little improvement	Energy efficiency treated as the “first fuel”, including retrofits
Distributed energy and resilience	Moderate uptake of rooftop and agri-solar	Low uptake; weaker community resilience	Strong growth in rooftop, agri-solar and community energy
Industrial development	Some gas-intensive industries exit over time	Gas-intensive industries exit a few years later; limited diversification	Increased attractiveness for data centres and electrified industries
Hydrogen	None at scale	None at scale	Some use for heavy transport and aviation; production outside Waikato

13.2 Modelling approach

A suite of complementary models was used to capture interactions across the electricity system, the broader energy sector, and the wider economy, with scenarios projected out to 2050 and 2075. Concept Consulting's electricity market model was used to assess generation cost curves, capture rates, and resulting wholesale electricity prices under each scenario.

These outputs are incorporated into the Emissions in New Zealand (ENZ) model, which simulates national energy supply, demand, and emissions pathways over time, capturing changes in electricity generation, fuel use, technology uptake, and energy prices. As ENZ operates at a national level, a regionalisation process is applied to isolate the Waikato region from the rest of New Zealand, drawing on multiple region-specific datasets.

The three scenarios were modelled fifty years to 2075 and are illustrated for comparison of energy flows for the year 2050 to align with the national target for reduction of greenhouse gas emissions.

The resulting regional energy pathways were then used as inputs to an economy-wide computable general equilibrium (CGE) model, which assesses the implications of the scenarios for the wider economy, including impacts on GDP, sectoral output, investment, prices, and trade.

Key energy related economic factors compared for the three modelled scenarios are:

- Energy demand by fuel including all form from within the region and imported.
- Energy demand by sector based upon sector GDP and agricultural output projections.
- Energy Prices (electricity, gas and carbon).
- Transport (road, rail and air).
- Greenhouse gas emissions, decreasing under all scenarios, to different extent and at different rates.

In addition to the specific sector changes attributable to each of the three scenarios – the wider regional and national (rest of New Zealand) economic impacts have been modelled in relation to the reference of BAU scenario for both short-term (first 13 years) and medium term second (second 13 years to 2050) using 2024 as the baseline data. Specifically:

- Impacts on regional and national gross domestic product (GDP).
- Wage increases and household consumption.
- Vulnerability to sudden oil price shocks. Assessed as a ten percent price hike to imported oil in 2043.

Linking economic performance to the baseline scenario is appropriate as it reflects the temporal nature of changes over time.

Further details can be found in *Waikato Regional Energy Scenarios* by Concept Consulting¹⁹³.

13.3 Modelling outcomes

13.3.1 Scenario 1 – Business as usual

This reference scenario continues current policy settings and central government energy and economic projections. In this scenario energy related greenhouse gas emissions reduce by 72 percent by 2050. Energy flows for the year 2050 are illustrated in Figure 37.

Key changes from the current situation include significant increases in the supply and use of energy sourced from within the region as well as a reduction in the importation of liquid transport fuels.

¹⁹³ [Concept Consulting, 2025.](#)

Within region supply is characterised by significant increases in geothermal and biomass with alongside wind and solar increasing electricity generation by 17 percent and exports to the rest of the country by ten percent.

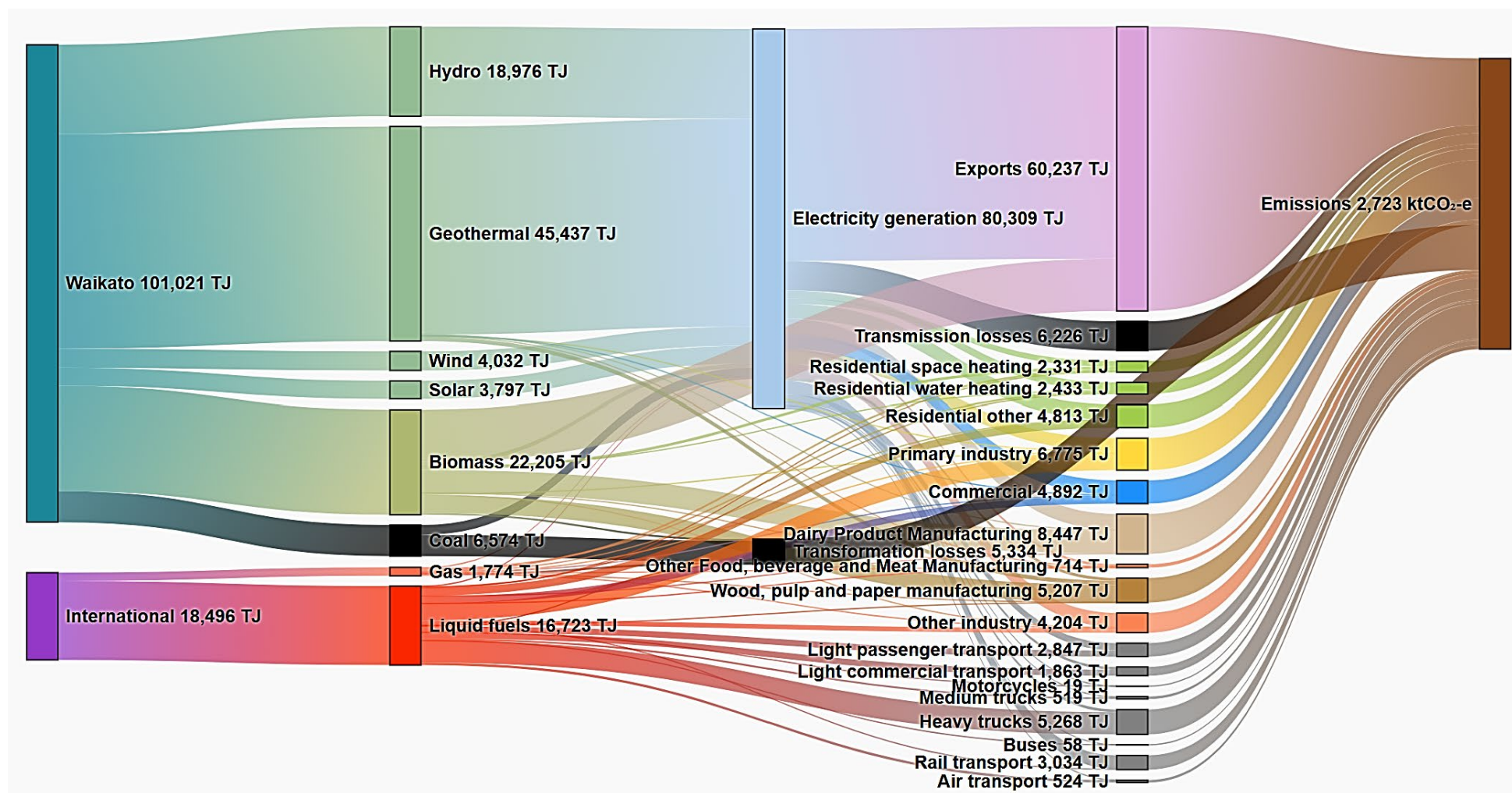


Figure 37: 2050 energy flows and emissions – Business as usual¹⁹⁴

¹⁹⁴ An interactive version of the diagram is available at <https://econergy.earth/ConceptApps/waikato/WaikatoSankeyDynamic.html>

Energy demand by fuel

This shows an early increase in the use of coal as it is used for winter electricity firming in place of more expensive gas. Coal consumption then declines sharply by 2037 as existing coal-fired boilers are phased out under the Industrial Heat National Environmental Standard. Biomass use increases over time as industrial users progressively switch fuels for process heat. Liquid fossil fuel consumption declines gradually as the transport sector electrifies at a measured pace. Geothermal energy use grows more strongly than wind and solar, reflecting the Waikato region's relatively small share of new wind and solar generation build under BAU investment conditions (Figure 38).

In this and in all other scenarios, hydroelectricity is considered a mature generation type with minor increases (around two percent) in generation coming from small and community scale projects built on tributary rivers.

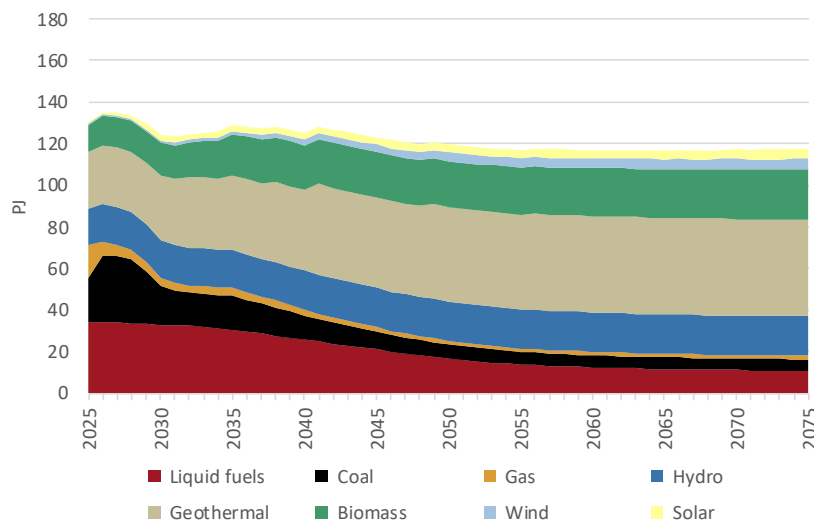


Figure 38: BAU energy demand by fuel for 2025 to 2075

Energy demand by sector

This has been estimated for major industries using GDP projections, while agricultural activity uses Ministry for Primary Industries projections of agricultural outputs. As a result, all scenarios reflect changes in energy intensity and fuel mix rather than changes in the scale of economic activity.

