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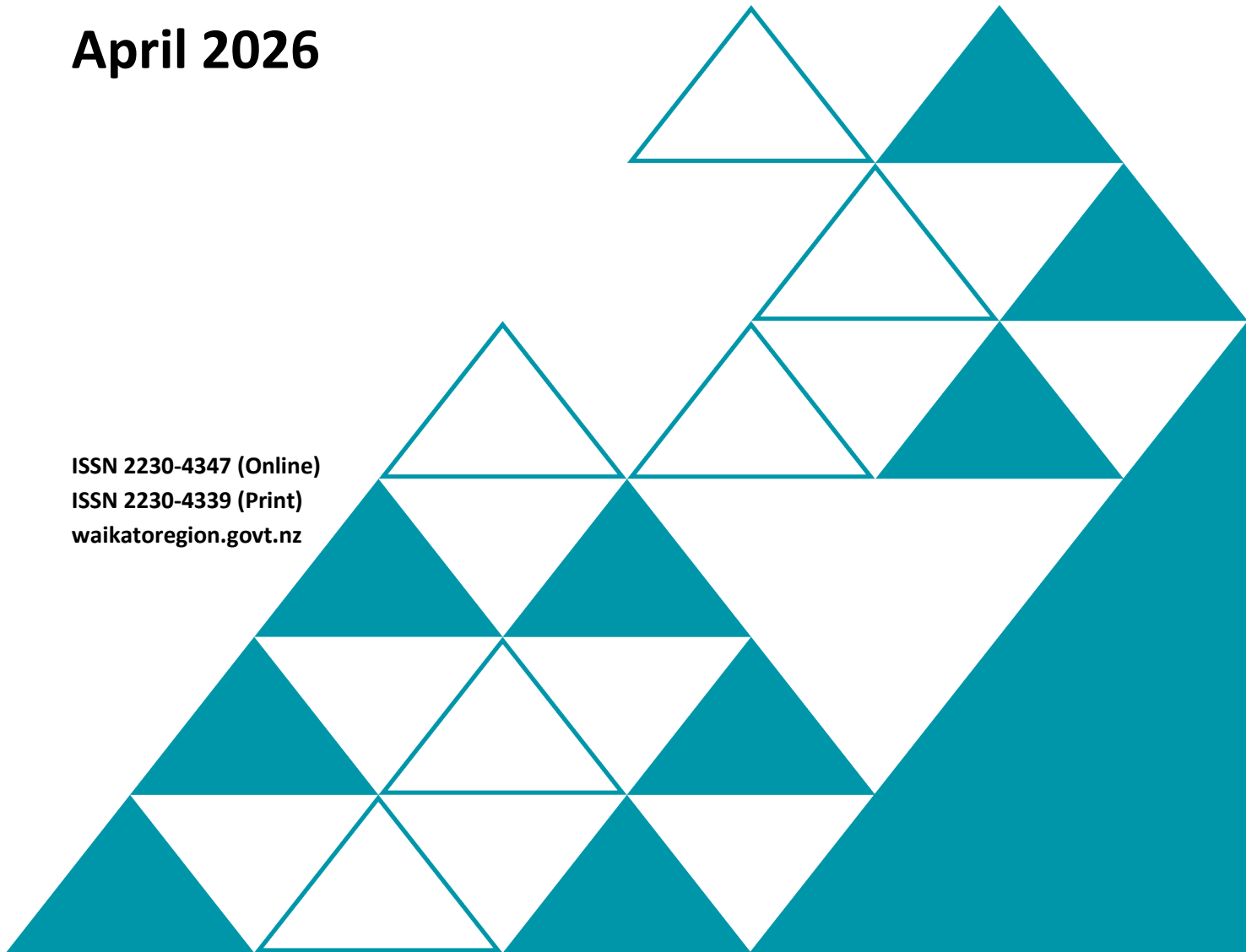
Waikato
REGIONAL COUNCIL
Te Kaunihera ā Rohe o Waikato

Te Rautaki Pūngao ā-rohe o Waikato

Waikato Regional Energy Strategy 2026-2050

April 2026



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Chairperson's 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, has now updated 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 security[1].

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] PS26-03-Strategic-Direction-2026-2036.pdf

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 *Waikato's energy system – resilient, affordable and sustainable.* *Powering Waikato's growth and New Zealand's clean energy transition*.	
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 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, has now updated 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 direction[2], the Waikato Regional Energy Inventory[3], 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 resource[4] 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 existence[5]. 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] Te Pae Tawhiti | Strategic Direction 2026-2036 | Waikato Regional Council
[3] Waikato Regional Energy Inventory | Waikato Regional Council
[4] Energy as the Master Resource
[5] The Woven Universe: Selected Writings of Rev. Maori Marsden 2023

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 managed[6].

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 sets 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 productivity[7].

[6] Transition to a Low-Carbon Economy for New Zealand | Royal Society
[7] OECD Economic Outlook, Vol 2025, Issue 2

Rising electricity prices and high transport costs continue to erode the competitiveness of New Zealand exports. 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 advance 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).

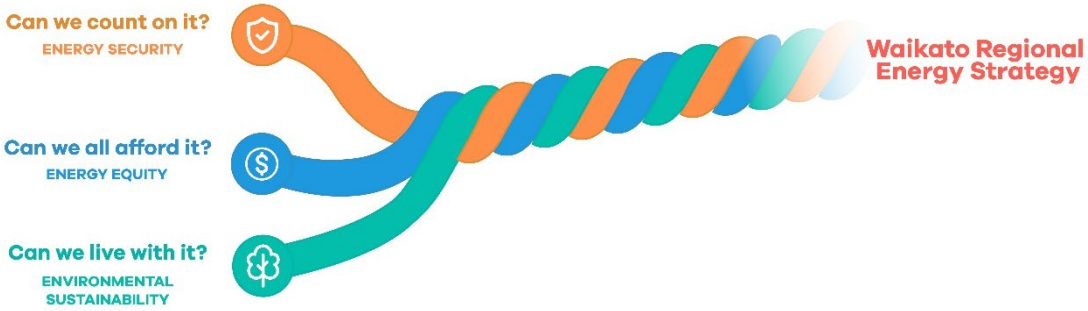


Figure 1: Integration of the three elements of the energy trilemma

1.3 Scope

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 CO_2, 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.

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.

2 Current situation

2.1 National picture

New Zealand continues to benefit from one of the world's highest shares of renewable electricity, primarily from hydro and geothermal.

[8] Stephen England-Hall, Genesis Energy Chief Revenue Officer at Climate Change and Business Conference, 2025

However, its overall energy supply still relies significantly on fossil fuels to meet its energy needs – mainly comprising coal, oil and natural gas (Figure 2).

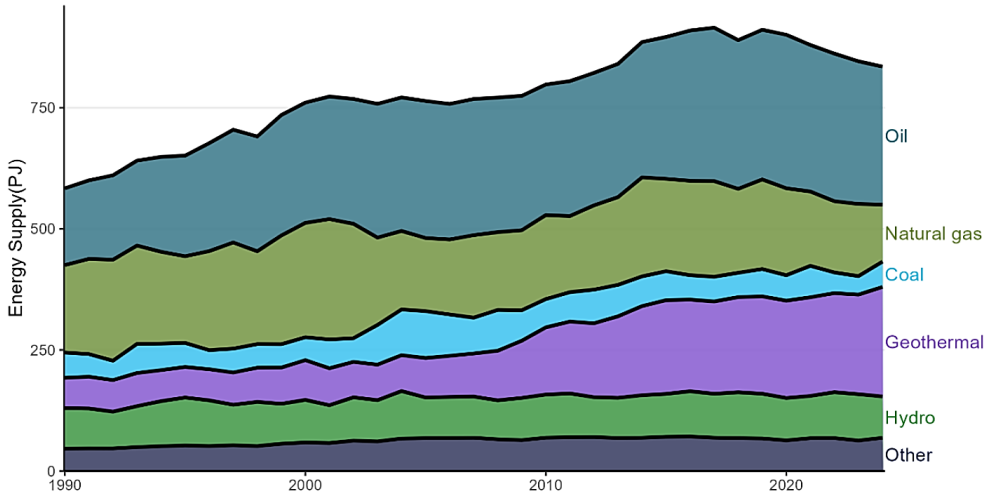


Figure 2: New Zealand's total energy supply[9]

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 (Figure 3) and unsuccessful exploration have tightened supply and increased costs for users. Gas remains most heavily used in industrial processes. Government policy has shifted – from banning offshore exploration in 2018 to reinstating it in 2025 alongside a $200 million Gas Security Fund, slowing the transition away from gas and delaying industrial decarbonisation. Despite uncertainty, existing gas infrastructure presents opportunities for renewable gases such as biomethane, and depleted reservoirs could support future gas storage or carbon capture.

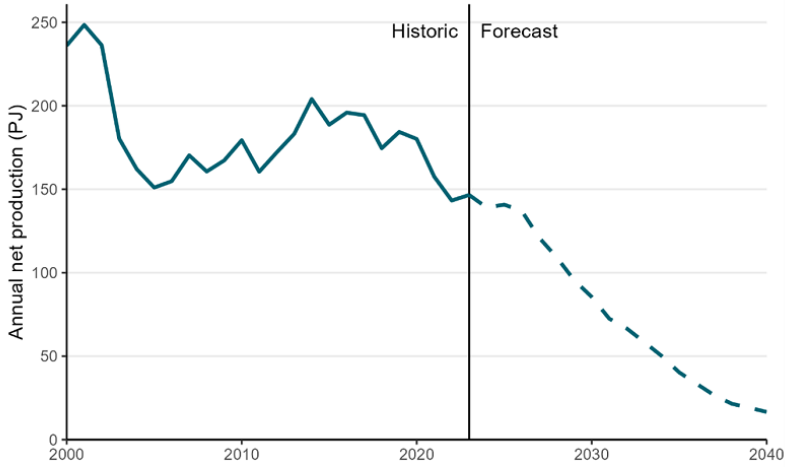


Figure 3: Historic and projected gas production[10]

The energy sector in New Zealand 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.

[9] Energy in New Zealand 2025 | MBIE
[10] Gas | Ministry of Business, Innovation & Employment

2.2 Regional picture

Waikato's role in New Zealand'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.

