TRANSPOWER

Whakamana i Te Mauri Hiko

Monitoring Report

October 2023

The Whakamana i Te Mauri Hiko Monitoring Report indicates how New Zealand is tracking against our energy futures

Our monitoring report series

In 2020 Transpower launched Whakamana i Te Mauri Hiko (WiTMH). This work took a scenario-based approach to consider what the future may look like in the year 2050 and the actions required to get us there.

The Monitoring Report is designed to identify, within the key drivers of Whakamana i Te Mauri Hiko, those factors that are consistent (or vary) from the expected course of our scenarios.

By publishing these six-monthly reports, we want to share with the rest of Aotearoa the trends we observe on our journey to decarbonise our economy. We aim for this to be a discussion and an industry resource, so we welcome feedback and suggestions on how to improve our monitoring. If you have comments please send them to: communications@transpower.co.nz

For all our reports in the Te Mauri Hiko series, visit https://www.transpower.co.nz/about-us/transmission-tomorrow

This edition

As we get a better understanding of the underlying electrification and decarbonisation trends, and have access to richer, more comprehensive data, we are continuously improving this report to bring readers newer, and more relevant insights.

What you might notice is that some of the data may not be refreshed every edition, and for some sources, the latest data refers to previous years. This is because some data sources are only published annually. However, the indicators we've chosen help tell New Zealand's story.

Since having published Whakamana i Te Mauri Hiko, we have seen other scenario work emerging across the industry. If they are looking at different aspects of the energy sector, they are broadly consistent with our findings: by 2050, demand for electricity will increase as we decarbonise Aotearoa's economy. However, the way to get there might be differ, especially as technology, costs, and policy considerations continue to evolve.

In this edition, we continue to highlight the progress that is being made towards the decarbonisation of our country through electrification. This progress manifests through innovative new technologies and market trends; but it also reveals itself in challenges that face the industry as we shift away from a reliance on fossil fuels.

This report also highlights the tight balance between rising peak demand and sufficient generation to meet it. We highlight a challenging balance between the two, noting that the next winter remains a concern. We also draw attention to the amount of generation that is consented and consider how quickly this will need to progress in order to stay ahead of demand.

This report is high level and, as for all our Whakamana i Te Mauri Hiko work, intended to start a discussion. Feedback is most welcome.

Our Whakamana i Te Mauri Hiko scenarios

The base case:
Accelerated Electrification

A realistic yet aspirational future, that anticipates large-scale transformation of energy in New Zealand

Tiwai Exit:
Electric Tiwai Exit

A variation of *Accelerated Electrification* where the Tiwai Aluminium smelter exits around 2025

Higher demand:
Mobilise to Decarbonise

Higher demand for electricity is driven by significant and rapid efforts to mitigate climate change after years of 'sitting on our hands'

Slower case:
Measured Action

A variation of *Accelerated Electrification* where transport electrification is slowed by factors such as policy or technology

Lower case:
Business as usual

Significant electrification fails to eventuate and other climate change mechanisms such as forestry abatement are prioritised

At a glance: New Zealand stays on course for the *Accelerated Electrification* scenario, supported by positive signs of electrification growth

Summary

In our last update, we reported New Zealand continues to exhibit signs of a new period of electrification growth. Since then, our key indicators continue to point towards growth in electrification of transport and process heat, and this time are also supported by signs of life in the base drivers of growth such as population. Connection enquiries continue to convert into committed projects on the supply side, and, equally importantly, a strong response from the demand side with a significant pipeline of new customer load connections. We expect this trend to continue as investors and developers invest in decarbonisation and we push to meet our energy and decarbonisation targets.

We continue to see slower than expected overall electricity demand notably with lagging industrial consumption, but signals remain strong that growth is imminent. Data centre developments, process heat conversion, and the possibility of very large demand arising from hydrogen are all potentially on the horizon.

Turning our attention to the near-term raises concerns around teething issues as the sector copes with the challenge of peak demand increases. At the same time, the sector will also be managing increased variability from intermittent generation and increased outages for peaking plant. This will be particularly evident in winter 2024.

Together, these signs confirm that we are still in the stages of a push towards a more renewable electricity system and a new period of electrification growth. For this reason, New Zealand could remain on the base case 'Accelerated Electrification' trajectory.

How our indicators are tracking against our forecasts

Generation is covering peak demand, but the margins are close with next winter a key concern — ▲ Uncertain

Capability to meet energy demand and peak demand is being challenged, with support needed to ensure supply in time — ▲ Consistent

Renewable utility scale generation interest continues well on track to meet 2050 forecasted energy demand from electrification — ▲ Consistent

Emissions reduction continues to be a concern for New Zealand and the rest of the world, with uncertainty stifling progress — ● Inconsistent

Electricity demand is slow due to industrial load reductions, but there are strong signs of potential new growth on the way — ● Uncertain

Drivers of base demand are beginning to rebound after a period of uncertainty with strong growth in population especially — ▲ Uncertain

Overall energy efficiency and energy intensity continues to improve, with electrification offering clear efficiencies — ▼ Consistent

Industrial energy users are still relying on fossil fuels, but clear signals abound for significant growth in industrial electricity demand — ▲ Uncertain

Process heat decarbonisation continues to increase with government support, but the future is uncertain — ▲ Uncertain

Electric vehicle numbers continue to push higher boosted by transport policy, but hybrids continue to dominate uptake — ▲ Consistent

Battery technology and flexible demand is building momentum with new products and technologies on the way — ▲ Consistent

Distributed solar installations continue to increase with long term costs falling, with growth consistent — ▲ Consistent

Electricity affordability needs to be maintained, as the transition to a highly renewable energy system to meet targets is underway — ▲ Consistent

Progress against the ten Whakamana i Te Mauri Hiko industry themes is ongoing and may shift further with future energy policy — ▲ Consistent