Electrification reduces the total amount of final energy required to deliver a given level of service, as electric motors, electric boilers, and heat pumps are substantially more efficient than fossil fuel technologies. This effect is most pronounced in the road transport sector, where total energy demand falls markedly across all three scenarios. In other sectors, changes are more subtle, reflecting the existing use of electricity and the fact that biomass boilers do not offer the same efficiency gains as electrification.

Energy prices

Energy prices are a significant driver of economic activity and can be broken down into three areas: electricity, gas and carbon. Wholesale electricity prices reflect probable consented and planned new generation, with moderate demand growth and some system inefficiencies persisting over time.

Retail gas prices follow these wholesale trends but are also influenced by network and retail cost recovery. As the number of pipe gas customers declines, fixed distribution and retail costs are spread across a smaller customer base. This is a particular constraint for the BAU scenario.

Under the BAU scenario, the carbon price follows government ETS settings projections, which indicates NZU supply constraints emerging in the early 2030s, followed by a return to surplus supply as forests planted in recent years mature. This occurs even with farm conversion limits in place. The NZU price rises to around \$90 in the early 2030s before gradually declining thereafter.

Transport demand

Transport electrification increases over time, driven by growing consumer confidence, narrowing upfront cost differentials, and ongoing fleet turnover. For road transport, the pace of uptake differs by scenario, with faster transition occurring at the point of vehicle purchase. With the least incentives, high private road fleet, weak emission standards, and low electric vehicle (EV) uptake is in line with projections with gradual efficiency gains leading to around 50 percent of light vehicle travel is electric by 2041.

The modelling highlights that the most cost-effective interventions occur at the point of vehicle purchase, where relatively small incentives or efficiency standards compound over time to deliver substantial impacts on fleet composition and emissions.

There is limited rail electrification under the BAU scenario, and no substantial transition away from existing patterns. Under the BAU scenario, limited electrification of short-haul regional flights emerges from the late 2030s.

Greenhouse gas emissions

Under the BAU scenario, energy-related greenhouse gas emissions fall by approximately 69 percent, reaching around 1.76 Mt CO₂-e by 2075.

Economic indicators

The change in GDP for the BAU scenario is a starting point from which the other two scenarios are compared. This is an artifact of using a computable general equilibrium (CGE) model that defines the Waikato region as one of interest and relates it to the rest of New Zealand. The model contrasts the likely evolution of both the Waikato regional, and the New Zealand economy based upon economic principles, expected technology and policy trends¹⁹⁵. As a result, little can be attributed to the performance of economic indicators or the resilience to external price shocks (imported fuel) for the baseline or Do- nothing scenario.

13.3.2 Scenario 2 – Static

In this scenario, energy security and affordability are prioritised over sustainability and the transition to a low emissions economy slows. Nevertheless, energy related greenhouse gas emissions reduce by 54 percent by 2050. Energy flows for the year 2050 are illustrated in Figure 39.

¹⁹⁵ [Concept Consulting, 2025.](#)

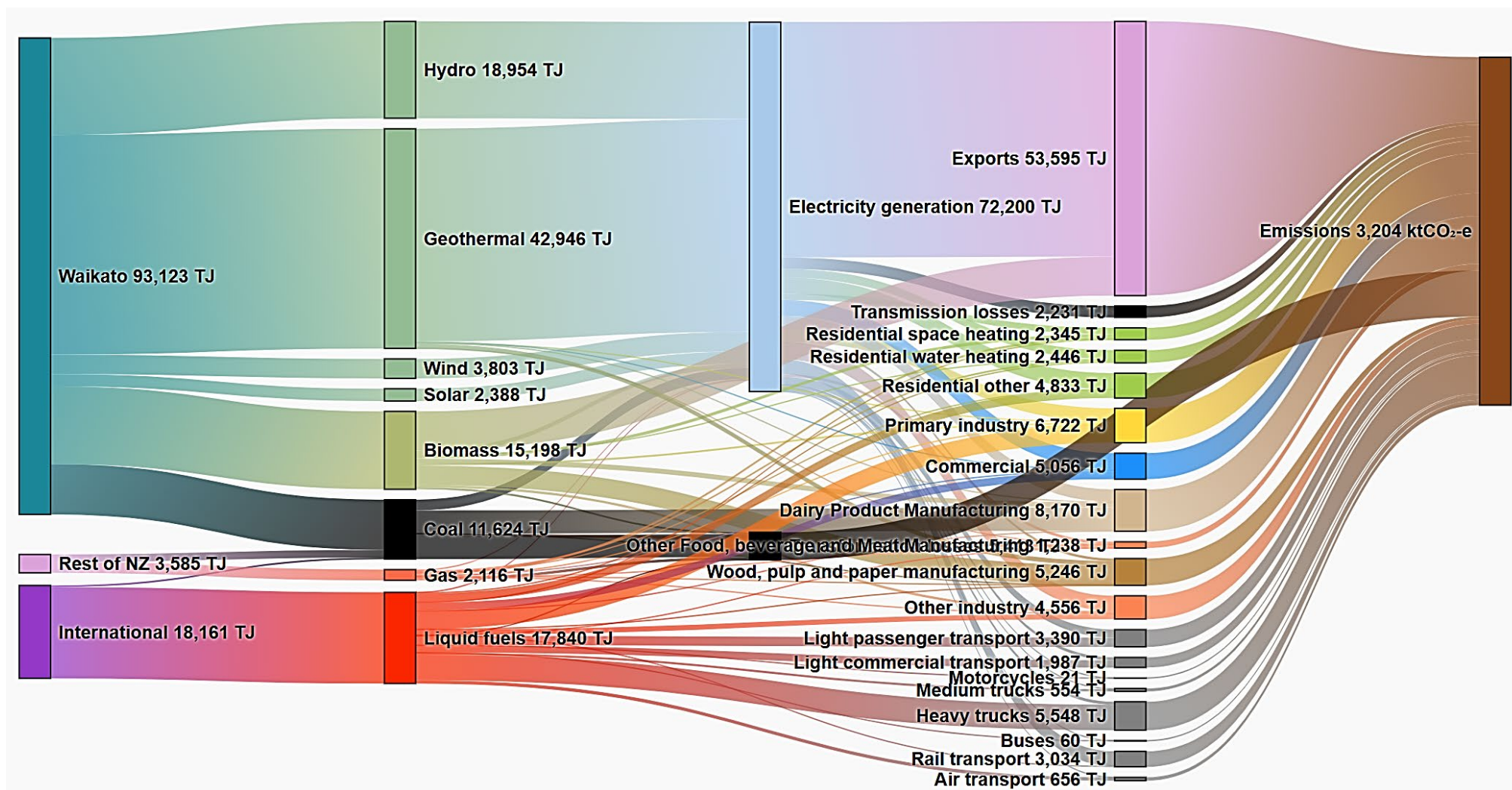


Figure 39: 2050 energy flows and emissions – Static

Key changes from the current baseline include a 30 percent increase in energy supplied from within the region coupled with a reduction in the use of imported fossil fuels. Electricity generation increases by 11 percent with a similar amount exported to the rest of the nation indicating increased use of electricity by economic sectors within the region.

This scenario is the most gas intensive of the three.

Energy demand by fuel

This scenario shows a continued reliance on fossil fuels with a slow decrease the use of coal, now sourced from within the region, liquid fuels and gas in response to weak incentives to decarbonise. Despite this, geothermal energy use continues to grow, driven by its relative cost competitiveness compared with new thermal generation options (Figure 40).

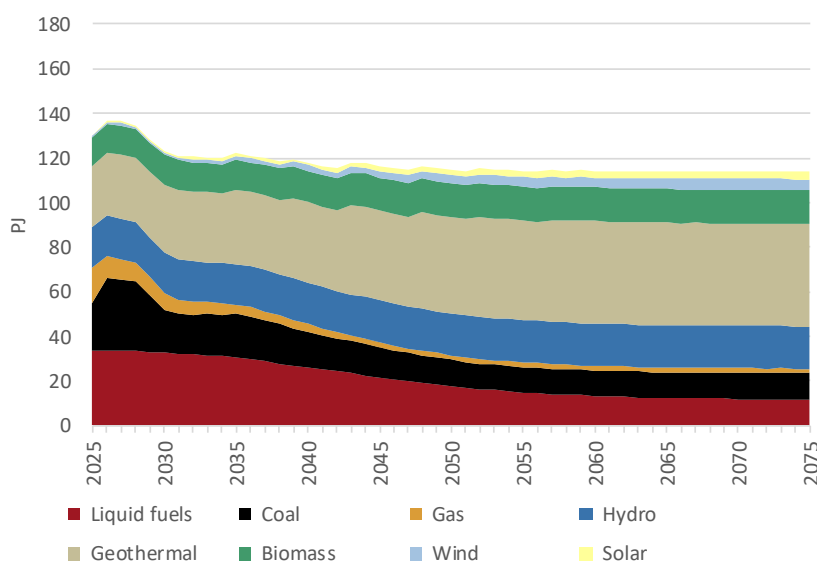


Figure 40: Static scenario energy demand by fuel for 2025 to 2075

Energy demand by sector

Energy demand by sector has been estimated for major industries using GDP projections, while agricultural activity uses Ministry for Primary Industries projections of agricultural outputs. As a result, all scenarios reflect changes in energy intensity and fuel mix rather than changes in the scale of economic activity.

Energy prices

Energy prices are a significant driver of economic activity and can be separated into three types: electricity, gas and carbon. These are estimated for inclusion into subsequent modelling of economic impacts.

Wholesale electricity prices remain higher for longer due to prolonged reliance on gas-fired peaking plant. Over time, wholesale prices converge across scenarios, although the underlying supply mix and system resilience differ markedly by 2050.