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 (refer to the energy flow diagram in Appendix B). 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)

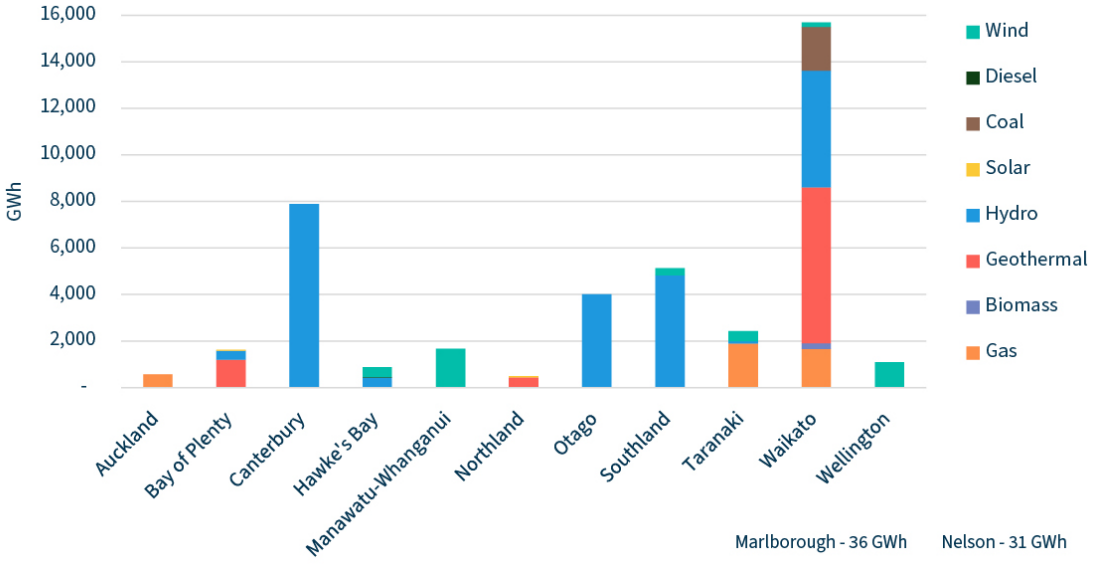


Figure 5: Grid connected electricity generation by region (2024)[11]

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.

[11] Concept Consulting Ltd analysis

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 Appendix B[12].

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 CO_2e 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 manufacturing[13].

How are greenhouse gas emissions managed?

Greenhouse gas emissions are primarily managed through the Emissions Trading Scheme (ETS). 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 emit[14]. 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)[15]. At the time of writing, a tonne of CO_2 emissions was priced at NZ$178 (4.5 times the local price) with expectations of between NZ$200 and NZ$300 (current exchange rate) by 2030.

3 Operating environment

3.1 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.

[12] See Appendix A for guidance on how to read and interpret a Sankey diagram
[13] How are my region's emissions tracking? | Stats NZ
[14] At the time of writing the price of carbon was $41.06
[15] Implementation of the European Union's Carbon Border Adjustment Mechanism | NZ Foreign Affairs and Trade

3.2 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. Successive governments have largely avoided making bold, structural changes to address long-standing issues. Instead, they have made incremental adjustments, without committing to reforms to reshape the energy system.

Government responses to obligations under the Paris Agreement[16] 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.

The focus of the current Government is 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.

3.3 Regulatory framework

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:** this Act 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.
- **Emissions Reduction Plan:** the Climate Change Response Act 2002 requires that an emissions reduction plan is prepared that sets out the policies and strategies for meeting the relevant emissions budget.
- **Resource Management Act 1991:** the Resource Management Act 1991 (RMA) establishes the roles of councils in managing the use, development, and protection of natural and physical resources. This includes the allocation of resources for the generation of electricity and the managing of the effects of electricity generation. 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.
- **Fast-track Approvals Act 2024:** the purpose of this Act is to facilitate the delivery of infrastructure and development projects with significant regional or national benefits.
- **Resource management replacement legislation:** the government is in the process of replacing the RMA with two new acts; a Natural Environment Act and a Planning Act. The Planning Act includes mandatory regional spatial planning which will set the strategic direction for development and public investment priorities in a region.

[16] The Paris Agreement is an international treaty on climate change. Its primary purpose is to keep the global average temperature well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

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 fuels[17]. 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.

Regional and local context

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.

- **Te Ture Whaimana o Te Awa o Waikato:** this is the primary direction setting document for the Waikato River and its catchment, including the Waipā River. Te Ture Whaimana prevails over any inconsistent RMA planning instrument, including any national policy statement.
- **Waikato RPS:** the RPS provides an overview of the resource management issues for the region and aims to achieve integrated management of natural and physical resources. Regional and district plans are required to give effect to the RPS[18]. The Waikato RPS recognises renewable energy as a significant regional issue. This has translated into streamlined consenting, long-duration approvals and spatial planning that supports renewable generation while protecting sensitive landscapes.
- **Waikato Regional Plan:** the Operative Waikato Regional Plan provides for the regulation of functions of the council under section 30 of the RMA, being water, river and lake beds, land and soil, air, and geothermal resources.
- **Waikato Coastal Plan:** the Operative Waikato Coastal Plan provides for the regulation of activities in the coastal marine area.
- **Proposed Waikato Regional Coastal Plan – Decisions version:** this is intended to replace the Operative Coastal plan and contains an Energy and infrastructure chapter, which recognises the benefits of renewable electricity generation and transmissions and enables these activities in appropriate circumstances within the coastal marine area.
- **District plans:** 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 though their management of land use and development.
- **Spatial plans:** the proposed legislation to replace the RMA will require a single regional scale plan that includes a spatial plan chapter. This will provide the opportunity to identify current and future locations of energy related infrastructure.

3.4 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 mix of parties includes:

- Central government
- Iwi Māori
- Electricity providers and transmission/distribution infrastructure providers

[17] New Zealand's First Emissions Reduction Plan | Ministry for the Environment
[18] RMA, Sections 67(3)(c) and 75(3)(c)

- Gas transmission and distribution networks
- Te Waihanga, Infrastructure Commission
- Te Mana Hiko, Electricity Authority
- Te Tari Tiaki Pūngao, Energy Efficiency Conservation Authority (EECA)
- New Zealand ETS
- Crown research institutes
- Commerce Commission
- Private fuel companies
- Transport fuel regulators
- Economic development agencies
- Industry peak groups
- Community advocacy groups

Waikato Regional Council's role

There are three mutually reinforcing roles driving regional council interest: supporting regional economic development that depends on energy; ensuring the sustainable use of natural and physical resources that contain energy; and strategically integrating energy supply, distribution, and end-use infrastructure with land-use planning across the region.

PART B – EVIDENCE BASE

4 Renewable energy sources

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 marine. An overview of current resources and opportunities is presented in Figure 6.

4.1 Solar

Solar energy uses sunlight to generate electricity most commonly through photovoltaic (PV) panels that convert solar irradiance into usable power. Solar can be installed almost anywhere – from rooftop to floating systems.	
Advantages	Sunlight is abundant and accessible, systems are quick to consent, easy to install, and versatile – can be installed on homes, marae, public buildings, farms, industrial sites or on water. It provides opportunities for iwi and has no operational emissions.
Disadvantages	Solar has intermittent generation and output is lowest in winter (when demand is highest). The upfront costs of solar panels is a significant barrier and suitable land parcels are required for large-scale development. Poor site development can affect landscapes, biodiversity or culturally significant places. In some areas network capacity is limited and connection charges are high. The 'energy return on energy invested' (EROI) is lower than all other forms of renewable energy[19].
Opportunities	Residential rooftop solar is the most widespread form of distributed generation in the Waikato and offers significant potential, particularly if upfront cost barriers can be overcome. Nationally, only one in 27 homes (3.7 percent) has rooftop solar[20]. A typical 3–5 kW system costs around $8,500–$11,500, with an additional $5,000–$15,000 for a battery[21]. There are several small solar farms currenting operating in the region, with at least eight larger projects consented, under construction or planned.

4.2 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. New Zealand has a substantial biomass resource. Within the Waikato, most exotic forests are concentrated near Tokoroa and Taupō.	
Advantages	Biomass can provide continuous, controllable energy – complementing intermittent renewables. It is highly versatile and affordable, and is a low emissions energy source when obtained sustainably. Forest waste can be used.
Disadvantages	The sustainability of the resource depends on the feedstock, and its use requires large feedstock volumes, with extensive storage and handling space.

[19] Solar Energy in New Zealand | EECA
[20] Which regions lead NZ in rooftop solar | Rewiring Aotearoa
[21] Breaking Down Home Solar Costs and Savings | EECA

Opportunities	Biomass is becoming an increasingly important part of the national energy mix. Māori land blocks with forestry plantations, farm operations, or access to organic waste streams may be well positioned to supply or own biomass projects. The co-location of North Island production forests with geothermal developments creates synergies by using geothermal heat to dry timber. Several biomass initiatives are underway, including new pellet and pine-chemical production at Kawerau (Foresta), food-waste-to-bioenergy and biomethane production in Reporoa (Ecogas[22]), biomass trials at Huntly, a waste-to-energy system being piloted in Reporoa (Cetogenix[23]), and ongoing landfill-gas power generation at Hampton Downs[24].

4.3 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.	
Advantages	Wind energy is abundant, reasonably stable over longer periods, produces zero emissions, and has a high EROI.
Disadvantages	Generation can vary significantly over hours and days. Wind turbines can have a visual impact on the environment, create noise and affect bird populations. They can also impact culturally significant skylines and ancestral relationships to maunga and ridgelines. Construction of wind turbines needs energy and material input – embodied emissions.
Opportunities	Wind provides higher output than solar during stressed winter periods supporting seasonal reliability. The Waikato currently has one operational wind farm (Te Uku), with seven more proposed, including two offshore projects. Offshore wind will depend on major upgrades to Port Taranaki and coordinated supply-chain development, including potential trans-Tasman partnerships. Grid capacity and transmission investment also remain key constraints.

4.4 Hydroelectricity

Hydroelectricity relies on gravity-driven water to generate electricity and operate within awa that are taonga, carrying their own mauri and whakapapa. It is increasingly challenged by more frequent dry winters and highly variable inflows, with storage levels now the main driver of electricity price volatility in New Zealand. The Waikato region has two major grid-connected hydro schemes – Tongariro Power scheme (operated by Genesis Energy) and Waikato hydro scheme (operated by Mercury). Water from the Whanganui, Whangaehu, Moawhango and Tongariro catchments is diverted into Lake Taupō, contributing around 19 percent of its annual inflow. Consents authorising the diversion of waters will expire in 2039. These will require reconsenting, 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.	
Advantages	Hydroelectricity is one of the only fully controllable and dispatchable renewable electricity sources. Hydro is reliable and consistent, when enough water can be stored, and has the highest EROI out of all energy sources.