Generation is covering peak demand, but the margins are close with next winter a key concern

Uncertain

Winter margins continue to be tight, but generation is sufficient

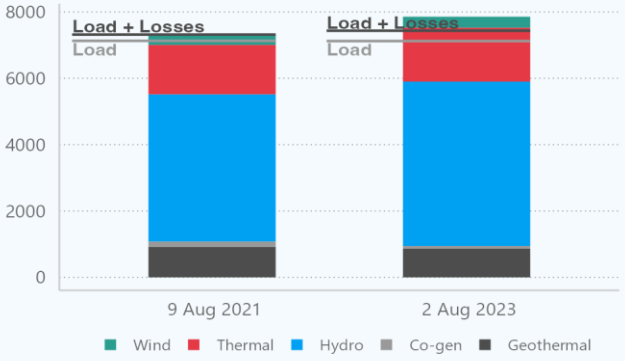
On the evening of Wednesday 2 August 2023, national electricity demand reached 7122 MW. This is only 7 MW short of the highest ever demand, which was 7129 MW on 9 August 2021. On that evening, electricity supply was insufficient to meet the peak demand, resulting in a grid emergency.

On 2 August 2023, electricity supply was sufficient to meet an almost identical load while also providing instantaneous reserve and a residual of 244 MW. The reason for this was 552 MW of additional offered generation. Most of the additional generation was hydro, with 518 MW more hydro generation offered on 2 August 2023 than was offered on 9 August 2021. There was also 131 MW more thermal generation offered on 2 August 2023 than was offered on 9 August 2021.

This shows that the industry is working well together to ensure sufficient generation, and that increased information provided to industry by Transpower as System Operator is effective; but equally, it shows that margins remain tight with similar or worse pressure expected in 2024.

Offered generation vs load

MW, comparing two very similar load profiles



Consistent

Peak demand continues clear upward trend of strong growth

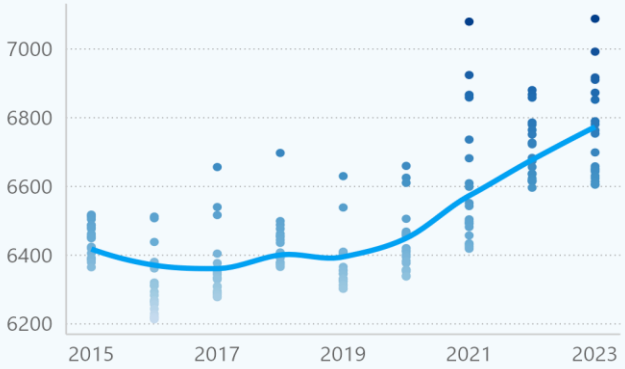
Peak electricity demand growth continues to raise concerns for potential capacity issues during peak demand periods. Six of the highest peaks on record occurred in 2023, with the maximum peak of 7122 MW on 2 August 2023 coming just 7 MW short of the record set on 9 August 2021.

Peak demand growth has risen 2% annually on average since 2021, with another increase of 122 MW this winter. This rise in demand can be attributed to the growing electrification of transport, process heat, and space heating. It is also attributed to the removal of RCPD charges, with analysis published by the Electricity Authority confirming that this is associated with a 157 MW increase in average peaks – or 2.2% of national demand.

However, a moderate winter, above average hydrological inflows and market coordination (see right panel) has seen the system cope with this increased peak demand. Looking forward, demand is expected to continue to grow as electrification ramps up. This growth will largely be met with new renewables such as wind and solar, but firming capacity will also be needed at peak times, as well as non-network solutions like demand response.

20 highest daily peaks each year

MW, 2015-2023



Uncertain

Generation capacity exists to meet peaks but some growing concerns

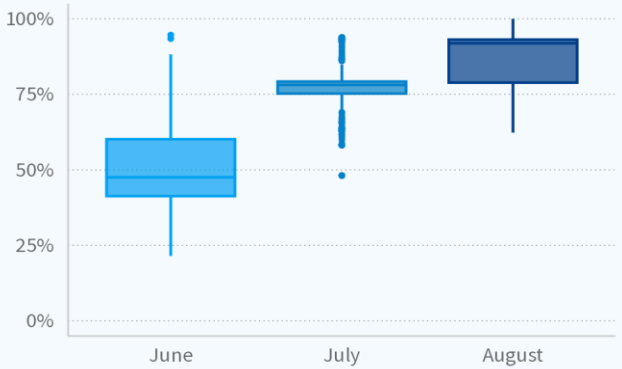
In its role as System Operator, Transpower has been warning for some time of the challenges the industry is facing meeting increasing winter peak demand. With intermittent wind generation up more than 50% since 2019, electricity supply can be squeezed when the wind drops at the same time as cold weather sends peak demand soaring.

Around half of New Zealand's thermal generation capacity is slow-start and not designed for these peak capacity requirements. This means thermal generators need early notice that they will be needed so that they can be warm and ready to offer. With around 700-800 MW of baseload generation capacity, or around 10% of peak demand, progressively on outage this winter due to equipment faults, the industry has had to work increasingly hard to make sufficient thermal generation available. The graph below shows increasing thermal commitment throughout winter as outages have grown.

With winter capacity challenges set to persist, we have signalled an urgent need for investment in flexible resources including fast start generation, storage, or demand response.