Additional domestic gas development and a larger retained demand base keep wholesale gas prices relatively lower than in other scenarios, although still materially higher than levels observed over the past decade.

Retail gas prices follow these wholesale trends but are also influenced by network and retail cost recovery. As the number of pipe gas customers declines, fixed distribution and retail costs are spread across a smaller customer base. In the Static scenario, the larger consumer base keeps retail prices lower than in BAU, but still at a significantly higher level than in previous decades.

Carbon prices

In the Static scenario, the carbon price follows a declining path, driven by unconstrained forestry supply and weak government commitment to emissions budgets and long-term targets. This undermines confidence in the ETS and weakens long-run decarbonisation incentives.

Transport demands

Transport electrification increases over time, driven by growing consumer confidence, narrowing upfront cost differentials, and ongoing fleet turnover. For road transport, the pace of uptake differs by scenario, with faster transition occurring at the point of vehicle purchase. With the least incentives, high private road fleet, weak emission standards, and low electric vehicle (EV) uptake, around 50 percent of light vehicle travel is electric by 2043.

The modelling highlights that the most cost-effective interventions occur at the point of vehicle purchase, where relatively small incentives or efficiency standards compound over time to deliver substantial impacts on fleet composition and emissions.

In line with the BAU scenario, there is limited rail electrification under the Static scenario, and no substantial transition away from existing patterns. Aviation electrification does not occur, with aircraft remaining fully reliant on conventional fuels throughout the projection period.

Greenhouse gas emissions

In the Static scenario, emissions decline more slowly, falling by around 55 percent to approximately 2.53 Mt CO₂-e by 2075. In the Static scenario, this is from a slow decline in transport emissions, and an increase in emissions from dairy manufacturing due to limited switching away from coal-fired boilers.

Economic indicators

Gross domestic product

Impacts on regional and national GDP are slightly positive compared to the reference situation. With a short-term 0.7 percent increase reducing to a medium-term 0.2 percent increase. The national situation sees a modest 0.1 percent increase over the entire modelled horizon out to 2050. Indicating little benefit in pursuing energy policies that support this scenario.

In Waikato region, electricity prices eventually rise above BAU reference scenario levels toward the end of the horizon. Similar price dynamics are observed for the rest of the country. These electricity price movements are central to understanding the broader economic impacts, as they feed directly into production costs, household consumption, and factor incomes.

The low change in regional and national GDP for the static scenario reflects a higher reliance on domestic and imported fossil fuels for all sectors including electricity and transport and the consequential higher influence of emissions pricing either directly as part of the domestic ETS or internationally from CBAM provisions.

Household consumption and income through wages

Household consumption in this situation is slightly higher than both the reference and the dynamic scenario due to lower greenhouse gas prices under not as high income and employment as in the dynamic scenario.

Within the region, employment and wages decline in the medium term, reducing 2.5 percent lower than the BAU scenario due to lower anticipated electricity generation, lower demand from new electric transport sectors and a more expensive legacy reliance on fossil-based electricity from carbon pricing.

Vulnerability to sudden oil price hikes

With the legacy reliance on imported fossil fuels, the static scenario showed a GDP decrease of 44 percent relative to the no shock GDP situation for the same scenario.

This is substantially larger than the rapidly electrifying future which provides greater macroeconomic resilience to oil price shocks.

13.3.3 Scenario 3 – Dynamic

This scenario treats decarbonisation as a long-term economic opportunity with coordinated action resulting in an 82 percent reduction in energy related greenhouse gas emissions. Energy flows for the year 2050 are illustrated in Figure 41.

Key departures from the present situation are reflected in both the amount and mix of energy supplied and the ability to pass clean energy to the benefit of economic activity in the rest of the country. By 2050, not only has the reliance on imported fossil fuels reduced by nearly 80 percent by indigenously sourced energy has more than doubled, primarily from increases in wind, solar and geothermal supply. This allows economic sectors within the region to decarbonise through electrification as well as increasing the amount of energy exported to the rest of the nation.

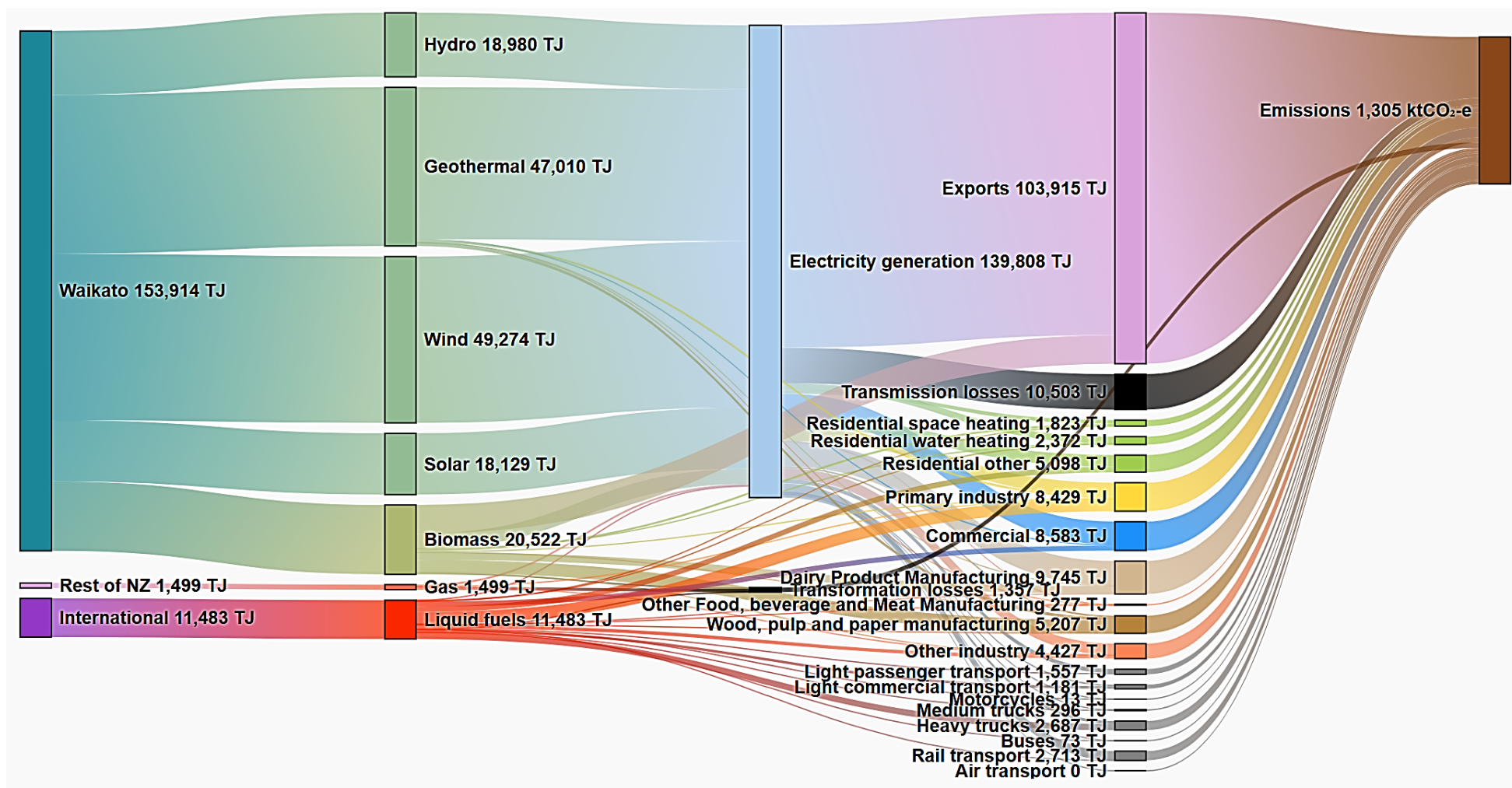


Figure 41: 2050 energy flows and emissions - Dynamic

Energy demand by fuel

In this scenario Energy demand by fuel undergoes a transformation as coal is phased out more rapidly due to stronger carbon pricing. Gas use increases slightly in the early years to support system security and firming but is subsequently phased out for all but the highest-value applications. There are substantial increases in both wind and solar generation, (both coming from very low base levels) as the Waikato region captures a larger share of renewable investment, including offshore wind. Geothermal energy use grows more strongly, reflecting expanded use for direct agricultural and commercial heat use alongside electricity generation (Figure 42).

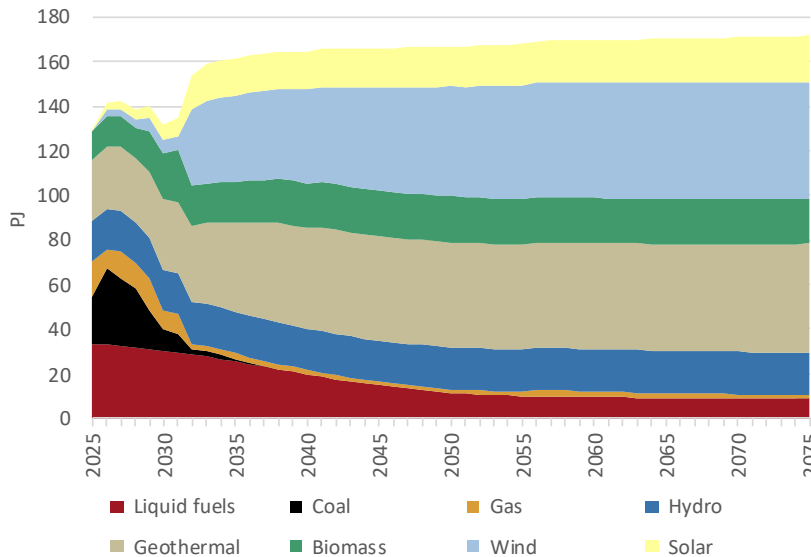


Figure 42: Dynamic scenario energy demand by fuel for 2025 to 2075

Energy demand by sector

In this scenario, energy demand by sector has been estimated for major industries using GDP projections, while agricultural activity uses Ministry for Primary Industries projections of agricultural outputs. As a result, all scenarios reflect changes in energy intensity and fuel mix rather than changes in the scale of economic activity. It shows an increase by 2050 from BAU (up from 52PJ to 56PJ or eight percent) reflecting the additional electricity demand associated with data centre development and increased use of geothermal heat in the region.