[22] Reporoa Organics Processing Facility | Ecogas
[23] Tackling Climate Change at a Global Scale | Cetogenix
[24] Hampton Downs Landfill

Disadvantages	While hydro has delivered national benefit, its development has also created enduring cultural, environmental, and social impacts[25], including altered river flows, habitats, and wāhi tapu, which continue to influence kaitiakitanga and cultural integrity.
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. There is a proposal to raise Moawhango Dam to improve storage and dry-year resilience (see Section 5.2).

4.5 Geothermal

The Waikato region has over 70 percent of the country's known geothermal resources, supporting both electricity generation and direct heat use across major industries such as pulp and paper, wood processing, dairy manufacturing, hydrogen production and greenhouse heating. Iwi Māori consider geothermal fluid as a living entity and a taonga, and have used geothermal systems for cooking, bathing and heating for centuries[26]. There are 15 large geothermal systems in the region – seven have been identified as development systems for use, two for limited development, one for research, and five are protected due to their taonga relationship to iwi Māori and vulnerability of surface features. Any new undiscovered system is by default managed as if it were a research system. Systems developed for use include Wairakei-Tauhara, Ōhaaki, Mokai, Rotokawa and Ngā Tamariki.	
Advantages	Geothermal energy is abundant in the Waikato. It's consistent and reliable – ideal for baseload uses. The emissions intensity of geothermal electricity is low. The resource is already hot and therefore is very efficient for direct heating and industrial process uses
Disadvantages	Developing a geothermal power station is an expensive and risky proposition, requiring significant preliminary investigations and infrastructure, and specialised maintenance. Geothermal development can have damaging environmental effects including land subsidence and loss of high-value and culturally significant surface features[26].
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. Additionally, there are at least 31 known sites of low flow, low temperature geothermal scattered around the region that, upon investigation, may have potential for direct heat uses. 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. Central government has allocated funding for research into accessing super-hot geothermal energy at depth[27]. The Rotokawa geothermal reservoir has been selected as the first site for exploration.

4.6 Marine – wave

Wave energy is a form of marine power, driven by wind. It 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.	
Advantages	Wave energy is consistent and reliable, and makes efficient use of offshore space.

[25] Appendix 23 - Hydro Dams
[26] From the Ground Up | MBIE
[27] Government Exploring New Energy Source | Beehive.govt.nz

Disadvantages	Wave energy devices can have adverse effects on marine ecosystems. 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 yet[28]. Research into wave energy is increasing, with the University of Waikato exploring offshore deployment and device testing[29]. Kawhia is a promising site due to its strong marine conditions and local technical expertise. Despite the lack of a southern hemisphere testing centre, the region holds significant development potential with global relevance.

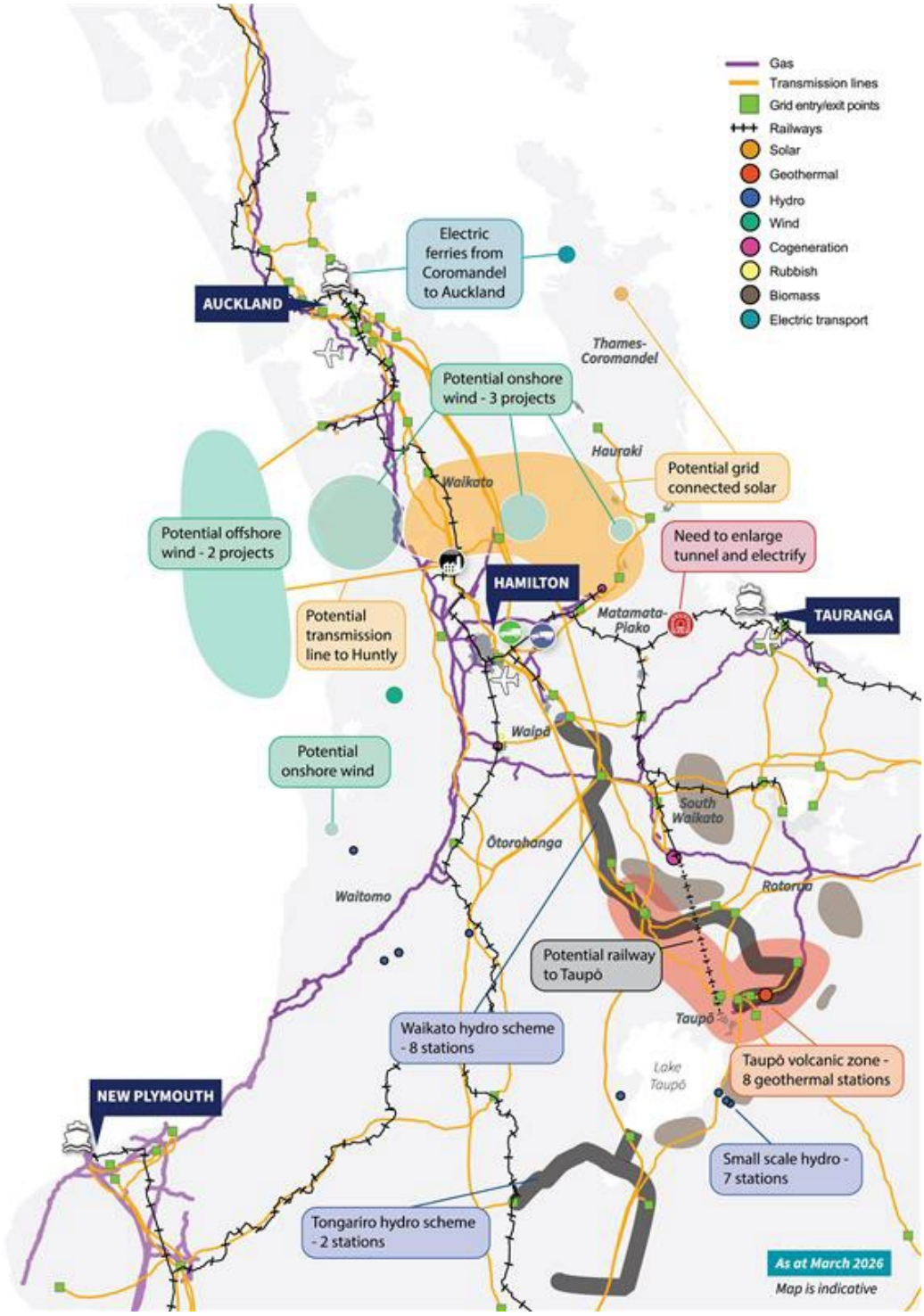


Figure 6: Overview of current renewable resources and opportunities in the Waikato region

[28] Integrated Site and Device Selection Methodology for Ocean Wave Energy Sector | UoW

[29] A Systematic Approach for Selecting Suitable Wave Energy Converters for Potential Wave Energy Farm Sites | Science Direct

5 How energy is stored

New Zealand's recent energy crises and rising use of intermittent wind and solar energy highlight the need for flexible storage to manage weather-dependent supply and support both local and national energy security. Storage is also critical to addressing the persistent dry-year problem, historically met by fossil fuels. Energy storage can take many forms – large scale options currently include batteries, pumped hydro, hydrogen and biomass.

5.1 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 remain the most common and cost-effective option, well suited to daily storage cycles. Newer technologies, such as sodium-ion (safer and more sustainable) and iron-air batteries (multi-day storage), are emerging and may complement future energy needs.

EV batteries are also becoming part of the wider system through vehicle-to-load (V2L) and vehicle-to-grid (V2G) capabilities. When coordinated at scale, EVs could supply power back to homes or the grid, reducing peak demand and unlocking significant economic benefits. Realising these benefits requires smart-charging, user-friendly systems, and nationwide "type-of-use" pricing that rewards flexible charging behaviour.

In the Waikato, there are currently four operational or committed BESS projects and four additional proposals.

5.2 Pumped hydroelectric

Pumped hydroelectric storage 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 Project[30] identified potential large-scale storage options, including Lake Onslow (although this option was halted – and since revived privately) and around Lake Taupō[31], including above Lake Moawhango – which consists of three dam locations and could add in excess of 1,000 GW hours storage. The Tongariro power development assets could be repurposed alongside this proposal.

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. Together, these could provide around 28 GWh of storage or deliver up to 600 MW of renewable peaking capacity for two days[32].

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.

5.3 Hydrogen and derivatives

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).

[30] New Zealand Battery Project | MBIE
[31] Identifying Potential Sites for Large-Scale Pumped Hydroelectric Energy Storage in NZ | NIWA
[32] Unpublished research proposal | UoW

In more complex pathways, green hydrogen contributes to other outputs such as green ammonia and sustainable aviation fuel (SAF):

- **Green hydrogen** is already emerging as part of Waikato's low-emissions transition, with early regional projects underway by Hiringa Energy[33] and partners.
- **Green ammonia** can replace fossil-fuel-based urea, provide energy storage for electricity generation, and also serve as a fuel for maritime transport. Maritime use of green ammonia is still emerging but trials show it can cut emissions by up to 90 percent. However, ammonia is toxic and corrosive, creating significant safety and environmental risks, especially near ports.
- **Sustainable aviation fuel (SAF)** is the umbrella term for non-fossil, drop-in fuels that can directly replace Jet A-1[34]. SAF includes bio-SAF made from crops (which raises sustainability concerns) and e-SAF produced from green hydrogen and captured carbon, which is more scalable long term but is currently expensive and still at pilot scale. Both fuels cost far more than Jet A-1, so SAF makes up only 0.3 percent of global use. Plans for a 300 MW e-SAF plant at Marsden Point could supply Auckland Airport, but additional infrastructure would be required for Hamilton Airport.

5.4 Biomass

Pelleted biomass provides a consistent, efficient, low-moisture fuel suitable for residential, commercial and industrial heat, with advanced forms like torrefied pellets able to directly replace coal and withstand outdoor storage. Foresta is producing torrefied pellets[35], powered by geothermal steam, at its Kawerau site, with potential expansion into the Waikato. Torrefied pellets offer high energy content, lower conversion costs, and up to 95 percent emissions reduction, proven through successful trials at Huntly Power Station, where Genesis Energy plans to source 300,000 tonnes annually by 2028. Fonterra's Te Awamutu site has already demonstrated the benefits of biomass conversion, with wood-pellet fuel delivering major emissions cuts, improved efficiency, and reduced environmental impacts, though pellets require covered storage to avoid moisture absorption.