Committed thermal generation

Percent of total available thermal generation in Winter 2023



Capability to meet energy demand and peak demand is being challenged, with support needed to ensure supply in time

Uncertain

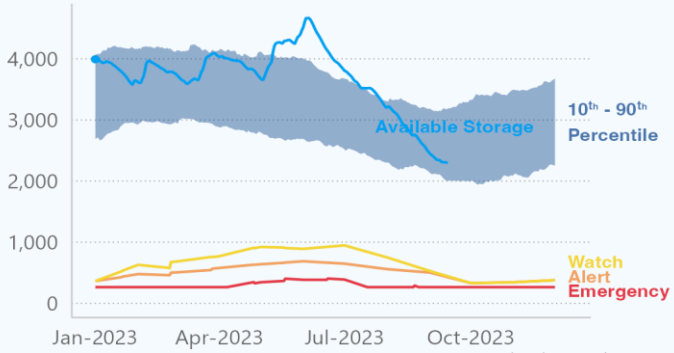
More rainfall needed as record hydro inflows have been depleted

The industry needs to ensure there is enough fuel storage and generation units available to meet electricity demand, particularly during dry years when low rainfall impacts hydro generation. Transpower regularly assesses New Zealand's security of supply outlook to help the industry with decision making to avoid shortages.

Earlier this year, above average inflows in autumn ensured the hydro catchments were topped up to the highest recorded level in May, since 2009. However, this healthy hydro storage was rapidly depleted over the course of winter, helped along by low winter inflows, which were about 30% less than the average winter inflows seen in the last five years. Current storage sits below the historic average for this time of year, but despite this remains above the risk curves. New Zealand has shifted towards El Niño climate conditions, bringing an end to the La Niña conditions which have persisted for the last three years. While generally El Niño years bring drier conditions to most of the country, we are, however, expecting normal to above average inflows in the South Island (where our hydro lakes are).

Electricity risk status curve

Available storage, GWh



Source: Transpower. Last updated September 2023.

Uncertain

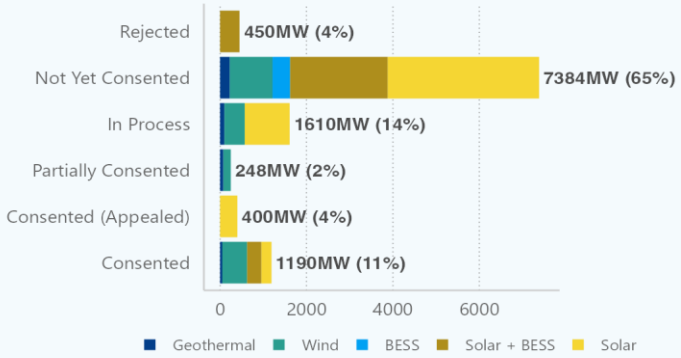
Solid pipeline of consented generation, but delays are risky

Te Waihanga, the Infrastructure Commission, recently published a report on Infrastructure Consenting for Climate Targets, which analysed the impact of different consenting scenarios on achieving NZ's carbon targets. The report found that from 2028, consent processing times would need to be 50% quicker than they are projected to be under the Resource Management Act, without which NZ would likely fail to meet its climate aspirations.

Transpower currently has just under 1.2 GW of consented generation projects in its connection pipeline (defined as projects which have reached application stage or later). Of this ~600 MW is currently in delivery across 7 projects, with the remaining 600 MW split between both application and investigation stages evenly. Beyond this, there is more than 2.2 GW either currently in the consenting process, partially consented, or currently under appeal (totaling 16 projects). The majority of this (64%) is solar, which has the lowest average consenting time according to Te Waihanga of <1 year. Next is wind with 29% and average consent times of around 2-4 years. The remainder is geothermal, with consent times of 1-2 years.

Connection pipeline consent status

MWs, by technology. Project in application stage or later.



Consistent

Renewable Energy Certificates can support new renewable growth

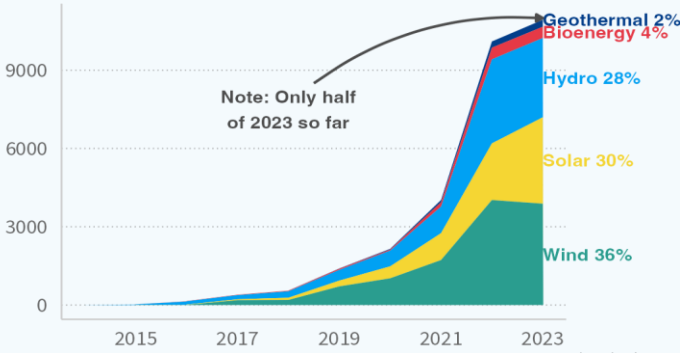
As NZ moves toward a fully renewable future, generators and energy consumers are seeking assurance in their investments. We're seeing the instruments of PPAs provide this assurance, which can be supported through accounting tools such as Renewable Energy Certificates (RECs). RECs provide legitimacy to the renewable energy claims of businesses, which is increasingly valued as climate-related disclosures are now often either required by law or at least expected by investors.

Globally, demand for REC issuances have grown exponentially, from just 27 in 2015 to almost 11,000 in the first half of 2023, according to the International REC Standard Foundation (I-REC), an international provider of RECs recognised by major reporting frameworks such as the Greenhouse Gas Protocol (GHGP), CDP, and RE100.

In New Zealand, Transpower through EMS has just launched the I-REC issuer service to support decarbonisation through investment in renewables. Transpower is well-placed to issue RECs given its market-independence as the System Operator, transmission grid owner, and metering services provider.