Energy prices

Energy prices are a significant driver of economic activity and can be broken down into three areas: electricity, gas and carbon.

In this scenario, electricity prices follow a similar early trajectory to the previous two but are subject to much stronger demand growth, pushing generation further up the cost curve. This upward pressure is partially offset by fast, enabling consenting processes and effective demand flexibility and load management.

Retail gas prices follow these wholesale trends but are also influenced by network and retail cost recovery. As the number of pipe gas customers declines, fixed distribution and retail costs are spread across a smaller customer base. In the Dynamic scenario the declining consumer base results in extremely high retail prices for remaining consumers, assuming these costs are recovered from consumers. Large industrial users, particularly those connected directly to transmission or operating under bespoke supply arrangements, are less exposed to distribution cost increases.

Carbon prices

In the Dynamic scenario, the carbon price follows the Climate Change Commission's 2023 demonstration price path, with NZU prices increasing by three percent per year. This trajectory delivers sufficient gross emissions reductions to achieve net zero by 2050 and provides a strong and durable signal for fuel switching and electrification within the model.

Transport demand

Transport electrification increases over time, driven by growing consumer confidence, narrowing upfront cost differentials, and ongoing fleet turnover. For road transport, the pace of uptake differs by scenario, with faster transition occurring at the point of vehicle purchase. The dynamic scenario with a mode shift from private vehicles to rail, active and public transport, reduced fleet size and strong EV uptake sees around 50 percent of light vehicle travel is electric by 2038, five years before the static scenario.

The modelling highlights that the most cost-effective interventions occur at the point of vehicle purchase, where relatively small incentives or efficiency standards compound over time to deliver substantial impacts on fleet composition and emissions.

In the Dynamic scenario, rail electrification accelerates, particularly from around 2035 onwards. Electricity demand continues to grow through mid-century but declines after 2050 as efficiency improvements may outweigh underlying demand growth. In the short term, diesel use increases due to a shift of freight from road to rail before full electrification is achieved. Aviation electrification occurs earlier and at greater scale than the BAU scenario, broadly aligned with the Climate Change Commission's High Technology pathway.

Greenhouse gas emissions

The largest greenhouse gas emissions reduction occurs in the Dynamic scenario, where emissions decrease by around 82 percent to approximately 0.99 Mt CO₂-e by 2075, reflecting faster electrification, fuel switching, and renewable energy deployment.

In 2025, road transport accounts for almost half of Waikato's energy-related emissions when emissions associated with exports are excluded. Under the BAU scenario, transport emissions decline substantially over time, falling to around 19 percent of total energy emissions as electrification accelerates. Emissions from dairy manufacturing also decrease markedly, reflecting the progressive decarbonisation of industrial heat.

Economic indicators

Gross domestic product

In the Dynamic scenario, emissions reductions occur more rapidly across all major sectors, driven by faster electrification and fuel switching. This results in a short-term regional GDP gain of 0.9 percent with a medium-term increase of 1.5 percent to 2050. This is mirrored in the rest of the country to a lesser extent 0.7 percent and 1.3 percent respectively. The medium-term increases in GDP for both the Waikato region and the rest of New Zealand are attributable to the additions in wind and solar generation, higher uptake of electric transport alternative (road, rail and air) and the presence of data centres. This surge in renewable generation exerts strong downward pressure on electricity prices within the region and across the country in the medium term.

In Waikato, electricity prices remain consistently lower than the BAU under the dynamic scenario, with similar price dynamics observed nationally. These electricity price movements are central to understanding the broader economic impacts, as they feed directly into production costs, household consumption, and factor incomes.

Household consumption and income through wages

Total household consumption increases relative to the BAU scenario reflecting lower electricity prices, indirect price reductions in electricity – intensive goods and services and higher employment and therefore wages.

In the medium-term, regional employment and wages grow 2.5 percent relative to the BAU situation. Reflecting the expansion of renewable electricity generation.

Vulnerability to sudden oil price hikes

Both scenarios show a decrease in regional GDP with respect to the no-shock GDP gains for each scenario. With less reliance on imported fossil fuels, only nine percent of the anticipated GDP gains are lost showing that an energy system with a higher fraction of renewable energy sources has more resilience to price shocks to supply.

13.3.4 Emissions intensity

Greenhouse gas emissions intensity is a proxy for economic efficiency or more correctly a ratio of activity and global impact and is increasingly valued by export markets and customers as a metric for quantifying market preferences.

Regional emissions intensity is estimated at around 0.16 kg CO₂-e per dollar of regional GDP (2024 prices) in 2025. By 2075, emissions intensity declines to approximately 0.04 kg CO₂-e per dollar under the Static scenario, 0.038 kg CO₂-e per dollar under BAU, and 0.015 kg CO₂-e per dollar under the Dynamic scenario (Figure 43).

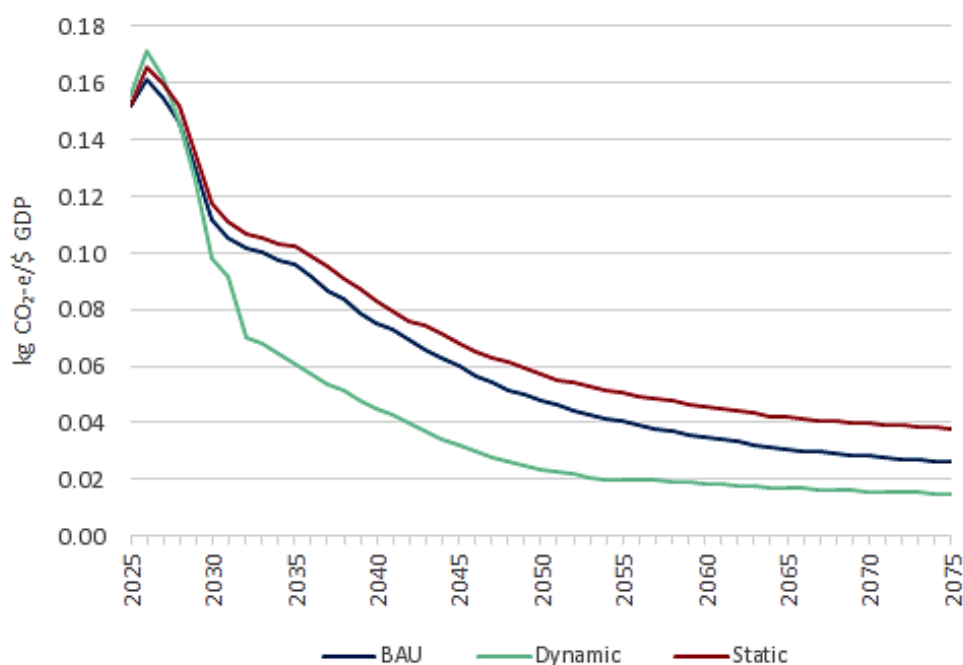


Figure 43: Greenhouse gas emissions intensity (tonnes CO₂-e/\$GDP)

13.4 Summary

The modelling shows that the strongest economic growth occurs when all three elements of the energy trilemma are advanced together – i.e. the dynamic scenario. This is achieved through widespread electrification of regional productive sectors, supported by expanded geothermal generation, increased distributed and grid-scale solar, and growth in both offshore and onshore wind. Intermittency is managed through mature hydro systems providing firming capacity, complemented by deployment of battery energy storage.

The transition to an electrified regional economy requires the largest short term (first ten years) investment – an additional \$22.5 billion nationally over the BAU scenario, including approximately \$4.5 billion within the Waikato.

Moving to an electrified economy also accelerates the shift to low emissions, strengthening the resilience of regional and national export sectors by reducing exposure to fossil-fuel price shocks and meeting growing international demand for low-carbon products.

The static scenario produces the weakest long-term outcomes – lowest GDP growth and leaves the economy increasingly exposed to geopolitical and market risks. Although it requires the least investment, around \$15.7 billion less nationally than the BAU scenario over 25 years – this is achieved by retaining twentieth-century technologies, resulting in an increasingly uncompetitive national economy over time.

A summary of the key findings is shown in Table 19.

Table 19: Summary of the key findings for the Waikato region at the year 2050

	BAU	Static	Dynamic
Greenhouse gas emissions	Down 53%	Down 44%	Down 77%
Electricity generation	Up 20%	Up 11%	Up 54%
Total energy use	114 PJ	110 PJ	158 PJ
Renewables use	94 PJ	32 PJ	154 PJ
Fossil fuel use	25 PJ	83 PJ	13 PJ
EV uptake – light vehicles	50% by 2041	50% by 2043	50% by 2038
Resilience to oil shock	-	Highly exposed, 44% GDP gains in BAU lost	Less exposed, 9% GDP gains in BAU lost
GDP (medium-term)	-	0.2% above BAU	1.5% above BAU
Employment and wages (medium-term)	-	2.5% below BAU	2.5% above BAU
Investment required (national)	-	\$15.7 billion below BAU	\$22.5 billion above BAU
Investment required (regional)		\$3.14 billion below BAU	\$4.5 billion above BAU

13.5 Key messages

Four messages emerge from all three scenarios.