6 How we use energy

Energy demand reflects the essential services society depends on – heat, light, transport from both domestic and industrial/commercial activity. Understanding how and where these services drive energy use is central to planning an affordable, resilient, and low-emissions system.

6.1 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.

Rail

Rail lines between Auckland, Hamilton and Tauranga, link the import and export ports of the 'golden triangle'[36] with high freight volumes and passenger flows. The first 52.3 km to Pukekohe is electrified as is a short section near Frankton Junction, however, beyond Hamilton, it remains unelectrified. Extension of electrification options to the entire North Island rail network would support inter-regional supply chains, strengthen connectivity for emerging energy-intensive industries, and enable export industries to benefit from the reduction of transport emissions.

[33] About Hydrogen | Hiringa Energy
[34] Also known as Aviation Turbine Fuel (ATF) or 'avtur'.
[35] Torrified Wood Pellets | Foresta Group
[36] Waikato Regional Transport Committee Presentation | KiwiRail

The Waikato region generates 25 percent of New Zealand's rail freight. In 2025, 260,000 truck trips were avoided through the use of rail freight. Rail uses approximately one-quarter of the energy of heavy trucking to move the same weight and has on average 60 percent fewer emissions[37].

There are a broad range of options[38] for the electrification of rail with the most promising option being a combination of battery electric and selective extension of overhead line electrification. Currently, charging economically is the largest uncertainty surrounding the choice of battery-electric locomotives. 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.

A hybrid network could look like Figure 7 and may be an interim step to full electrification. This would require a new dual track tunnel, through the Kaimai ranges, estimated at $1 billion, which could be met by reprioritising national roading infrastructure priorities.[39]

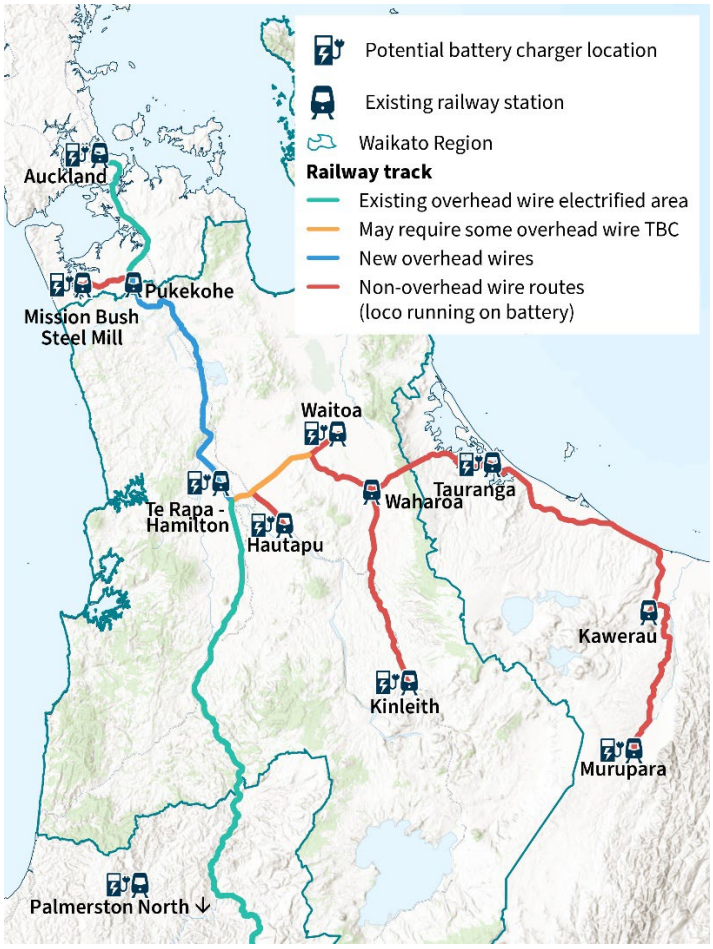


Figure 7: Potential electrification of the golden triangle using battery electric hybrid locomotives[40]

Road

Transport accounts for 21 percent of New Zealand's carbon footprint, with most emissions coming from the light vehicle fleet – cars, vans and utes. While low- and zero-emission technologies for road transport are proven and available, the main barrier to the transition is cost. Even freight operators committed to reducing emissions face challenges – government support is needed to overcome regulatory and cost barriers.[41]

[37] Environment | KiwiRail
[38] Biofuel, hydrogen, electricity, battery-electric locomotives, conventional overhead line electrification, fuel efficient diesel
[39] Dumping One Road of National Significance Would Pay for Fast Inter-City Rail | Asia Pacific Infrastructure
[40] Golden Triangle Electrification Project | The Chartered Institute of Logistics and Transport
[41] Heavy-Vehicle Operator Understanding | Ministry of Transport

A three-pronged approach offers the greatest impact: shifting more freight and passengers to rail; leveraging the region's strong renewable electricity generation for light vehicles and last-mile logistics; and using green hydrogen for heavy and long-haul transport. Rail produces far fewer emissions than road freight (36 gCO_2e/tonne-km compared to 508 gCO_2e/tonne-km) [42], and each freight train can replace around 40 trucks[43]. Mode shift also delivers wider benefits, including reduced road damage, lower congestion, and improved safety.

Neither hydrogen nor battery-electric systems can meet all road transport needs. Each has strengths for different tasks – hydrogen for heavier freight and long distances, and battery-electric for light vehicles and urban deliveries. Hydrogen trucks offer resilience to global supply shocks and lower freight emissions, though current fuel costs remain high and depend on grid-supplied electricity and water; these costs are expected to decrease with scale.

Battery-electric cars, vans and delivery trucks are already efficient, low-cost and widely available. Government investment is supporting this shift, including funding for 10,000 additional EV chargers. Public transport is also transitioning, with the Waikato Regional Public Transport Plan (RPTP) committing to zero-emission bus purchases from 2025, aligning with the national goal of a fully decarbonised bus fleet by 2035[44].

Maritime

Apart from the offshore ironsand terminal at Taharoa, the region has no major coastal ports. Maritime activity is instead centred on around 160,000 recreational boaties, along with charter vessels and ferries, which typically use petrol or diesel. Commercial marine diesel use is not well quantified but is likely a notable contributor to regional transport emissions, particularly from mussel farming and coastal freight[45].

There is long-term potential to transition commercial marine operations to low- and zero-carbon fuels, and possibly to manufacture substitutes for heavy fuel oil used in coastal shipping. While ammonia is already transported internationally, its toxicity and corrosiveness require specialised bunkering and careful handling, creating safety and logistics challenges.

More immediate opportunities lie in electrifying small to medium commuter ferries and aquaculture service vessels. A local business (Vessev) is trailing a passenger catamaran on the Hauraki Gulf [46].

Air

Hamilton International Airport has experienced rising passenger numbers since 2025, driven largely by the return of trans-Tasman flights. Growth is expected to continue with the Titanium Park expansion and potential increases in international services, particularly for high-value exports.

Aviation is recognised as a 'hard-to-abate' sector, and the Government's Aviation Action Plan[47] aims to reduce fossil-fuel use and support a transition to clean energy in line with New Zealand's 2050 net-zero target. Currently, only one low-carbon option, "drop-in" SAF, is compatible with existing aircraft. All other emerging technologies require changes to aircraft design.

SAF was identified as a significant opportunity by Air New Zealand[48] and could potentially be refined within the region, but high costs and the need for new refuelling infrastructure limit near-term adoption. Progress at Hamilton International Airport will require coordinated investment across infrastructure, policy and industry[49].

[42] Comparing Freight Transport Emissions by Mode | Transportation Conference 2021
[43] Rail Freight Saved 230,000 Tonnes of Emissions | KiwiRail
[44] Public Transport Decarbonisation | Ministry of Transport
[45] Economic Impacts of Aquaculture in the Waikato Region | Waikato Regional Council
[46] The NZ Startup Building Flying Electric Ferries | NBR Podcast
[47] Aviation Action Plan | Interim Aviation Council
[48] Climate Change & Business Conference 2025 | Sustainable Business Council
[49] Sustainability | NZ Airports Association

Electric aircraft may offer a viable option for some regional routes. Air New Zealand is already investigating the use of electric propulsion for freight and is currently conducting a technical demonstration programme with an electric aircraft.

Over time, aviation in the region will likely rely on a mix of battery charging, hydrogen fuelling and SAF. Hydrogen poses additional challenges, as all destinations must have compatible refuelling capacity, making a coordinated national strategy essential.

Ground effect marine

Ground-effect marine craft fly a few metres above the water, combining the speed of an aircraft with the low operating costs of a boat. Their aerodynamic "ground effect" delivers major efficiency gains – around 30–50 percent more efficient than conventional flight and 8–15 times more efficient than high-speed displacement boats.

A New Zealand company (Ocean Flyer[50]), plans to launch high-speed seagliders in the Hauraki Gulf from mid-2026 to provide fast, cost-effective passenger and freight services between coastal centres such as Whangārei, Auckland and Coromandel.

6.2 Industrial/commercial process and space heating

The Waikato has the highest concentration of fossil-fuel-dependent process-heat sites in the country. Waikato's Regional Energy Transition Accelerator (RETA) report[51] highlighted 91 sites in the region, highlighting significant opportunities for regional transition. These sites all operate large (>500 kW) fossil-fuelled process-heat equipment and span sectors such as dairy, meat, timber, food and beverage, and commercial sectors such as schools, hospitals and accommodation providers. 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 CO_2e emissions. The region's export economy is dominated by the dairy sector, making dairy processing sites the single largest opportunity for transitioning to renewable energy.

6.3 New industries – data centres

Digital services are now essential to modern life. Data centres are locations for storing and processing data and are becoming core infrastructure for the digital economy. Their growth is driven by rising demand for computing power, particularly from artificial intelligence and real-time applications such as autonomous vehicles and electricity grid management.

Data centres rely on three main types of infrastructure:

- **Information and communication technology**: computers, servers, routers international data cables and fibre optic cabling. New Zealand is connected to the rest of the world by five international submarine data cables – all connect to the United States west coast[52]. More are under construction and consideration.
- **Cooling systems**: needed to manage the significant heat produced by modern chips, often requiring large volumes of water. Water requirements and cool temperatures make the Southland an ideal location for hyperscale data centres.
- **Power supply**: reliable electricity supported by grid connections, backup generation and battery storage.