IREC issuances over time

Number issued by technology type with 2023 share



Source: IREC. Last updated July 2023

Renewable utility scale generation interest continues well on track to meet 2050 forecasted energy demand from electrification

Consistent

Strong generation pipeline continues to progress

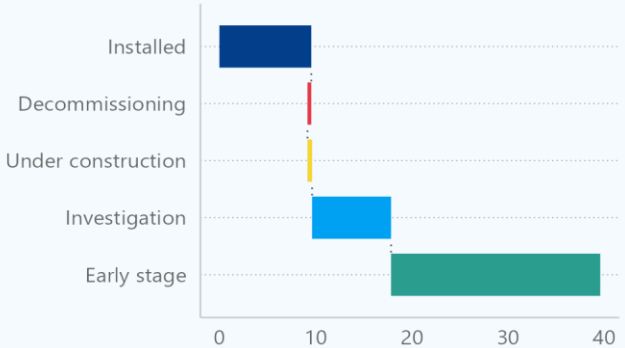
In the last three years, there has been a significant increase in the volume of announcements from potential developers of new generation. The 2023 financial year was another strong year of connection enquiries, with 104 in total, 72 of which pertained to generation. This was 20 fewer than FY 22, but still significantly higher than previous years.

Transpower's view of the total potential capacity of generation in the pipeline reveals 30.4 GW of projects at various stages. In the past six months, another 1,200 MW has progressed from early stage into investigations, lifting the total amount at this stage to 8.2 GW. There is also a further 480 MW under construction. Overall, this signals strong and growing interest in renewables, large enough to meet the Accelerated Electrification demand forecast of 22 GW and 70 TWh by 2050.

The key challenge is that the overwhelming majority of this new generation is wind and solar (see panel right). As this is variable renewable energy, it may require firming to produce enough capacity at any one time to meet the peak demand (MWp) needs of the system.

Forecast utility scale generation pipeline

GW, includes generation decommissioning by the end of 2024.



Source: Transpower. Last updated September 2023.

Consistent

Solar and wind continue to make up the bulk of the pipeline

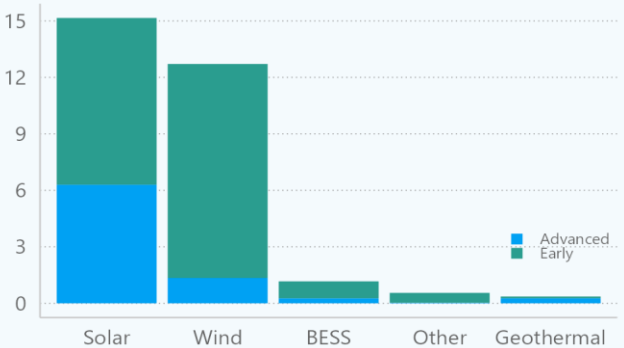
Of the new generation in the pipeline, approximately half of this interest is for grid scale solar with 15.2 GW (50.6%), followed by wind generation with 12.7 GW (42.5%). Solar still makes up the largest share of advanced projects with 76.8% of projects at investigation stage or later.

Both the amount of solar and wind in the pipeline is now significantly greater than the original amounts projected in our Accelerated Electrification scenario, which projected 6.5 GW of wind and 6 GW of solar by 2050.

However, the key change between this report and last is less the total GW in the pipeline and more the progression from early to advanced stages. Presently, 8.2 GW of the generation pipeline has progressed to the investigation stage or later, representing 27.4% of the total potential pipeline. All technology types except 'Other' have seen strong increases in the amount of advanced projects. Of the advanced generation, Transpower currently has 478 MW in delivery with Transmission Works Agreements contracted.

Breakdown of enquiries by generation type

GW. Excludes projects in delivery.



Source: Transpower. Last updated September 2023.

Consistent

Generation enquiries still high, with demand beginning to peak

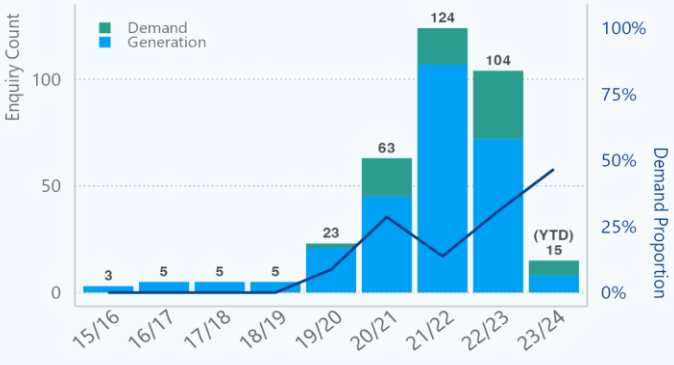
In the last several reports, we've observed significant growth in the number of connection enquiries we receive both for generation and demand-side. In the financial years (FY) 15/16 through to 18/19, we saw an average of 5 generation enquiries each year and no demand-side enquiries. From FY 19/20, however, this began to increase exponentially.

It appears that the peak of our generation enquiries has now passed, with 107 in FY 21/22, declining to 72 last FY (which, it should be noted, is still very high relative to historical averages). However, on the demand-side of the equation, we are still seeing growth in the number of enquiries. This was around 18 in FYs 20/21 and 21/22 but almost doubled in the last FY to 32.

The graph below illustrates both the number of enquiries Transpower has received by type and the demand-side proportion of those. This proportion has risen from 0% in the first 4 years since FY 15/16 to just under 50% of the enquiries in this FY so far. Overall, this suggests that the demand-side of growth is beginning to accelerate as more large industrials begin to electrify their processes.

Generation and demand customer enquiries

Count by financial year, excludes GXP enquiries from EDBs.



Electricity demand is slow due to industrial load reductions, but there are strong signs of potential new growth on the way

Uncertain

Electricity demand remains flat, driven by lower industrial load

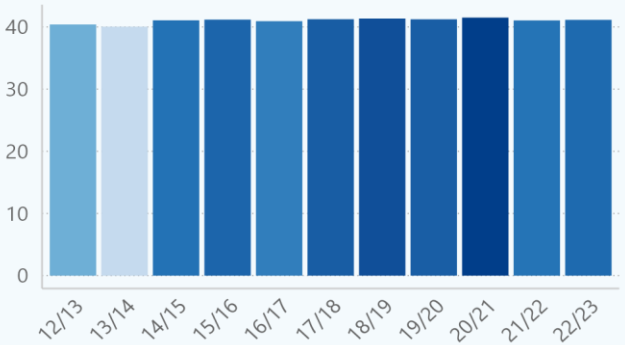
When we refer to demand we are referring to the volume of energy required to meet consumer and system requirements and ensure reliability. In the chart below, electricity demand is met from both generation that is grid connected and embedded, such as rooftop solar.