1. Waikato has influence

The Waikato region is already central to New Zealand’s energy system and is a net exporter of energy, particularly electricity. This position means that changes in regional generation capacity, demand growth, and infrastructure investment have outsized economic effects. Investment in renewable electricity in Waikato not only supports local decarbonisation but also supports the rest of the country to electrify and grow.

2. Transition is sensitive to policy changes

The pace and direction of the energy transition are highly sensitive to policy settings, investment signals, and institutional coordination. Market-led change under existing settings delivers gradual progress, but materially different outcomes arise where barriers to renewable investment are reduced, demand flexibility is enabled, and complementary policies reinforce price signals. In these cases, electricity demand growth within the region, driven by electrification of transport and industry, interacts positively with large-scale renewable build, supporting higher use of generation assets and more efficient network investment.

3. Decarbonisation assists affordability and resilience

A key insight from the scenario comparison is the relationship between decarbonisation, affordability, and resilience. In the dynamic scenario, there is accelerated electrification, improved energy efficiency, and reduced reliance on imported fossil fuels and offers lower long-run energy costs relative to the other pathways. While this scenario involves higher upfront investment and adjustment costs in the short term, over time it delivers greater exposure to low and stable-cost domestic energy sources. This improves affordability for households and businesses and materially reduces the impact of declining gas reserves and oil price shocks.

4. Importance of a long-term perspective

The modelling also highlights an important distinction between short- and long-term economic impacts. In the near term (first ten years), faster investment in renewable generation, networks, and enabling infrastructure requires capital expenditure and has transitional costs for some sectors. However, in the longer term, these investments support lower average energy prices, reduced import expenditure on liquid fuels, and higher economy-wide productivity. The CGE results indicate that these effects translate into stronger regional GDP over time, with positive spillovers beyond Waikato as lower energy costs, increased electricity supply, and improved energy security support national economic activity, trade competitiveness, and household incomes. While renewable energy involves high upfront capital costs, these are offset over the long term by minimal or no fuel costs.

In contrast, scenarios that retain higher dependence on imported fossil fuels for longer may appear less costly in the short term but expose the region and the wider economy to sustained affordability pressures, greater vulnerability to global fuel price volatility, and weaker long-run economic performance. In these pathways, higher energy costs act as a drag on both regional and national GDP, particularly for energy-intensive industries and export-oriented sectors.

PART C – Strategy Framework

14 Our vision and way of working

Our vision

Waikato's energy system – resilient, affordable and sustainable.
Powering Waikato's growth and New Zealand's clean energy transition.

Addressing regional energy challenges and advancing renewable energy solutions requires an approach that upholds cultural values, protects taonga, and enables genuine partnership. The following principles, guided by iwi, set the foundation for this approach.

➤ **Regional leadership and collaboration**

A strong regional voice, genuine iwi partnership, and coordinated cross-sector collaboration are essential to securing the policy, funding and investment needed for the transition. This means moving faster together – aligning roles and expectations, reducing duplication, and working with a shared direction and collective purpose.

➤ **Inclusiveness and participation**

Ensure all energy partners and stakeholders can meaningfully participate in shaping the region's energy transition. This requires collective responsibility to provide equitable access to information, resourcing, technical support and capacity-building, along with clear pathways for involvement across governance, planning, investment and delivery. Early, relationship-based engagement ensures iwi and hapū aspirations are embedded from the start, strengthens decision-making, reduces conflict, and ensures the transition delivers fair and enduring benefits for all communities.

➤ **Protection-first approach**

Apply a protection-first approach, ensuring taonga, wāhi tapu and environmental systems are safeguarded before development proceeds. This reflects the Treaty relationship and the role of iwi as kaitiaki. Decision-makers must give effect to Te Ture Whaimana o Te Awa o Waikato and treat protection as the starting point for any energy-related activity.

15 Outcomes

The strategy sets four outcomes to 2050, aligned with the strategy's purpose and energy trilemma. Success will be measured by our progress toward these outcomes.

Outcome 1 Communities have fair access to affordable and reliable energy, reducing energy hardship.

Outcome 2 Our energy system is secure and resilient, able to withstand disruptions and reliably meets the region's needs now and into the future.

Outcome 3 Greenhouse gas emissions are reduced, and renewable energy resources are used in ways that protect the environment and taonga.

Outcome 4 Economic growth is strengthened through greater use of renewable, affordable and reliable energy.

16 How do we achieve a dynamic future?

The transition to renewable energy presents major opportunities for the Waikato, creating high-quality jobs, strengthening the regional economy, and improving long-term resilience. Achieving this transition will require coordinated action across the region, as WRC's direct levers are limited and largely centred on regulation, convening, advocacy, information, procurement and partnership. This section outlines the key opportunities for the Waikato and the recommendations that a regional energy forum can progress to drive an aligned and effective transition.

16.1 Opportunities for the Waikato

16.1.1 Employment opportunities

New renewable infrastructure presents major opportunities for regional employment. Solar, wind, geothermal and bioenergy projects can create stable jobs. International evidence shows renewables generate more jobs per unit of energy than fossil fuels, spanning construction, engineering, installation, maintenance, project management and supply-chain services, with further economic benefits through local spending.

Stronger regional action can help ensure the employment benefits supplying and using renewables are realised. Building local value chains, expanding vocational training and apprenticeships, and supporting school-leaver pathways can anchor new opportunities in the Waikato. Procurement expectations for developers can also direct benefits to local communities and iwi Māori.

Many large-scale renewable projects are located in rural areas with limited employment options. With early engagement and training partnerships, these projects can bring high-quality jobs to local communities and build long-term regional capability.

Integrated approaches, such as biorefineries that convert waste into valuable products, demonstrate how renewable energy can support job creation, environmental improvement and regional economic development¹⁹⁶. Renewables also improve the viability of established industries previously constrained by energy costs.

16.1.2 Economic opportunities

Renewable energy supports long-term economic stability, reducing national spending on imported fossil fuels, and potentially saving billions each year (such as the \$10.8 billion spent in 2024). This allows more value to be reinvested into regional economic growth. Because renewable resources are indigenous, more of this value circulates locally through construction, maintenance, and high-skill jobs. By contrast, fossil fuels carry higher and more volatile costs, with most expenditure flowing offshore.

Decarbonising transport offers one of the highest returns on renewable energy investment. Reducing reliance on imported fossil fuels enables expenditure to be redirected into local jobs, skills development, and resilient regional infrastructure, particularly through the growth of energy-dense industries. In 2024, New Zealand spent \$10.8 billion on fossil transport fuels (roughly equal to the combined export revenue of the meat and seafood sectors¹⁹⁷), largely just to move people and goods around the country.

Electricity, whether renewable or fossil-fuel-based, underpins economic activity, supporting digital infrastructure, industrial processes, and emerging growth sectors such as data centres, hydrogen production and sustainable fuels. Increasing renewable electricity supply lowers long-term prices.

¹⁹⁶ [Trenkner et al., 2024.](#)

¹⁹⁷ Based on data from Infometrics Ltd.

Emerging energy carriers such as green hydrogen, ammonia and advanced biofuels offer new avenues for economic diversification. These technologies rely on affordable renewable electricity and can support high-value industries, export opportunities, and specialised workforce development.

Regions that produce goods with local renewable energy are better positioned to support sustainable economic growth and reduce embodied emissions in exported goods.

16.1.3 Renewable energy hubs

On the supply side, renewable energy projects have a high economic impact (boom) for local communities during the construction phase then settle into an operational and maintenance phase of lower tempo and impact. These are not the type of developments that return high or long term, sustained economic growth to the region. Typically, the benefit of the power (electricity) produced is transmitted or exported out of the region to industrial and commercial sectors in other places where the jobs and wealth occur.

Renewable energy occurs where resources containing the energy exist, for instance, geothermal heat cannot be accessed everywhere and that concentrates the industries able to use geothermal heat directly, including electricity generation, into the Taupō volcanic zone. Similarly, hydroelectricity requires elevated water bodies confining generation sites to the mountainous parts of the region, typically south of Karapiro.

The demand (use of energy) side is different, as commercial sector businesses and industries can exist anywhere certain criteria can be met. These include:

- Availability of labour
- Availability of affordable land
- Availability of water e.g. for industrial processing or in the case of hydrogen production, as a feedstock
- Availability of biomass either as a fuel or as a feedstock
- Proximity to logistical links e.g. freight road, rail or gas pipelines, data cables
- Proximity to an electricity grid

Most, if not all, these key factors conveniently converge in three places – Wairakei/Taupō, Tokoroa and Huntly (Table 20). No other areas of the region meet these key factors for economic development powered by resilient locally sourced renewable energy.

Table 20: Key factors for economic development at Wairakei/Taupō, Tokoroa and Huntly

Factors	Wairakei/Taupō	Tokoroa	Huntly
Renewable energy source	Geothermal Biomass	Geothermal Biomass	Wind solar
Logistics	Gas: pipeline Road: State Highway 1 & 5 Regional airport	Gas: pipeline Road: State Highway 1 & 32 Rail: Kinleith branch	Gas: pipeline Road: State Highway 1 Rail: North Island Main trunk
Water	Lake Taupō and Waikato River	Lake Whakamaru and Waikato River	Waikato River
Proximity to Grid	220kV AC	110kV AC and 400kV AC	110kV AC & 220kV AC
Availability of land	Available	Available	Some natural hazards (flooding)
Availability to labour	Available	Available	Available
Other factors	Does not have rail connections	Dispersed cluster of sites	Some areas prone to natural hazards (flooding) Close to Auckland, agri-solar and west coast wind

Transitioning existing industries and developing new industries close to the point of generation is a way of capturing the economic benefit of the region's available renewable energy and minimising any transmission losses. An example is the cluster development of dairy processing, horticultural cropping, hydrogen production alongside electricity production by Tūaropaki Trust using heat energy from the Mōkai geothermal system. After all, if you already have energy in the form of heat, there is no more efficient use than using it as heat¹⁹⁸.