New Zealand's data centre electrical capacity is currently 104 MW and is expected to triple by 2030. New Zealand already hosts 56 data centres (nearly half in Auckland) with four in Hamilton and a further 20 planned nationally[53]. Spark and the University of Waikato have an agreement to manage the University campus data centre as part of their strategy to build data centre capacity and enhance connectivity and resilience in the region.

[50] Seagliders - The Future of Travel | Ocean Flyer
[51] Waikato Regional Energy Transition Accelerator | EECA
[52] Submarine Cable Map | TeleGeography
[53] Our National Data Centre Infrastructure | NZTech

The location of data centres matters. While hyperscale facilities offer strong economies of scale, they also concentrate risk. Locating data centres close to where data is used reduces latency, strengthens resilience to natural and geopolitical disruptions, and supports indigenous data sovereignty[54]. New Zealand's political stability, distance from conflict zones, and abundant renewable energy provide distinct advantages[55], though the country is still exposed to natural hazards such as earthquakes and floods. The Waikato offers low seismic risk and low latency, but it remains uncertain whether these regional benefits will outweigh the natural cooling advantages of southern regions.

7 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 2050[56]. 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.

7.1 Electricity

Transmission and distribution

New Zealand's electricity sector operates through four distinct functions: **generation**, where most electricity is produced by four major companies (Contact, Genesis, Meridian and Mercury); **transmission**, where Transpower owns and operates the national grid and balances supply and demand; **distribution**, where local lines companies deliver electricity from substations to homes and businesses; and **retail**, where retailers purchase electricity on the wholesale market and sell it to consumers through installation control points (ICPs).

The system was designed to keep generation, transmission, distribution, and retail separate to promote competition and ensure prices reflected true production and infrastructure costs. Over time, however, most generators have also become retailers, creating vertically integrated "gentailers" that can offset losses in one part of the business with profits from another. Critics argue this vertical integration weakens competition and is a structural flaw in the current market model.

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.

Future transmission requirements

A successful low-emissions transition depends on a reliable, affordable electricity transmission system – there is *no transition without transmission*[57]. This requires proactive grid investment ahead of renewable generation, locating vulnerable assets away from climate-exposed areas, maintaining and upgrading ageing infrastructure, and ensuring policy settings support regional and national energy connectivity.

[54] Unlocking the Potential: New Zealand's Data Centre Industry
[55] Data Centres as Strategic Infrastructure: Unlocking Value for NZ Inc | BCG
[56] Electricity Demand and Generation Scenarios: Results Summary | MBIE
[57] No Energy Transition without Transmission | PwC

New Zealand's electricity system is shifting from a centralised model to a more decentralised one, with growing volumes of variable generation such as wind and solar, rising electrification of transport and process heat, and more active consumers feeding power back into networks.

Large-scale offshore wind will require significant grid upgrades, with Transpower's scenarios identifying South Taranaki and the West Coast of Waikato as the most viable locations. Waikato is the more cost-effective option for grid integration, while Taranaki developments would either need to be consumed locally or require major transmission investment. A shared development pathway across both regions would strengthen grid resilience.

Nationally, Transpower has reported a surge in grid-connection enquiries with 323 proposals totalling 46,548 MW as at December 2025 – signalling a structural shift toward electrification and the need for coordinated planning and investment. Waikato remains a major area of interest, contributing 19 percent of national enquiries and 15 percent of proposed capacity.

Interest in large-scale battery energy storage has also increased sharply, with three operational projects and five proposed, expanding proposed capacity by +700 MW – highlighting the rapidly growing role of storage in a future renewable-dominant grid.

Prices

New Zealand's electricity pricing system is complex. New Zealand consumers have experienced a significant increase in the price of electricity in the past 25 years, contributing to cost-of-living pressures, even as commercial and industrial users have seen reductions. International comparisons hide this because New Zealand started from a low base compared to other countries. Market reforms reversed earlier policies that kept residential prices low, leaving households with less bargaining power than large users[58]. Gentailers often attribute higher household prices to morning and evening peaks, but most consumers are on fixed-price plans that insulate them from price variability – but this also means that consumers can't take advantage of the variability by shifting their demand when prices are high.

New Zealand's electricity market has no price cap or capacity market, relying instead on high scarcity prices to fund long-run investment[59]. Unlike many countries where governments finance major renewable and storage projects, New Zealand passes these costs directly to consumers (through electricity bills)[60]. This model has contributed to underinvestment in new supply because sector settings prioritise shareholder returns over reinvestment.

Time-of-use pricing and smart metering could better reflect real costs, encourage shifting demand away from peak times, and reduce system costs, but most households remain on flat-rate plans. To address this, the Electricity Authority is updating the industry code to strengthen incentives for retailers to offer time-of-use plans and reward consumers who supply or shift power during peak periods.

Managing electricity demand

Demand management reduces overall energy system costs by lowering or shifting electricity use. It helps match demand with variable renewable supply, particularly solar and wind, by moving consumption to off-peak periods when electricity is cheaper and more plentiful. Balancing energy supply and demand is challenging, and around 20 percent firming capacity is needed to meet peak demand. New Zealand relies on coal, oil and gas to back up hydro during cold winter peaks – demand management can provide an alternative approach, reducing reliance on fossil fuels. It also includes local generation, such as rooftop and onsite solar, which lowers grid demand.

[58] An analysis of the nature and quality of discourse around, and the drivers of policy change in NZ electricity sector
[59] The New Zealand Electricity Market: Challenges of a Renewable Energy System
[60] Energy to Grow, Securing New Zealand's Future | BCG

Although New Zealand has used tools like ripple control[61] since the 1950s, demand management declined after energy-market deregulation, as energy conservation was seen as conflicting with profitability.

Recent dry years have highlighted system vulnerability: low hydro inflows drive up prices, contributing to industrial closures and worsening cost-of-living pressures. Recent closures include Tasman Mill, Penrose paper recycling mill, Karioi Pulp Mill and Kinleith Mill[62].

As climate change increases the frequency of dry years, effective demand management will be essential to reduce prolonged high prices and support system stability.

Distributed renewables

Distributed generation produces electricity close to where it is used, using technologies such as rooftop solar, small-scale hydro, wind turbines, and BESS. Because these systems connect to local distribution networks rather than the national grid, they can reduce demand on centralised generation and help balance supply and demand. Distributed renewables can lower electricity costs for households, communities, and businesses, while improving resilience during extreme weather by maintaining local supply. Their short construction times and small scale make them flexible and cost-effective, with minimal energy costs once installed. Generating power locally also reduces network losses and can ease wholesale electricity prices, providing particular benefits for low-income households who spend a larger share of their income on energy.

7.2 Gas

New Zealand's gas transmission network, owned and operated by First Gas Limited, is a key strategic asset linking Taranaki's onshore and offshore gas fields to major industrial users and urban centres across the North Island. The Waikato region sits in a pivotal position within this network as the corridor connecting Taranaki to the wider upper North Island.

The pipeline system also provides future opportunities to transport increasing volumes of renewable gases such as biomethane. This is already underway at the Ecogas facility in Reporoa, which plans to upgrade biogas to biomethane for direct injection into the national pipeline network.

Depleted oil and gas reservoirs offer proven long-term gas storage potential, creating future strategic value if linked to emerging carbon-capture technologies. Experimental work[63] is currently exploring the capture of CO_2 from geothermal electricity generation and reinjecting it into geothermal reservoirs, highlighting the potential for integrated carbon management solutions.

8 Exploring future energy pathways

The Waikato energy transition will not follow a single fixed path; instead, it will depend on choices made today, in response to global forces, policy settings, and technological change. In short, there is no 'silver bullet' and a range of approaches will be needed in any transition. To understand possible futures, three scenarios were developed and modelled – not as predictions, but as plausible pathways reflecting different policy and market conditions.

These range from an incremental, market-led change, a security-focused static pathway, to a coordinated and proactive dynamic transition. Together they show the spectrum of likely futures. The scenarios are summarised in Figure 8 and Appendix C.

[61] A network management tool – used to switch off the electricity supply to certain electrical appliances during peak demand
[62] Energy to Grow, Securing New Zealand's Future | BCG
[63] Carbon Dioxide Removal with Geothermal and Bioenergy Sources | University of Canterbury Research Programme

Business as usual (BAU): market-led transition	Static: energy security over sustainability	Dynamic: coordinated, proactive transition
The BAU scenario represents a continuation of current policy settings and government projections. It provides a baseline against which the static and dynamic scenarios are compared.	In this scenario, energy security and short-term affordability are prioritised (via legacy technology) over environmental sustainability. The shift away from fossil fuels is deprioritised and the transition is slow.	In this scenario, decarbonisation is seen as a long-term economic opportunity, with a balanced and coordinated approach to the energy trilemma. The transition is the fastest under this scenario.

Figure 8: Future energy scenarios developed and modelled for the Waikato Regional Energy Strategy

The three scenarios were modelled 50 years into the future to 2075. Sankey diagrams[64], showing energy flows for each scenario, are provided for 2050 to align with the national target for the reduction of greenhouse gas emissions. These are provided in Appendix D, with interactive versions available online: Waikato Region Energy Sankey 2024-2050

The resulting regional energy pathways were 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 gross domestic product (GDP), sectoral output, investment, prices, and trade[65].

8.1 Findings from the modelling

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 1.

Table 1: 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

[64] See Appendix A for guidance on how to read and interpret a Sankey diagram
[65] Waikato Regional Energy Scenarios December 2025 | Concept Consulting Group Limited

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

Business as usual

Under the BAU scenario, energy-related greenhouse gas emissions decline substantially over time, falling 53 percent by 2050. This reduction is driven by a gradual shift in both energy supply and demand. Energy supply is increasingly sourced from within the region, with strong growth in geothermal and biomass and more moderate increases in wind and solar. This lifts electricity generation by around 20 percent and enables higher exports, while hydro generation remains largely unchanged. Coal use increases briefly to support winter electricity needs but declines sharply after 2037 as coal-fired boilers are phased out. Biomass progressively replaces fossil fuels for industrial heat, and liquid fuel use declines as transport electrifies (Figure 9).

Electrification improves overall energy efficiency, particularly in road transport, helping to reduce total final energy demand. Energy prices in this scenario are shaped by new electricity investment, a shrinking base of gas customers, and ETS carbon pricing that peaks in the early 2030s. Transport electrification progresses gradually, with limited observable impacts on GDP.