Electricity demand has been relatively stable in recent years, decreasing at an average of 0.1% per annum from 2012 to 2022. Whakamana i Te Mauri Hiko estimates a 68% increase in electricity demand by 2050 in the 'Accelerated Electrification' scenario. This demand is expected to come primarily through the electrification of private vehicles and process heat.

Although we're not seeing a ramp up in annual demand yet, other indicators suggest that it is imminent. EDBs are also reporting very different rates of growth in their regions, including some quite substantial increases expected. However, as we explain in this report (see our coverage on peak demand in slide), the energy system's capability to meet peak demand is already being challenged, as peak demand continues to rise.

Annual electricity demand

TWh



Source: Electricity Authority. Last updated September 2023.

Uncertain

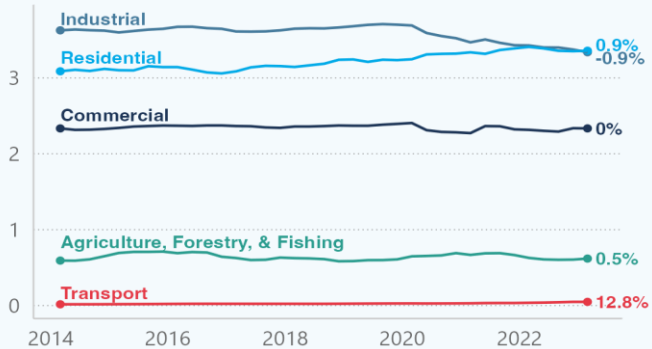
Industrial load continues to fall, offset by residential and transport

Electricity demand across the different sectors had been stable over the past ten years up until 2020. However, since 2020, the industrial and agriculture, forestry and fishing sectors have declined in demand largely due to closure of plant, curtailed operations due to higher electricity prices, and the effect of COVID-19. These sectors have fallen 4.2% and 12.4% respectively, but there are indications of likely step changes in load in the future from switching to electricity and/or dual fuel such as biomass, as well as the increasing electrification of farming.

On the flipside, residential demand has been growing by around 2% per annum over the prior two years, due to a higher number of ICP connections and higher electricity consumption per ICP. Residential consumption now makes up 35% of total demand, which is the same share as industrial (for the first time since the 1980s). Transport electricity demand has also grown significantly, increasing 73% since 2020 – an average of ~13% per year since 2014. However, this comes off a very small base (0.5% of total demand), so this growth is yet to have a material impact on overall demand.

Electricity demand by sector

TWh quarterly, rolling 4 quarter average, CAGRs 2014-2023



Source: MBIE. Last updated March 2023.

Consistent

Data centres on the rise in NZ could significant boost demand

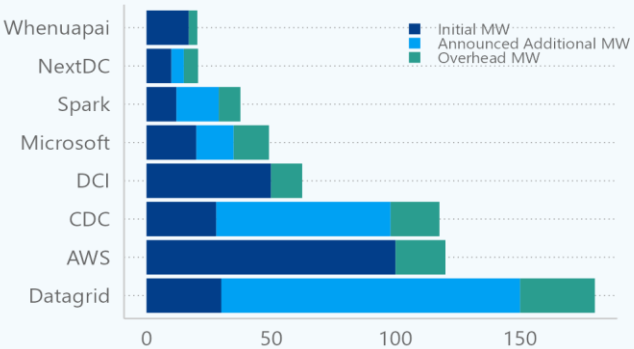
A flurry of recent announcements for new hyperscale data centres in Auckland and Southland has raised the possibility of NZ as a hub for green data centres. NZ has many of the features that make it an attractive place for this investment, including high connectivity with Australia and the US, an abundance of potential renewable energy, and low ambient temperatures.

An important factor to take into account is the Power Usage Effectiveness (PUE) score of each project, which refers to the total power consumption used over the computational energy required. The global average PUE score is 1.5, meaning for every 1 kw of computation, 1.5 kw in total is required by the centre, while 1.2 is achievable by highly efficient hyperscale centres.

Including the average PUE scores for each company (or 1.2 where unavailable), around 600 MW has already been announced, or approximately 5,000 GWh of energy annually, assuming 95% uptime. And this could just be the start: international experience has shown that wherever big companies start building data centres, others soon follow.

Possible new hyperscale data centre load

Total MW, including overheads using estimated PUE



Source: Various media sources.. Last updated September 2023.

Emissions reduction continues to be a concern for New Zealand and the rest of the world, with uncertainty stifling progress

Inconsistent

Global climate action is progressing, but still insufficient

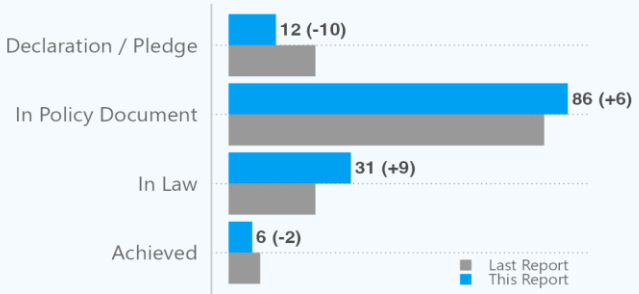
Countries and companies around the world are increasingly recognising the need for climate action, so that the globe avoids the catastrophic consequences of inaction. Since the last report, seven more countries have committed to net zero in policy, and a further 7 have now committed this to law.