Not all key factors are equal, and some may develop over time. With good logistical connectivity, it may be appropriate to bring in feedstock and export product from locations that satisfy the other key factors. However, wet industrial processes and expansion of supporting communities would be difficult and expensive in overallocated catchments without water supply infrastructure, which is provided naturally to the three identified areas by the Waikato River.

Wairakei/Taupō renewable energy hub

The Wairakei/Taupō area is unique in the region as it is surrounded by the nation's major geothermal development systems. It is ground zero for the efficient use of geothermal energy. Industries that need process heat (temperatures from warm to very hot) can get large efficiency gains by using geothermal heat directly, instead of first generating electricity and then converting electricity back into heat. These include:

- Greenhouse heating
- Timber drying kilns
- Dairy processing
- Aquaculture (fish farms)
- Food dehydration / processing
- District heating networks
- Industrial hot water and steam (for refining local biomass)

In addition to the industrial work force required for the sub-region's existing use of development geothermal systems for renewable electricity production and for production forestry. The lake, proximity to central plateau mountains, and protected geothermal systems have created an economy anchored in tourism. This has generated, sustained demand for workers across hospitality, adventure tourism, events, and customer service roles. These and attendant service sectors (industrial and hospitality) have created a large, resilient, skilled and flexible, service-oriented labour pool.

Tokoroa renewable energy hub

Tokoroa and environs including Kinleith, Whakamaru and Lichfield ticks all the boxes for a sustained economic development cluster focussed on Tokoroa township. It is close to production forestry/biomass, lakes Whakamaru and Maraetai, the Waikato River, untapped Mangakino development geothermal system, and existing strategic transport connections with the Kinleith rail line that connects to Tauranga for exports north with the electrified North Island Main Trunk at Frankton (Hamilton). Other critical logistical connections include the First Gas pipeline and Transpower's high voltage grid connection.

Even though major plant closures have occurred recently (e.g. Kinleith Mill paper line, plywood plant¹⁹⁹), this has resulted in a large pool of experienced industrial workers now available for redeployment. The deep industrial skill base in forestry/manufacturing, and a large, experienced labour pool provide opportunities for active retraining and redeployment programmes to make use of the strong and diverse existing workforce.

¹⁹⁸ If geothermal already gives you heat, don't waste energy converting it into electricity first — just use the heat directly. [Eureka, 2025.](#)

¹⁹⁹ [Rankin A, 2025.](#)

Huntly renewable energy hub

Huntly is a town in transition. The surrounding hinterland receives less rainfall than it historically did²⁰⁰, challenging the current pastoral agricultural economy. As a result, the hinterland is becoming a desirable area for agri-solar and floating solar developments. It has a secure source of freshwater from the Waikato River, enhanced by the Waipā River confluence at Ngāruawāhia. It also has excellent logistical connectivity within the Upper North Island 'Golden Triangle' with transport connections and energy links with FirstGas and Transpower. The proximity to the west coast (both onshore and offshore) world class wind resource. Huntly has an existing and mature energy precinct exclusively developed on fossil fuel electricity generation, potentially able to be converted to biomass pellets²⁰¹ supplied from within the region. Potential exists to leverage these key factors for low emissions manufacturing.

Huntly is actively transitioning away from coal-dependent employment, meaning a portion of the local workforce is seeking new opportunities. Although dated, the Huntly Community Plan explicitly notes the shift away from coal mining and the need to prepare for alternative industries²⁰², implying a labour pool available for new sectors.

16.2 Action

While WRC does not hold all the levers required to deliver the Regional Energy Strategy, it plays a key leadership role and is well placed to convene and support a regional energy forum to implement the strategy collaboratively. Establishing the forum is the central action to the strategy.

Establish a regional energy forum

As soon as practicable, establish a regional energy forum to consider the recommendations and lead implementation of the Waikato Regional Energy Strategy. The right representation at the right level will be key.

16.3 Recommendations

Seven pou provide the framework for key recommendations required to achieve the strategy's vision. These recommendations are intended for consideration and implementation by the regional energy forum.

Pou 1 Strategic partnerships

Strategic partnerships across government, iwi, industry, research and communities accelerate progress by reducing duplication, sharing resources, and combining expertise to unlock innovation and ensure communities shape and benefit from the transition.

Partnerships models: support partnership models, including joint ventures, that enable co-investment, shared governance and equitable participation in renewable energy projects.

Iwi partnership, participation and engagement: support early, funded engagement with iwi and hapū at the design stage of energy projects, and create the conditions for meaningful iwi participation and partnership throughout planning and delivery. This includes supporting iwi-led strategies and strengthening pathways for iwi Māori involvement across the full project lifecycle.

Pou 2 Advocacy and leadership

Strong advocacy and leadership drive the region's low-emissions transition by shaping supportive policy and regulation, aligning stakeholders, and signalling long-term commitment.

Advocate for consistent and clear government messaging: advocate for messaging from central government that prioritizes renewable energy and decarbonisation. This includes ensuring public statements, policies and incentives align with long-term climate goals, avoiding mixed signals such as support for new fossil fuel exploration.

²⁰⁰ [Waikato Regional Council, 2023.](#)

²⁰¹ [Genesis Energy, 2023.](#)

²⁰² [Huntly Community Board, n.d.](#)

Reach out to Māori businesses: provide energy specific information to Māori businesses and enterprises to support participation and leadership in the transition.
Showcase successful transitions: highlight case studies of companies that have moved away from fossil fuels to demonstrate practical solutions and inspire others.
Shift public messaging towards renewables: counter conflicting signals (e.g. government statements on gas) by promoting clear, consistent message that encourage investment in renewable energy.
Lead by example in procurement decisions: lead by example through procurement and organisational decision-making that prioritises low-emissions solutions.
Actively advocate for renewable energy: when engaging with government, industry, iwi and communities actively advocate for renewable energy by leveraging the evidence and insights contained in the strategy.
Promote iwi leadership in governance: design programme governance arrangements that enable iwi leadership in oversight and delivery where appropriate.

Pou 3 Supportive policy settings

Clear, coordinated policy and spatial planning provides long-term direction, enables consistent renewable energy development, and builds investor confidence to accelerate delivery.

Advocate for New Zealand Energy Strategy: advocate for the preparation of a clear and coordinated New Zealand Energy Strategy that provides long-term direction for electrification, renewable generation, firming resources, and enabling infrastructure, aligned with national climate commitments.

Supportive regional policy and spatial planning: maintain and strengthen regional policy settings that support renewable energy and regional decarbonisation. Prioritise and encourage spatial planning activities that support low emissions transport. Work with partners to proactively identify suitable (including resilient) areas for renewable energy infrastructure.

Align regional policy with iwi priorities: recognise iwi Māori aspirations in energy planning through iwi-led and partnered renewable, clean heat, and community energy projects, supported by early engagement, alignment with iwi management plans, avoidance of sensitive sites, and iwi leadership where initiatives affect their rohe. Integrate iwi priorities into regional policy and spatial planning by identifying suitable areas for renewable energy, avoiding negative impacts on culturally sensitive sites.

Pou 4 Workforce capability and capacity

A skilled and well-supported workforce is vital to the energy transition, backed by sustained investment, strong training pathways, and collaboration across government, iwi, industry and communities to align skills with emerging technologies and build long-term regional resilience.

Strengthen workforce capability and capacity: support development of coordinated education, training and apprenticeship pathways aligned with future energy needs.

Enable training with iwi priorities: enable training and scholarship initiatives aligned with iwi priorities, including project finance, engineering, operations and compliance.

Attract a skilled workforce: support regional attraction and retention of skilled workers by promoting Waikato's opportunities in renewable energy.

School leavers programme: facilitate school-to-work pathways that connect rangatahi with energy sector employers and training providers.

Pou 5 Information and monitoring

Transparent, timely and reliable information, supported by robust monitoring, enables evidenced-based decisions, reduces uncertainty, and strengthens collaboration.

Support transition advice: support delivery of coordinated transition advice for businesses and communities, complementing existing EECA services and addressing identified gaps.

Integrate iwi-led indicators: embed iwi-led indicators within monitoring frameworks to track environmental, cultural, social and economic outcomes.

Identify unconstrained parts of network: work with electricity distributors and Transpower to identify unconstrained parts of the regional network suitable for renewable energy development, ensuring that spatial planning and project siting align with grid capacity and opportunities for efficient connection.
Connect businesses and knowledge holders: link interested businesses (particularly large emitters) with willing advisors and service providers such as EECA, engineering consultants, energy market consultants, funders, fuel suppliers, Transpower and electricity distributors.

Pou 6 Funding and finance

Financial schemes and incentives are important to help communities transition, making low-emissions technologies more accessible, reducing upfront costs, and enabling households, businesses, iwi and community organisations to participate meaningfully in the energy shift.

Engage industries with recent gas investments: target outreach to businesses that have recently invested in gas-based equipment to help them plan for future decarbonisation pathways.

Explore financing schemes: explore options such as bulk-buy programmes and ratepayer schemes to improve access to energy efficient and renewable technologies such as rooftop solar. Prioritize high-impact measures such as transport.

Target key purchase decisions: encourage replacement of end-of-life assets with low-emissions alternatives, such as old vehicles and outdated boilers.