The BAU scenario assumes GDP growth consistent with the New Zealand national emissions projections, sizing the Waikato economy at $24.9 billion in the start year and growing in real terms to $39.1 billion by 2050 – an increase of $14.2 billion, or average annual growth of $0.54 billion.

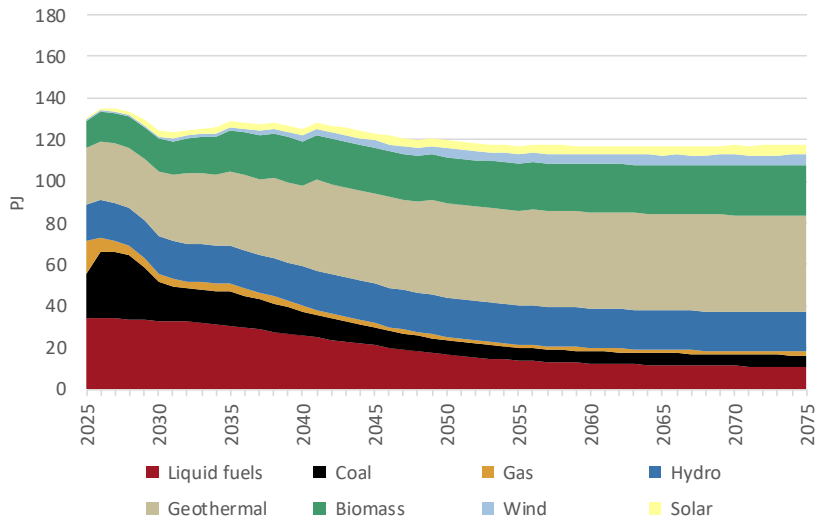


Figure 9: BAU energy demand by fuel for 2025 to 2075

Static

The static scenario prioritises short-term energy security and affordability over sustainability, slowing the pace of decarbonisation but still reducing energy-related greenhouse gas emissions by 44 percent by 2050. In this scenario, more energy is supplied from within the region (up 30 percent), reliance on imported fossil fuels decreases, and electricity generation increases by around 11 percent, with similar exports to other parts of the country.

However, overall energy demand remains more dependent on fossil fuels than in the other scenarios, with only a gradual decline in locally sourced coal, liquid fuels and gas under weak decarbonisation incentives. Geothermal demand continues to grow due to its cost competitiveness (Figure 10).

Because decarbonisation incentives remain weak, fossil fuels retain a prominent role and gas-peaking power prices stay higher for longer. Transport electrification progresses more slowly, only about 50 percent of light-vehicle travel is electric by 2043, and emissions fall to around 2.53 Mt CO_2e by 2075 (about 55 percent below current levels).

Economic growth under this scenario is modest. Regional GDP is only slightly above the BAU scenario in the short term (up 0.7 percent after ten years), easing to a small 0.2 percent increase by 2050, with national GDP rising just 0.1 percent. This indicates limited economic benefit from policies that align with this pathway.

In the Waikato, electricity prices rise above BAU levels toward 2050, with similar trends nationally. These higher prices flow through to production costs, household consumption, and factor incomes. The small GDP gains reflect continued reliance on domestic and imported fossil fuels, which increases exposure to international carbon-border measures such as the CBAM.

Household consumption of electricity is slightly higher than in both the BAU and dynamic scenarios due to lower NZU. However, regional employment and wages fall by around 2.5 percent below BAU by 2050, driven by weaker electricity generation growth, slower transport electrification, and ongoing exposure to carbon-priced fossil electricity. The scenario's dependence on imported fossil fuels also makes it highly vulnerable to oil price shocks, with GDP gains falling by 44 percent compared to a no-shock scenario[66].

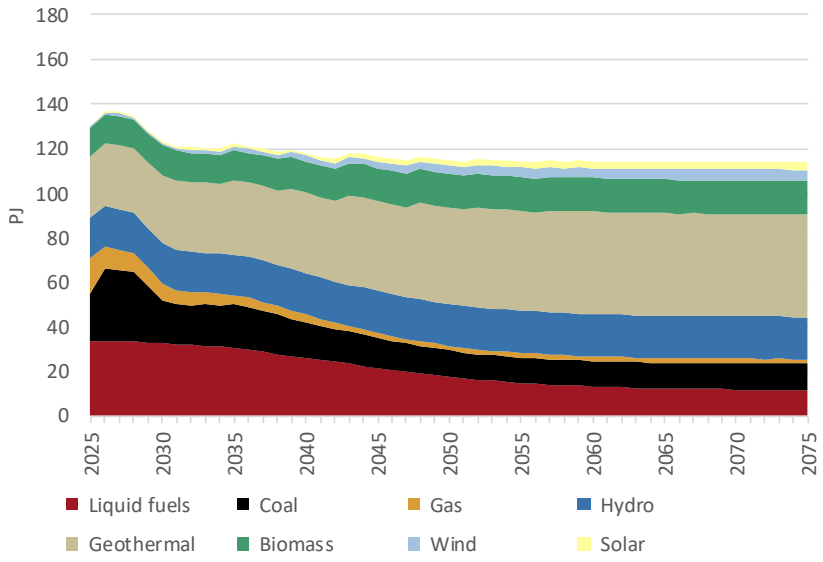


Figure 10: Static scenario energy demand by fuel for 2025 to 2075

Dynamic

This scenario treats decarbonisation as a long-term economic opportunity and delivers the largest emissions reduction, cutting energy-related greenhouse gas emissions by 77 percent. This is achieved by rapidly shifting the region away from imported fossil fuels toward locally supplied renewables such as wind, solar and geothermal, enabling greater electrification and increased electricity exports to other parts of the country.

Coal is phased out more quickly under stronger carbon pricing. Gas is used only briefly for security and firming before being largely phased out, while geothermal energy expands for both electricity generation and direct heat applications (Figure 11).

[66] An oil shock was simulated by adding a 20 percent increase in the price of imported oil products in 2043 to both the static and dynamic scenarios.

Energy demand increases from 52 PJ in the BAU scenario to 56 PJ by 2050, driven by rising data-centre electricity use and greater direct use of geothermal heat. Electricity prices face some upward pressure due to higher demand but this is partially offset by faster consenting processes and increased demand flexibility. Retail gas prices rise sharply for the remaining small consumers as network costs are spread across fewer users.

Carbon prices follow the Climate Change Commission's 2023 demonstration path, with NZU prices rising three percent per year. Transport electrifies more rapidly, with half of light-vehicle travel electric by 2038, alongside accelerated rail electrification (from 2035) and earlier uptake of low-emissions aviation. These changes help reduce energy-related greenhouse gas emissions to around 0.99 Mt CO_2e by 2075.

Faster electrification with efficiency gains[67] and fuel switching lift regional GDP by 0.9 percent after ten years and 1.5 percent by 2050 (compared with 0.7 percent and 1.3 percent nationally). This growth is supported by additional wind and solar generation, higher uptake of electric transport, and the presence of data centres that put downward pressure on electricity prices.

Lower electricity prices flow through to reduced costs and higher household consumption, while expanding renewable generation increases regional employment and wages by around 2.5 percent in the medium term compared with BAU.

With far less reliance on imported fossil fuels, the region becomes more resilient to external shocks. An oil-price shock erodes only about nine percent of anticipated GDP gains – demonstrating greater resilience under a renewable-dominant and locally sourced energy system.

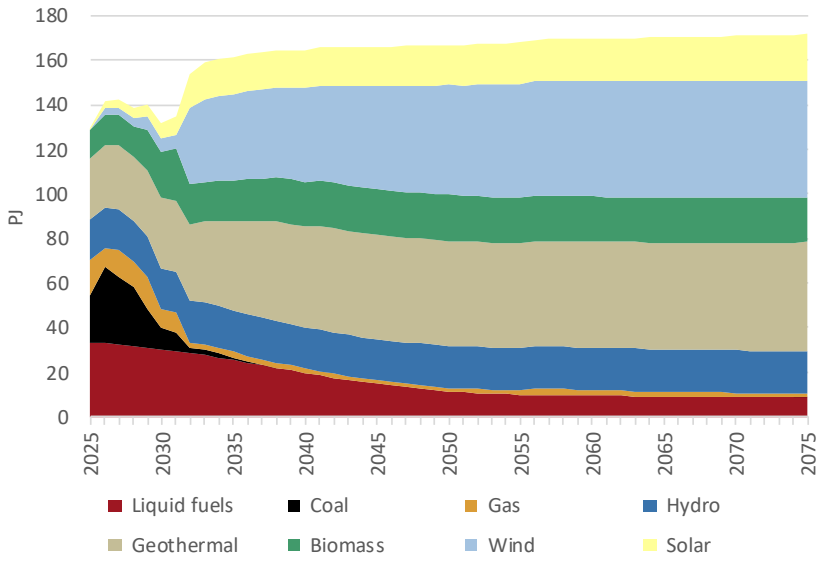


Figure 11: Dynamic scenario energy demand by fuel for 2025 to 2075

8.2 Key messages

The scenario modelling reveals several key messages for the region.

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.

[67] Electrification reduces the total amount of energy required to deliver a given service, as electric motors, electric boilers, and heat pumps are substantially more efficient than fossil fuel technologies. This is most pronounced in the transport sector.

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.

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.

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

9 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.

10 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.

11 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.

11.1 Opportunities for the Waikato

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 development[68]. Renewables also improve the viability of established industries previously constrained by energy costs.

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 sectors[69]), 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.

[68] Closing the Nutrient Loop Between Urban and Rural Areas | Analysing the Technical Potential of Recycling Fertilizers from Urban Biorefineries

[69] 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.

Renewable energy hubs

Transitioning existing industries and locating new ones close to where renewable energy is found helps capture more of the economic benefits and reduces transmission losses. An example is the cluster at Mokai, where Tuaropaki Trust uses geothermal heat from the Mokai system to support dairy processing, horticultural cropping, hydrogen production and electricity generation in one integrated energy precinct. If energy is in the form of heat, there is no more efficient use than using it as heat[70].

Commercial and industrial businesses also need access to skilled labour, affordable land, strong logistical links (such as freight roads, rail, gas pipelines and data cables), reliable grid connections, and a consistent biomass supply. Most, if not all, these key factors conveniently converge in three places:

- **Wairakei/Taupō hub**: the Taupō–Wairakei area is a major geothermal hub, making it ideal for industries that require direct process heat such as greenhouse horticulture, timber drying, dairy processing, aquaculture, food processing, district heating and industrial steam.
- **Tokoroa hub**: Tokoroa and its surrounding area, including Kinleith, Whakamaru and Lichfield, is close to major forestry and biomass resources, the Waikato River hydro lakes, an undeveloped geothermal system, and critical transport links such as the Kinleith rail line, SH1, the First Gas pipeline and Transpower's high-voltage grid.
- **Huntly hub**: Huntly is strategically located within the upper North Island golden triangle, with strong transport links, and existing energy infrastructure. The area is increasingly suitable for agri-solar, floating solar, and both onshore and offshore wind development. Huntly's established fossil-fuel energy precinct could be converted to biomass.