However, Climate Action Tracker is cautious to note that none of the countries it tracks is yet displaying action compatible with the 1.5°C Paris agreement. It also describes NZ's action as highly insufficient due to the present failure to include a working agreement on methane emissions, which remain exempt from the NZ-ETS. A new proposal to reduce emissions from agriculture has now been tabled, but it has yet to be adopted or fully endorsed.

Note also that in the following chart, the number of nations that have achieved their climate commitments has decreased, as Cambodia and Madagascar have now changed their self-reported status to In Policy Document and Proposed/In Discussion respectively.

Countries with policies committed to net zero carbon by 2060 or earlier

Number of countries



Climate Action Tracker. Excludes countries with targets under discussion. Some European countries do not have a separate target from the EU.

Uncertain

Emissions Trading Scheme struggles amidst uncertainty

NZUs peaked at $88.50 last year before tumbling to around $35 in July. This was largely caused by the Government's decision not to follow the Climate Change Commission's (CCC) recommendations to stiffen up the supply of NZUs, as well as uncertainty around the ongoing integration of forestry in the market.

The uncertainty led to all three carbon auctions this year failing to clear, with one auction remaining in December. Experts now expect this auction to fail also, owing simply to the volume of credits that must be sold, which will reach around 17.9 million NZUs in December. If this auction should fail, those credits will permanently be removed from the market.

However, the Government has recently reversed its decision not to implement the CCC's recommendations. As of December, a two-tier cost containment reserve trigger price will also be introduced. The Tier 1 cost containment reserve trigger price will increase from $82 to $173. This has had the impact of raising the price of carbon on the secondary market to around $70.

New Zealand Carbon price

Dollars per NZU on the secondary market since 2020

Inconsistent

Greenhouse gas emissions are still rising

Since 1990, New Zealand's net GHG emissions have grown an average of 0.7% per year, with a total increase of 25%. This growth in net emissions was due to an underlying increase in gross emissions of 19% while the amount of emissions offset by forestry reduced.

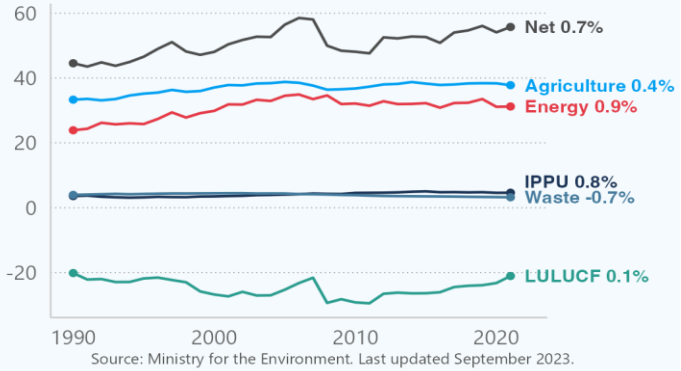
In the energy sector specifically (including transport), emissions in 2021 were 31% higher than in 1990, with an average growth rate of 0.9% per year.

In terms of recent change, total gross emissions decreased 1% between 2020 and 2021, but net emissions increased by 3% due to reductions in forestry and land use offsets.

Between 2019 and 2021, emissions from the energy sector decreased by 7%. However, this decrease was primarily due to impacts from COVID-19, which saw decreases in emissions from road transport, domestic aviation and manufacturing. The latest report shows little difference between energy emissions in 2020 and 2021, however energy emissions are expected to increase again as activity resumes.

New Zealand emissions by sector

Mt CO_2e, annual, with 1990-2021 CAGRs



Source: Ministry for the Environment. Last updated September 2023.

IPPU: Industrial Processes & Product Use
LULUCF: Land Use, Land Use Changes& Forestry

Drivers of base demand are beginning to rebound after a period of uncertainty with strong growth in population especially

Consistent

Population returns to pre-COVID level growth in 2023

Because each New Zealander consumes electricity in their day-to-day life, population is an important driver of base demand. When excluding the impacts of increasing energy efficiency, we can expect base demand to increase with population growth.

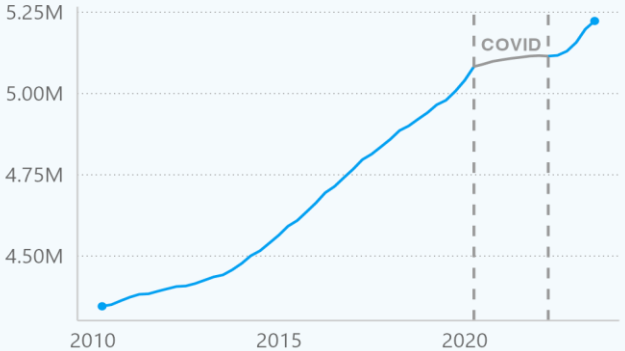
Prior to COVID-19, the New Zealand population was growing at 1.6% per annum since 2010. However, during the time when our international borders were closed due to COVID-19, our population grew at just 0.3%.

However, these restrictions were lifted in August 2022 and since then, NZ's population has regained its upward trend, with a CAGR rate presently even exceeding the pre-Covid average at 2.1%.

According to Stats NZ population projections, New Zealand's population growth is expected to slow in the long term, due to an aging population and a low birth rate. We expect North Island population growth to grow faster than the South Island with the population of Auckland reaching 2 million by 2040.

Estimated NZ resident population

Millions of people



Source: Stats NZ. Last updated June 2023.

Uncertain

The New Zealand economy slows with rising unemployment

Economic activity is also a driver of base electricity demand as businesses use energy to deliver their goods and services.