Promote total cost of ownership analysis: encourage businesses and households to consider lifetime costs, including fuel, maintenance, and emissions, when making investment decisions.

Funding for advice: provide a limited amount of funding available each year for businesses to engage consultants for advice on tangible decarbonisation opportunities.

Pou 7 Renewable and energy efficient technology

Widespread adoption of renewable and energy-efficient technologies is essential to lowering emissions, reducing energy costs, and strengthening regional resilience.

Solar

Funding mechanisms: consider targeted funding mechanisms, such as ratepayer-assistance schemes or bulk-buy programmes.

Support iwi initiatives: support iwi-led and iwi-partnered solar initiatives.

Spatial planning: use spatial planning to identify suitable areas for utility scale solar.

Lead by example: lead by example through WRC's procurement and operation.

Encourage solar developments: encourage solar development on homes, marae, papakāinga, community facilities and commercial buildings.

Floating solar: support floating solar where appropriate.

Biomass

Spatial planning: use spatial planning to identify:

- Opportunities for biomass hubs near industrial heat users and geothermal developments.
- Sustainable feedstock availability across the region.
- Opportunities for SAF production in hubs, such as areas with access to rail, renewable energy, labour and biomass resources.
- Opportunities for onsite treatment of organic waste streams where scale and logistical considerations are met.

Support iwi initiatives: support iwi-led and iwi-partnered biomass initiatives.

Biogas refineries: encourage biogas refineries within energy hubs to support use and distribution through existing pipelines.

Wind

Support iwi initiatives: support iwi-led and iwi-partnered wind initiatives.

Spatial planning: use spatial planning to identify suitable locations for wind farms, avoiding culturally sensitive landscapes.

Hydroelectric

Small-scale hydro: support communities to meet local energy needs through small-scale hydro.

Marine energy
Support trials: support wave energy trials in conjunction with the University of Waikato, once transmission opportunities exist.
Support new technology: support development of experimental devices/structures through provisions in the Regional Coastal Plan.
Geothermal
National geothermal strategy: actively engage with central government on the National Geothermal Strategy.
Support new research: support new research that enables access to untapped geothermal resources, both low temperature use and deep high temperature (super-critical).
Transparent information: actively support open information to allow new operators to invest in undeveloped systems.
Food production: encourage use of geothermal for food production and glass houses.
Spatial planning: make provision for existing and future industries that use geothermal heat by locating them close to known geothermal development areas and limited development systems.
Energy storage
National energy strategy: advocate for a national energy strategy that includes nationally consistent type of use pricing to encourage and provide for distributed e.g. rooftop and EV participation in grid and network support.
EV grid support: collectively use opportunities such as adjustments to electricity market regulatory settings, to advocate for nationally applicable settings that encourage and provide for distributed EV participation in grid and network support.
Spatial planning: use spatial planning to identify opportunities for BESS close to networks and the grid.
Pumped hydro: work with parties to investigate opportunities for pumped hydro in the region and identify locations in spatial plans.
Advocate for iwi energy projects: advocate for iwi energy projects in the green hydrogen space.
Water allocation: recognise the need for water as a raw ingredient in the production of green hydrogen and provide for it in resource management planning documents and water allocation strategies.
e-SAF transport corridors: recognise that e-SAF produced outside the region will require transport corridors and ensure these are identified and provided for through regional spatial planning.
e-SAF at energy hubs: create opportunities to produce e-SAF at energy hubs, where appropriate.
Pipeline: advocate for a pipeline between Tokoroa renewable energy zone or use rail tanker stock.
Secure supply chain: advocate for a secure supply chain for biomass for e-SAF production centres and process heat conversion sites.
Transport
Spatial planning: use spatial plans to identify: • Opportunities to electrify rail corridors linking central Waikato freight hubs with wharves in Tauranga and Auckland. • Provision for energizing rail overhead wires for charging locomotive battery. • Green hydrogen production sites near Hamilton International Airport to power hydrogen fuelled future medium range aircraft. • Wharves and charging infrastructure requirements for electric commuter ferries linking Coromandel coastal towns with wider Hauraki Gulf including Auckland City. • Locations for commuter ferry wharves that provide connections between the Waikato, Waiheke Island and the wider Auckland region. • A maritime hub in Thames/Kopu. • Wharves and charging infrastructure required for electrification of service vessels for offshore wind projects. • Charging/refuelling stations to avoid congestion points. • Passenger and freight docking, charging facilities and routes for ground effect passage between Coromandel townships and Auckland region.
EV charging infrastructure: recognise the need for EV charging infrastructure in rural townships.
Double track: double track the entire North Island Main Truck through the Whangamarino wetland and provide for a new double track tunnel through the Kaimai ranges.

Rail electrification: advocate for hybrid battery electric locomotives as an interim step and full electrification of the Golden Triangle for both freight and passenger rail.
Passing loops: increase the number of passing loops to enable more frequent rail services.
Expand Te Huia: support expansion of Te Huia to strengthen regional connectivity and reduce reliance on private vehicles.
Encourage mode shift: advocate for shifting more freight from road to rail.
Charging hubs: work with regional partners to identify sites to deploy high-capacity (>300kW) charging hubs to ensure regional coverage, reduce range anxiety and lock into the proposed spatial plan.
Fuel cell electric trucks: partner with local freight logistics companies to trial fuel cell electric trucks.
Smart charging technology: utilize smart charging technology to ensure EV charging coincides with high solar/wind generation and low network demand, partnering with local lines companies.
Zero emissions bus fleet: continue with and accelerate the transition of WRC's bus fleet to zero emissions, focused on high-usage routes in Hamilton.
Rapid chargers: advocate for and support logistics companies installing rapid chargers at Waikato-based depots, enabling vehicles to charge during loading/unloading.
Hydrogen refuelling: accelerate the rollout of hydrogen refuelling stations along the Waikato freight routes including State Highways 1, 2 and 3.
Green hydrogen: produce green hydrogen onsite at refuelling stations using electrolyzers powered either by Waikato's renewable electricity or off-peak wind and solar.
Dual fuel engines: support the adoption of dual fuel engines to transition existing diesel trucks to lower emissions immediately while new fuel cell electric trucks become more accessible.
Funding for fuel cell electric vehicles: advocate for funding for truck operators to switch to fuel cell electric vehicles that can travel 500km+ and refuel in 15-20 minutes.
Develop active and public transport networks: develop and support investment in accessible, reliable public and active transport networks, especially between and within major centres. Consider opportunities for partnerships with entities that can deploy relevant infrastructure at lower cost and risk.
Grow active and public transport: use existing communication channels with agencies, businesses and communities to grow active and public transport.
Low emissions vehicles: use existing communication channels with agencies, businesses and communities to promote, encourage and normalise the uptake of low-emissions vehicles. This could include: • Support reinstatement of subsidies for EVs. • Helping commercial and private vehicle owners to understand the total cost of ownership of low emissions vehicles and the environmental benefits. • Approaching large fleet owners to better understand the challenges and opportunities they face in transitioning to low emissions vehicles.
Vehicle fleet turnover: continue to transition WRC's fleet to low emissions fuels and support opportunities to assist others with funding challenges. For example, the use of a ratepayer assistance scheme.
Enable the rollout of public EV charging infrastructure: create a supportive environment for charge point operators (CPOs) considering investing in the region. This could include: • Enabling access to suitable tracts of land. • Expediting consenting processes. • Identifying high-priority sites and corridors for EV charging based on traffic flows, regional growth expectations and engagement with electricity network owners on capacity constraints. Also recognising that EV charging infrastructure is accessible in rural townships. • Funding support for CPOs to the extent practical.

Road network initiatives: support road network initiatives, such as: • Working with Road Controlling Authorities to set speed limits that promote safe travel and lower emissions motoring. • Considering the opportunities for zero-emissions traffic areas in the region. This would only be practical in more dense urban areas where priority could also be given to pedestrians, public transport and active transport. • Engaging with forthcoming opportunities to contribute to the development of congestion charging in the region to consider how lower emissions vehicles and transport modes could be incentivised.²⁰³
Transport of green ammonia: commission work to investigate the transport of green ammonia.
Fuel usage: determine estimate for fuel usage from commercial and recreational boating.
Export manufacture of boats: explore the economic development opportunity to build on existing Hamilton trailer boat heritage and extend to attracting export manufacture of energy efficient vessels in identified energy hubs.
Aviation SAF: advocate for the use of SAF in aviation to complement sector export industry targets.
National SAF mandate: support industry leaders and advocate to central government for a national SAF mandate to provide SAF at New Zealand airports.
e-SAF movement: advocate for the extension of electrified rail network to allow e-SAF movement to Hamilton International Airport.
Data centres
Data requirements: understand the data requirements of Waikato data centres and ensure that the regional spatial plan identifies areas of low natural hazard risk.
Spatial planning: ensure the regional spatial plan recognises the need for secure data cables and makes provision for these.
Electricity demand management
Financial support: • Advocate for financial support to help industry transition away from fossil fuels e.g. reinstatement of the GIDI fund. • Explore options such as bulk-buy programmes and ratepayer schemes to help home-owners upgrade to energy efficient homes.
Energy efficient rentals: require a building WoF for energy efficiency so renters have clear, reliable information about a home's performance when choosing where to live.
Incentives: advocate for incentives to provide higher-quality and energy-efficient homes.
Energy transmission and distribution
Up-to-date information: maintain an up to date understanding of connectivity requirements for the Waikato region.
Spatial planning: make provision within spatial plans for: • Electricity supply and distribution infrastructure to ensure it is identified, protected and supported for future growth. • Facilities that inject renewable-energy-derived hydrogen and biogas into existing natural gas distribution networks.
Grid expansions and upgrades: support and advocate for long term planning for grid expansions and upgrades.
Embedded and distributed generation: actively support the development of embedded and distributed generation across the region.