These areas present the best opportunities to create or expand renewable energy hubs. They also present opportunities for iwi-led and partnered development, including skilled employment for rangatahi, local supply chains, and projects aligned with rohe-specific aspirations.

11.2 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.

[70] If geothermal already gives you heat, don't waste energy converting it into electricity first — just use the heat directly Direct Use Geothermal vs Power Generation: Which is More Efficient?

11.3 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.

Partnership models

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

Support 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.

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 and enable renewable energy developments

When engaging with government, industry, iwi and communities, advocate for renewable energy by leveraging the evidence and insights contained in the strategy. Promote clear and consistent messaging that encourages investment in renewable energy developments.

Lead by example

Lead by example by prioritising low-emissions solutions in procurement and organisational decision-making, and by sharing practical case studies of organisations transitioning away from fossil fuels to inspire and guide others. See the WRC example in Appendix E.

Engage with central government

Actively engage with central government on the National Geothermal Strategy.

Advocate for a New Zealand energy strategy

Advocate for the preparation of a clear and coordinated 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.

Maintain and strengthen regional policy settings

Maintain and strengthen regional policy settings that support renewable energy and regional decarbonisation.

Use spatial planning to identify renewable energy opportunities

Use spatial planning to identify suitable locations for renewable energy (e.g. solar and wind), energy hubs, battery storage, charging stations, electrified transport corridors, data centres, and transmission and distribution infrastructure – integrating iwi priorities and 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.

Build workforce capability and capacity

Support the development of coordinated education, training and apprenticeship pathways aligned with future energy needs. This includes the supply and use of renewable energy and training initiatives aligned with iwi priorities, including 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.

Build understanding of renewable energy resources and regional use

Support the delivery of clear, accessible transition information and advice for businesses, iwi partnerships and communities, that complements existing EECA services.

Maintain up-to-date information

Maintain an up-to-date understanding of regional energy requirements to ensure the region can plan effectively and respond to changing conditions. Maintain high quality databases of renewable energy resources, particularly geothermal systems.

Provide guidance to high-use fossil-fuel industries

Provide guidance on future decarbonisation pathways for high-use fossil-fuel industries and advocate for financial support to enable a smooth transition away from fossil fuels.

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.

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 solar and transport.

Advocate for government incentives

Advocate for government incentives to help make low emissions technology more accessible.

Promote total cost of ownership analysis

Encourage businesses and households to consider lifetime costs, including fuel, maintenance, and emissions, when making investment decisions.

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.

Encourage the adoption of renewable energy and energy efficient technologies

Encourage renewable and energy efficient technology across homes, marae, papakāinga, community facilities, commercial and industrial buildings.

Support iwi renewable energy initiatives

Support iwi-led and iwi-partnered renewable energy initiatives.

Support research and development opportunities Support research and development across emerging and existing renewable energy options, including untapped geothermal and wave resources, as well as opportunities for pumped hydro, small-scale hydro, aviation SAF, green hydrogen and green ammonia.
Encourage energy hubs Support the development of renewable energy hubs, particularly around Wairakei/Taupō, Tokoroa and Huntly.
Encourage mode shift Advocate for and enable a shift toward lower-emissions transport by supporting greater use of public transport, rail and active travel, and accelerate the transition of WRC's bus fleet to zero-emissions, focusing on high-usage routes in Hamilton.
Advocate for rail electrification and support more frequent rail services Advocate for hybrid battery-electric locomotives as an interim step and full golden triangle electrification, and improve rail capacity by double-tracking key sections, expanding Te Huia services, and adding passing loops for more frequent, reliable travel.
Encourage the use of low emissions vehicles and enable public EV charging infrastructure Promote and normalise low-emissions vehicle uptake through existing communication channels, and create a supportive environment for charge point operators investing in the region.
Utilize 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.
Support grid expansion and distributed generation Support, advocate for and facilitate long-term grid expansions and upgrades, and actively enable the development of embedded and distributed generation across the region, including EV participation.

12 Implementation pathway

12.1 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.

12.2 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
BAU	Business as usual
BESS	Battery energy storage system
CBAM	Carbon Border Adjustment Mechanism
CGE	Computable general equilibrium
CO_2e	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
KW	Kilowatt
LNG	Liquified natural gas
MW	Megawatt
NZU	New Zealand units
PHEV	Plug-in hybrid electric vehicle
PJ	Petajoule
PV	Photovoltaic
RMA	Resource Management Act
RETA	Regional Energy Transition Accelerator
RPS	Regional Policy Statement
RPTP	Regional Public Transport Plan
SAF	Sustainable aviation fuel
V2G	Vehicle-to-grid
V2L	Vehicle-to-load
WRC	Waikato Regional Council

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.

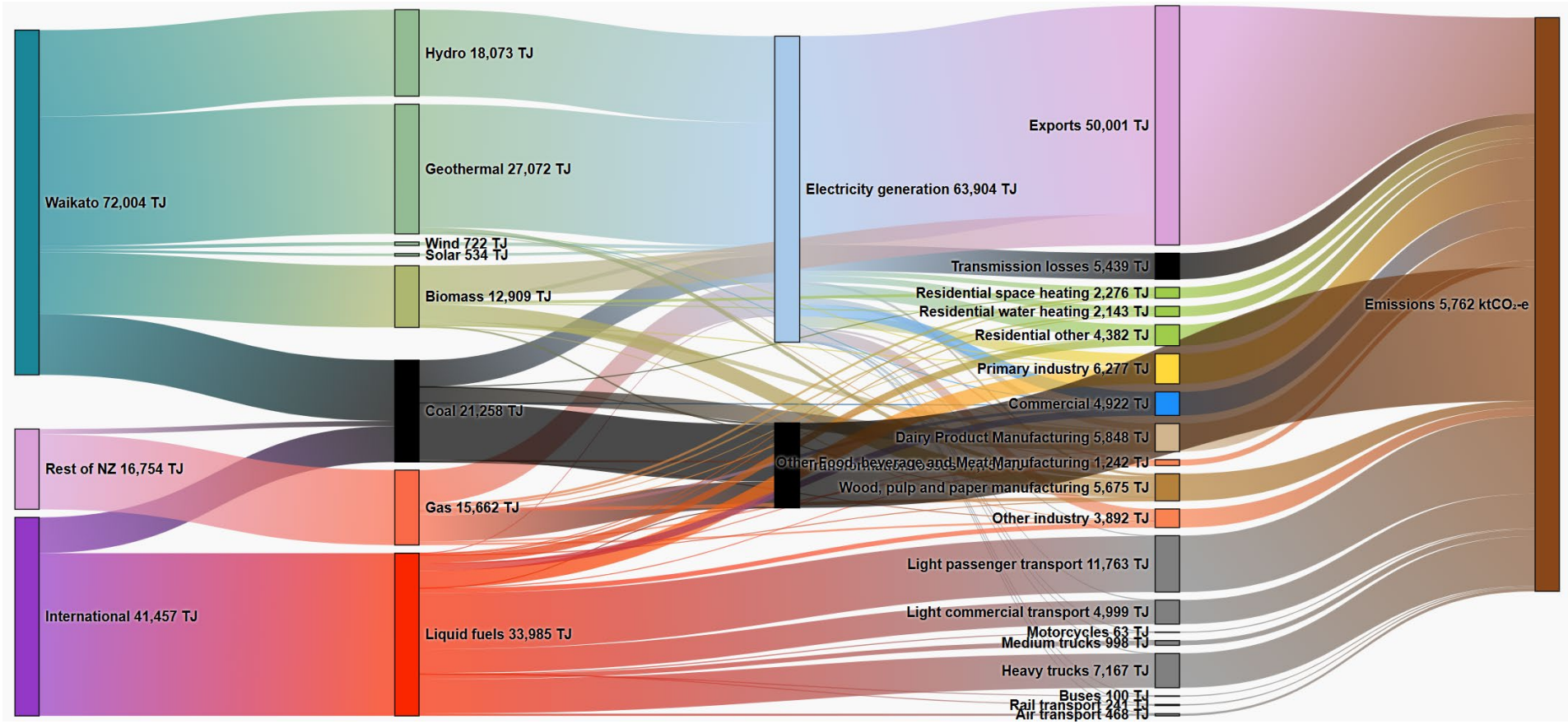
Appendices

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: Current (2025) Waikato energy flows and emissions[71]