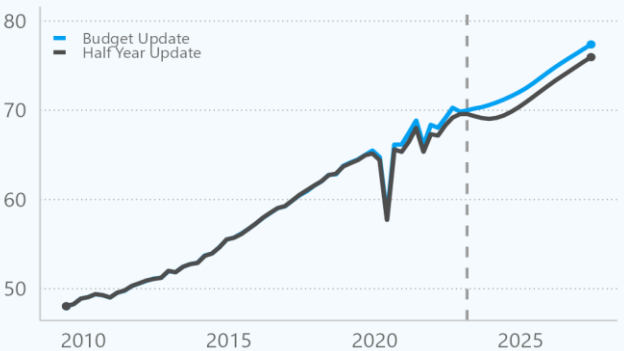
We can expect base demand to increase with economic growth, although some of this is offset by increases in efficiency. The changing composition of the economy (e.g. increasing share of services) will also have an impact on base demand as some industries are more energy intense than others.

The chart below compares the previous Half Year Update 2022 to the Budget Update 2023. The forecast technical recession during 2024 has now softened to a forecast of low growth at 1% throughout 2024 and rising unemployment, led by the rebuild following the North Island weather events, a quicker return of tourism, and less contractionary fiscal policy.

The outlook is uncertain because of the range and scale of the challenges present, including persistent domestic and global inflation and sharply higher interest rates.

Historical and forecast real production GDP

NZD billions, 2009/10 prices, quarterly



Source: Treasury. Last updated May 2023.

Consistent

Growth in ICP volume steady in line with historic average

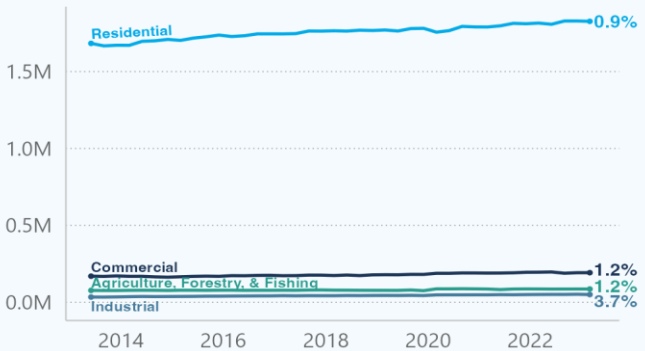
Installation Control Points (ICPs) are the physical points of connection on a local network. When new ICPs are added – for example when new houses are built – it is likely that there is an increase in electricity demand.

As with population and GDP growth, any growth in base demand will not be directly proportionate to ICP number growth due to energy efficiency and the specific consumer behaviours associated with those new ICPs.

Over the past year, the total number of ICPs has not changed significantly. The residential sector, which has 85% of the ICP count, grew by 11,430 (+0.6%) compared with an average of +0.9% per year since 2014. Decreases were observed in all other sectors. The agriculture, forestry and fishing sector dropped by 388 (-0.4%), the commercial sector by 3,115 (-1.6%), and the Industrial sector by 417 (-0.8%). In each of these three sectors, this runs against the long-term average of moderate annual increases.

Number of ICPs

Millions of ICPs, quarterly, 2014-2023 CAGRs



Source: MBIE. Last updated March 2023.

Overall energy efficiency and energy intensity continues to improve, with electrification offering clear efficiencies

Consistent

Energy intensity is decreasing at a national level

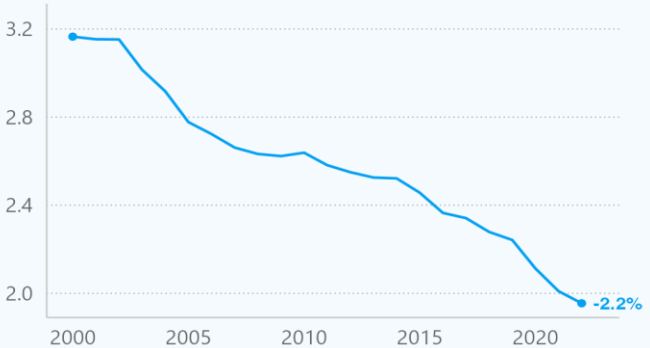
Energy intensity is a measure of the energy inefficiency of an economy. It is calculated as energy use divided by gross domestic product (GDP), and it tells us the amount of energy required to produce goods and services. High energy intensity means more energy is required per dollar of GDP.

In MBIE's latest Energy in New Zealand data, energy intensity improved slightly in 2022, with the national average energy intensity indicator falling 2.5% in 2022. This was driven by improvements in key sectors across NZ including Agriculture, Forestry and Fishing (5%) and Commercial (excluding Transport, 0.2%). However, the Industrial sector (including Chemicals and Metals) saw a slight increase (0.4%). However, with the move by NZ Steel (discussed on page 11) to shift to an arc furnace in their processes, we expect to see efficiency improve in this sector in future reports.

This decrease has been driven by both efficiency improvements in the industrial sector and continued economic growth in the commercial sector which, being service based, is relatively less energy intensive than other parts of the economy.

Energy intensity across New Zealand

MJ/$ GDP in real 2009/2010 prices, annual. 2000-2022 CAGR



Source: MBIE. Last updated September 2023.

Consistent

Residential electricity consumption per ICP declines

The average electricity consumed at a residential ICP can be an indicator for improvements in energy efficiency in New Zealand homes.

Between 2010 and 2017 average consumption fell by an average of 1.3% per year, reaching its lowest point at 7,055 kWh per ICP. This reversed during the period between 2017 and 2021 where it increased by an average of 1% per year. This may be explained by increased working from home due to COVID-19, however, the trend was apparent before the first lockdown, suggesting it is driven by changes in electricity consumption more broadly.

However, in the year 2022, average residential consumption reversed and was 3% lower. Changes in consumption trends will become evident in future data releases. Energy efficiency remains an extremely important driver of household energy trends, however it's likely that residential consumption per ICP will continue to increase with electrification along with EV uptake and increasing electrification of space heating.