²⁰³ E.g., revenue from congestion charging could be recycled towards investment in active transport, public transport and/or other low emissions transportation initiatives.

17 Implementation pathway

17.1 Implementation plan

Implementation of this strategy will be led by a regional energy forum. Establishment of the forum is central to the strategy. The forum will bring together key participants responsible for the supply, distribution and use of energy across the Waikato, including iwi, infrastructure providers, major energy users, education, local and central government and commercial representatives. This will ensure a coordinated, partnership-based approach to regional energy planning and delivery.

The forum will develop an implementation plan outlining timeframes, resourcing, responsibilities and actions. The forum will consider the recommendations in this strategy and progress agreed actions through the implementation plan.

The forum will report to WRC's Regional Growth and Resilience Committee through WRC staff. WRC will maintain oversight of the strategy and implementation plan, providing technical and administrative support for the forum.

17.2 Monitoring, reporting and review

Monitoring the success of the strategy is important to demonstrate progress towards the vision, and to provide clear evidence of what is working and what is not.

As part of the implementation plan, a monitoring and reporting programme will be developed and led by the regional energy forum. To track progress, performance indicators could be established, including economic indicators for example clean-energy job growth, industry fuel-switching, and uptake of low-emissions technologies, and transport indicators for example EV uptake, mode shift, rail electrification, and adoption of hydrogen or SAF.

Regular reports, such as annual progress updates, will be reported to the Regional Growth and Resilience Committee.

The strategy will be formally reviewed every five years, with earlier reviews triggered for example if a national energy strategy is released or if significant policy or system changes occur.

Acronyms and units

Acronym/unit	Meaning
B2B	Business to business
BAU	Business as usual
BESS	Battery energy storage system
CBAM	Carbon Border Adjustment Mechanism
CUE	Carbon usage effectiveness
CGE	Computable general equilibrium
CO₂e	Carbon dioxide equivalent
EECA	Energy Efficiency Conservation Authority
EROI	Energy return on energy invested
ETS	Emissions Trading Scheme
EU	European Union
EV	Electric vehicle
GDP	Gross domestic product
GWh	Gigawatt-hour
ICP	Installation control point
ITU	International Telecommunication Union
KW	Kilowatt
LNG	Liquefied natural gas
MW	Megawatt
NZU	New Zealand units
PHEV	Plug-in hybrid electric vehicle
PJ	Petajoule
PUE	Power usage effectiveness
PV	Photovoltaic
RMA	Resource Management Act
RETA	Regional Energy Transition Accelerator
RPS	Regional Policy Statement
RPTP	Regional Public Transport Plan
SAF	Sustainable aviation fuel
UNEP	United Nations Environment Programme
V2G	Vehicle-to-grid
V2L	Vehicle-to-load
WRC	Waikato Regional Council
WUE	Water usage effectiveness

Glossary

Term	Definition
Atua	Ancestor.
Awa	River, stream, creek.
Climate change	Changes in global or regional climate patterns that are evident over an extended period (typically decades or longer). May be due to natural factors or human activities.
Electrification	Converting a device, system or sector from non-electric sources of energy to electricity.
Embodied emissions	Total greenhouse gases released during the production and transportation of goods.
Emissions intensity	A measure of the amount of greenhouse gas emissions produced per unit of activity. Measured as megajoules per dollar of GDP.
Energy hardship	When individuals, households and whānau are not able to obtain adequate energy services to support their wellbeing in their home or kāinga.
Energy intensity	A measure of energy used per unit of economic output or activity. It indicates how much energy is required to produce a product or service.
Firming	Backup power or storage that keeps electricity supply steady when renewables fluctuate.
Gentailer	Company that operates both as a generator and retailer of electricity.
Greenhouse gas	Gas in the Earth's atmosphere that traps heat from the sun and prevents it from escaping into space e.g. carbon dioxide and methane.
Gross domestic product	A measure of a country's economic activity.
Hapū	Kinship group, clan, tribe, subtribe.
Indigenous	Sourced locally from within New Zealand.
Industrial process heat	The heat used in factories and industrial sites to make products, such as heating materials, drying them or making chemical changes.
Iwi	Refers to tribe or grouping of Māori people descended from a common ancestor(s).
Kāinga	Home.
Kaitiaki	A person who is active in the guardianship of the mauri of ecosystems.
Kaitiakitanga	Active protection and enhancement of the mauri of ecosystems.
Mahinga kai	Means "to work the food"; a food gathering place.
Mātauranga Māori	Māori customary knowledge, traditional knowledge, or intergenerational knowledge and is held by tangata whenua at place
Maunga	Mountain, peak.
Mauri	Life force, life essence.
Moana	Sea, ocean.
Papakāinga	Original home, village, communal Māori land.
Pou	Māori term for a carved wooden post, pillar, or upright support used in traditional architecture, often representing ancestors or marking boundaries (pou rāhui). It signifies strength, connection, and history, serving as a pillar for community identity, storytelling, or a metaphorical support/mentor.
Resilience	In the context of this strategy, the ability of energy systems to adapt and recover from disruptions e.g. a flood.
Ripple control	A tool for managing electricity demand. For example, where providers temporarily turn off hot water to reduce pressure on the grid.

Rohe	Territory.
Sankey diagram	In the context of this strategy, a diagram representing the flow of energy.
Taiao	The natural world.
Taonga	All things of value treasured by tangata whenua.
Tikanga	Procedure, custom, lore.
Wāhi tapu	Sacred place or site.
Wai	Water.
Whānau	Family group, extended family.
Whenua	Land.

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Appendices

Appendix A: How to read and interpret a Sankey energy flow diagram

A Sankey diagram is a visual way of showing how energy flows through a system. The key rules when reading the diagram are outlined below with examples.

1. Width equals quantity: the width of each band, flowing left to right, represents the amount of energy. Wider flows = more energy, narrower flows = less energy.
2. Read the diagram from left to right – looking at the five columns:
 - a. The first column shows where energy is geographically sourced e.g. Waikato, rest of New Zealand or internationally.
 - b. The second column shows the energy sources e.g. geothermal, coal.
 - c. The third column shows how energy sources are converted into useable forms e.g. electricity.
 - d. The fourth column shows the final energy use e.g. transport, industry, including electricity exported to other regions.
 - e. The fifth column shows estimated greenhouse gas emissions.
3. Energy splits and merges to tell a story: where a flow splits, energy is being distributed to multiple uses. Where flows merge, different sources are contributing to the same use.
4. Pay attention to losses: energy losses are shown as 'transmission' losses. Fossil fuels often lose large amounts during conversion to useful energy.
5. Use Sankey diagrams to compare scenarios: diagrams were prepared for the BAU, static and dynamic scenarios to enable comparison. Look for:
 - a. Shrinking fossil fuel flows.
 - b. Growing electricity and renewable flows.
 - c. Reduced energy losses.
 - d. Greater electrification of transport and industry.
 - e. Reduced greenhouse gas emissions.

Appendix B: WRC case study

This case study demonstrates how WRC is applying the strategy's principles by reducing its own corporate emissions and leading by example.

In 2017, WRC committed to accurately measuring and reducing its carbon footprint, with progress to date independently assessed and verified through the Toitū carbon reduce programme. As part of this commitment, WRC prepares an annual Emissions Inventory Report to quantify organisational greenhouse gas emissions and updates its Emissions Management and Reduction Plan. The organisation has set a target to reduce corporate emissions by 65 percent by 2030. To support this goal, WRC has implemented a range of initiatives, including:

Solar: three grid-connected solar systems have been installed across WRC's offices as part of a single corporate solar programme. Together, the systems supply approximately 30–40 percent of electricity demand, materially reducing reliance on grid-supplied electricity.

During 2024/25, solar generation reduced grid electricity consumption by 139,479 kWh, delivering estimated operating cost savings of around \$32,000 over the 12 months, based on average electricity purchase and export buy-back rates.



Solar panels on WRC's main office in Hamilton

The total capital investment for the programme was \$259,867, with current performance aligning with original business case assumptions, including estimated annual operating cost savings of approximately \$26,000 and an indicative simple payback period of 9–12 years. Following payback, the long operational life of the solar panels means the programme will continue to deliver net financial value to Council, while reducing exposure to increasing electricity costs and strengthening electricity supply security at Council sites.

Electric vehicles: the most significant ongoing corporate emissions sources are diesel and petrol. A transition pathway is in place to reduce overall fleet fuel consumption. Strong progress has been made with a deliberate shift away from diesel vehicles towards electric options. As part of this transition, petrol hybrid and plug-in hybrid vehicles have been introduced as interim solutions – balancing capital constraints with operational needs, especially in areas where fully electric vehicles are not yet viable for fit-for-purpose use. WRC's current fleet now includes 13 EVs, 23 plug-in hybrid electric vehicles (PHEVs) and seven petrol hybrid vehicles. EV charging stations have been installed at all offices excluding Whitianga which is being aligned with the new build due for completion this year.

Building management systems: the Ward Street office is equipped with a building management system (BMS) that monitors and controls key building services. Working in collaboration with the landlord, WRC has implemented a programme to improve the efficiency of cooling, lighting, and heating systems. This has delivered a measurable reduction in electricity consumption and strengthened overall operational performance.

Pump stations: electricity use is predominately from the operation of flood pumps across the region. Depending on rainfall, electricity use can vary considerably from year to year. Emissions reduction options are now built into plans for pump station replacements. Some options include increased automation and pumping at night.

Overall, these actions demonstrate that WRC is delivering a meaningful shift in its carbon footprint, with a 38 percent reduction in emissions recorded for the 2024/25 period.