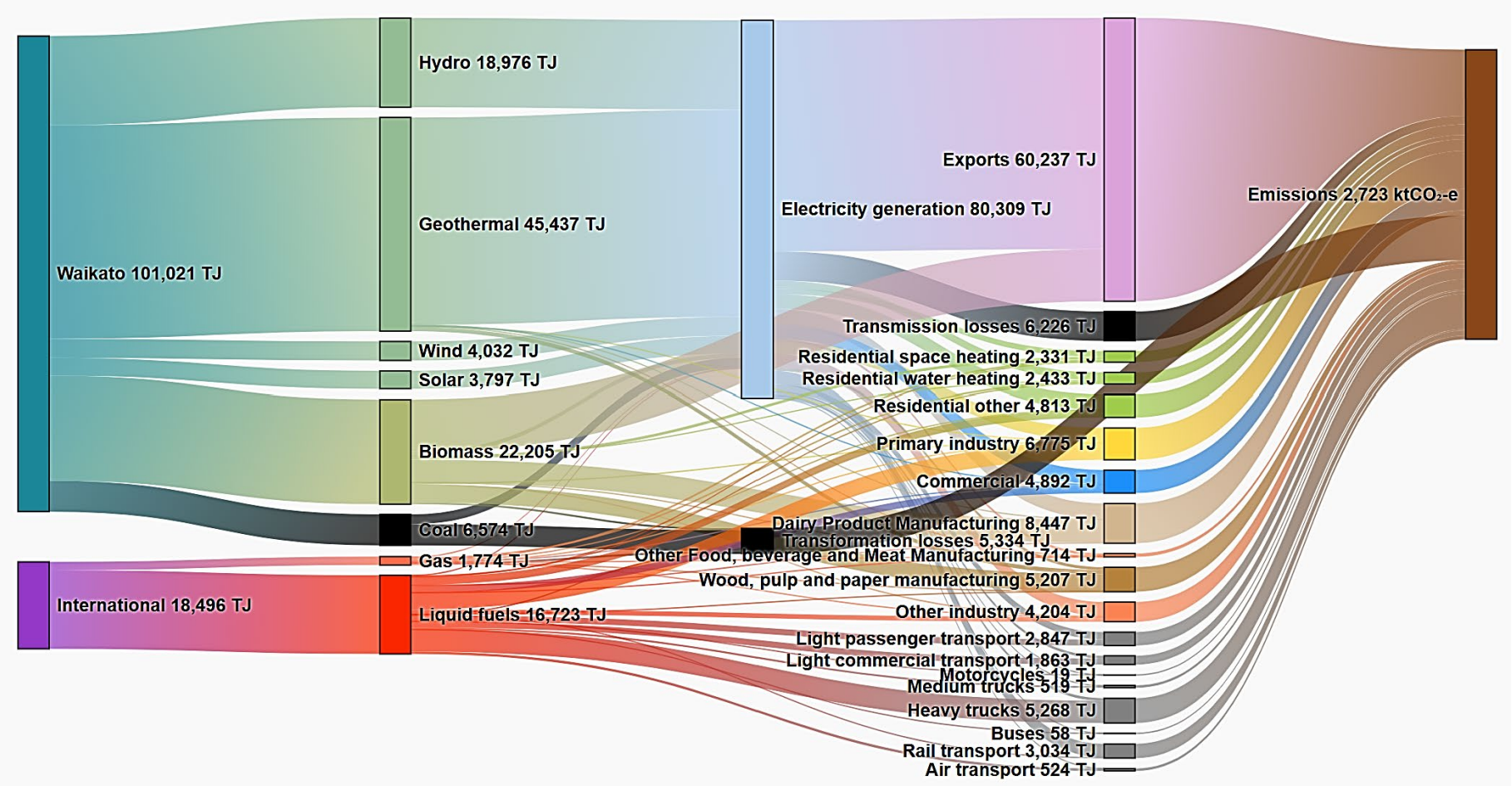
[71] Prepared by Concept Consulting. An interactive version of the diagram is available at https://econergy.earth/ConceptApps/WaikatoSankeyDynamic.html

Appendix C: Comparison of future energy scenarios

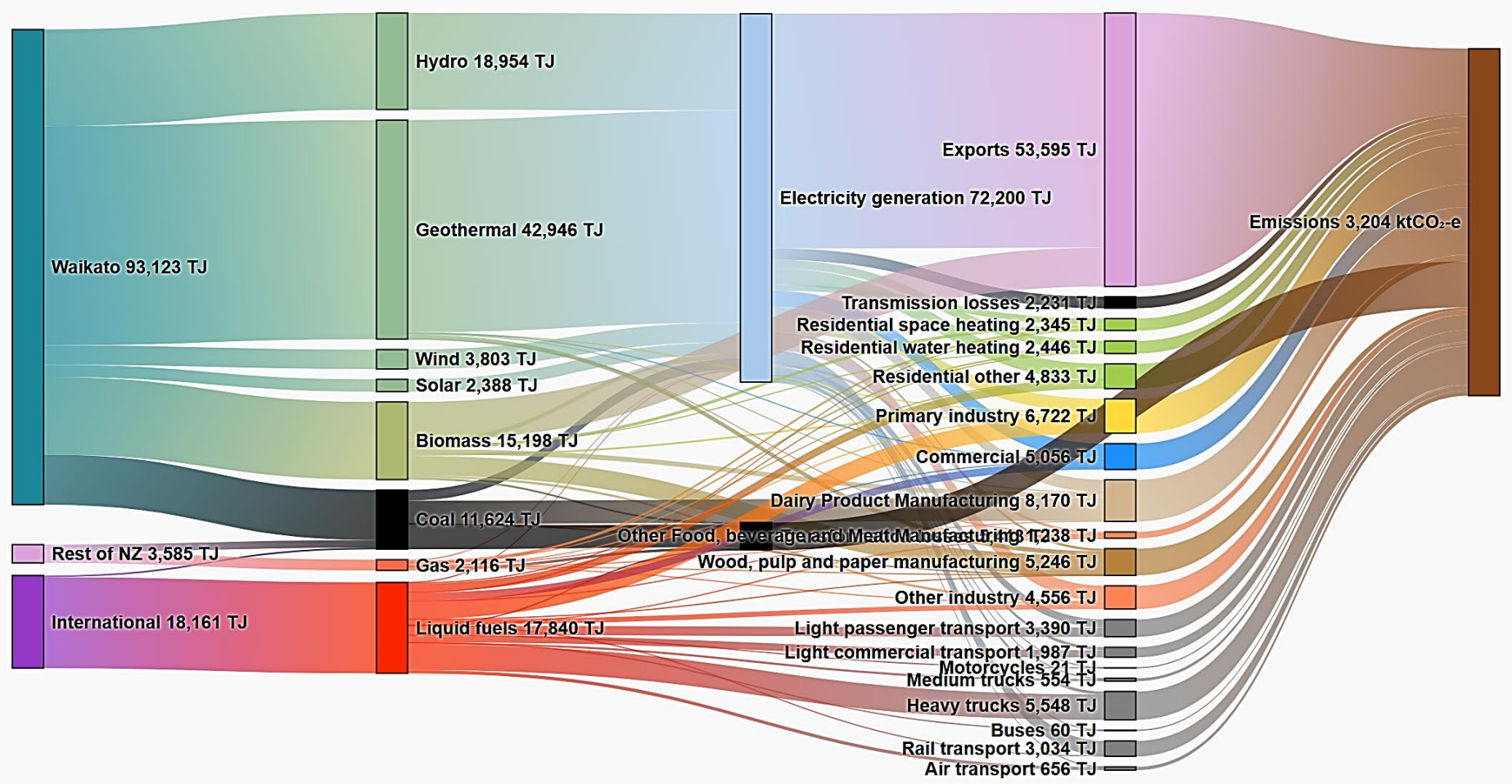
Dimension	Business As Usual	Static	Dynamic
Overall framing	Continuation of current policy settings and central government projections;	Energy security and affordability prioritised over sustainability; transition slows	Decarbonisation treated as a long-term economic opportunity with coordinated action
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

Appendix D: Future (2050) Waikato energy flows and emissions

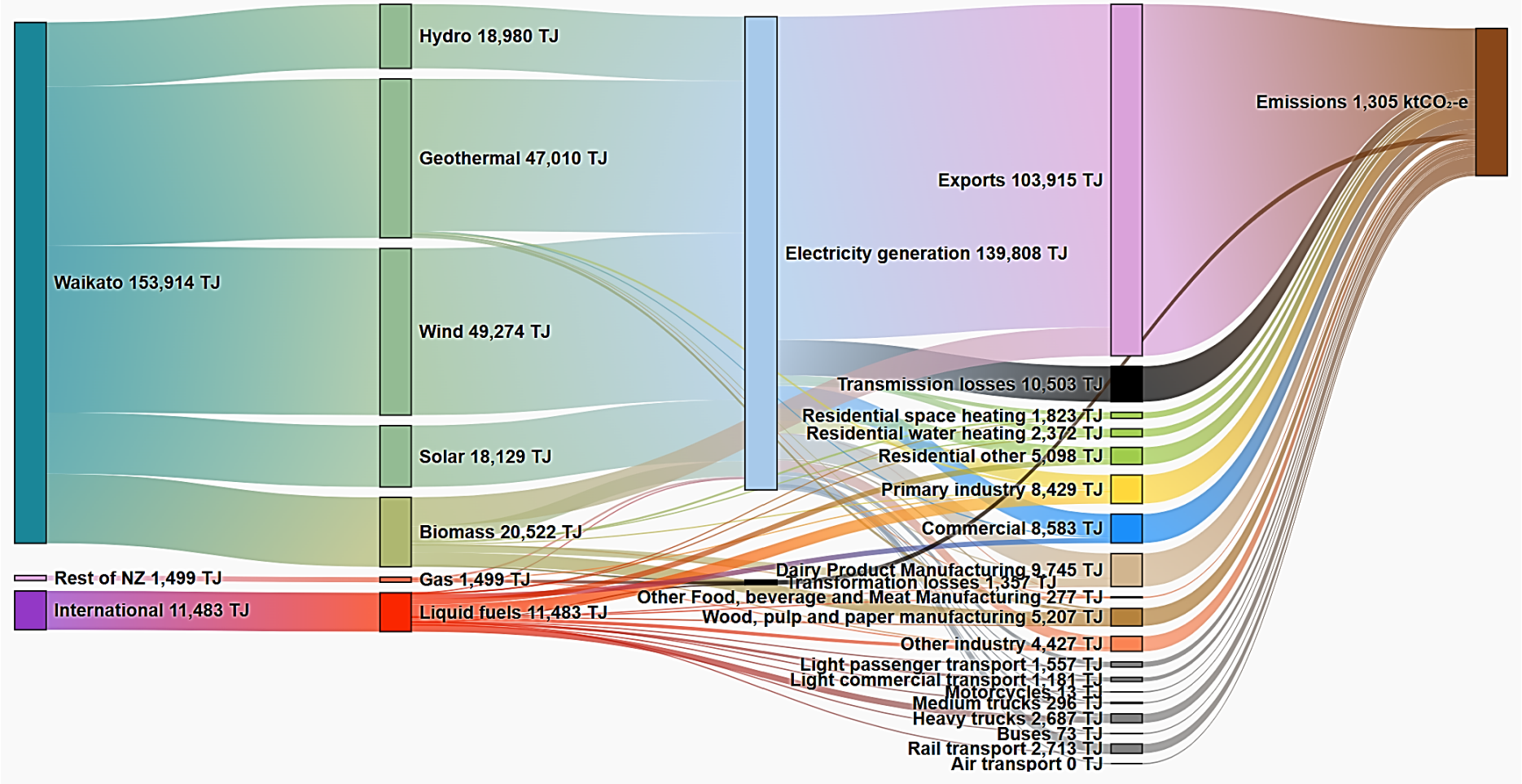
Business as usual scenario



Static scenario



Dynamic scenario



Appendix E: 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 meaningfully shift its carbon footprint, with a 38 percent reduction in emissions recorded for the 2024/25 period.