Average residential consumption per ICP

kWh, annual. 2000-2023 CAGR

Source: MBIE. Last updated December 2022.

Inconsistent

EVs are getting better, but not necessarily more efficient

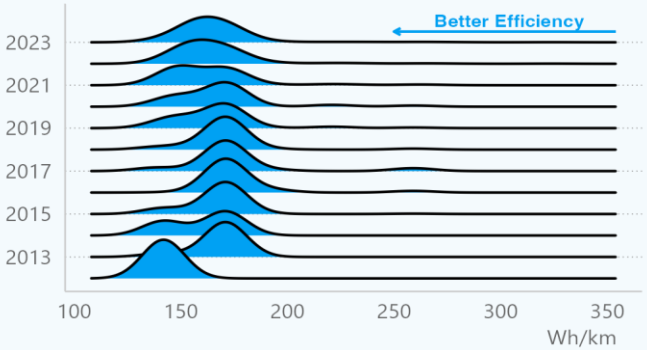
The fleet-weighted average efficiency of New Zealand's EV fleet has remained surprisingly static over the past decade. In 2012, the average watt-hours per kilometre (Wh/km) was just 142, largely due to the limited availability of EVs and the consequent popularity of the Nissan Leaf. Over the past decade, this figure has crept up and is now 166 (the same as last year), though there is now a much greater range of efficiencies to choose from as the graph below shows.

The key reason for this shift is the popularity of more powerful EVs. For example, the first-generation Nissan Leaf had an efficiency of 142 Wh/km, but the second-generation model sits at 171 Wh/km (and is still NZ's most popular EV by registration count).

Fortunately, current models now include highly efficient EVs that also have the benefit of greater power and range. The most efficient EV on the market today is the Hyundai IONIC 38 kWh model at 138 Wh/km – even better than the original Leaf. Two other very popular EVs are the Tesla Model 3 (149 Wh/km) and the Tesla Model Y (157 Wh/km).

NZ EV efficiency over time

Distribution of EV efficiency by year of registration



Source: EVDB and NZTA. Last updated August 2023.

Industrial energy users are still relying on fossil fuels, but clear signals abound for significant growth in industrial electricity demand

Uncertain

Electricity is the largest industrial fuel while overall use declines

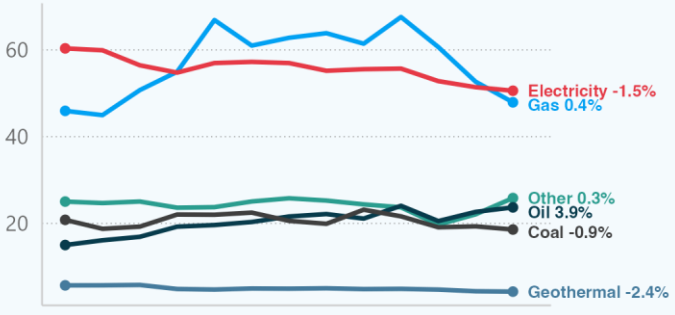
New Zealand's industrial sector relies on both fossil fuels and renewable energy sources. In the future, greater electrification should see some fossil fuel demand replaced by electricity.

In 2022, electricity moved ahead of natural gas as the primary industrial fuel for the first time since 2013. Electricity now makes up 30% of industrial energy consumption, vs 28% for natural gas, which had been the primary fuel. While some fuel switching accounts for this, the wood, pulp, paper and printing and chemicals sectors were the largest contributors to the decrease, due to lower production from Methanex in 2022 and recent closures of mills. The food product manufacturing sector was lower, potentially driven by lower milk processing and meat production volumes.

All other fuels have largely remained constant, except for the category of 'Other renewables', which has been increasing since 2020 and includes fuels such as biomass and biogas. Coal is another alternative to electricity in industrial use, and this has been steadily declining since 2010 at a rate of around 1% per year.

Industrial energy consumption

Petajoules, with 2010-2023 CAGRs



Source: MBIE. Last updated September 2023.

Uncertain

Energy prices remain volatile and elevated across the board

Carbon: The NZU spot price reached highs of $88 in November 2022, but fell as low as $37 in July after two failures of the NZU auction. It has since risen again to around $70 due to the Government's decision to adopt strengthening measures.

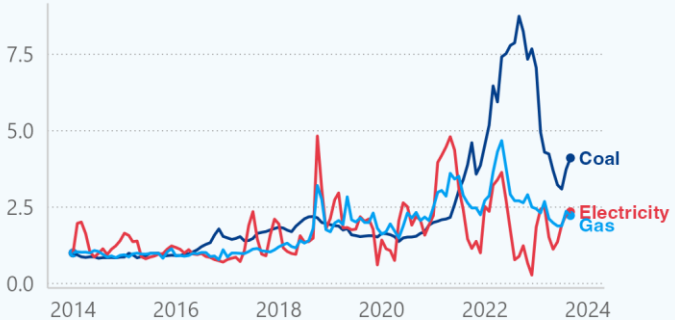
Coal: Although Newcastle coal prices have fallen to around half their September 2022 peak of $440/tonne USD, they continue to remain elevated due to geopolitical tensions and the strength of Chinese demand.

Gas: Supply has lifted with new infill drilling at Maui, Pohokura, Mangahewa, Kapuni and Turangi. This coupled with an outage at Motunui over the winter is contributing to less supply stress and consequently prices have fallen off their 2022 peak.

Electricity: Above average hydro inflows led to suppressed prices over winter, but a major outage at the Huntly and Stratford power stations has increased pressure on the system as it copes with growing peak demand.

Change in fuel prices

Monthly average price incl. carbon indexed against 2014



Source: Electricity Authority, emstradepoint, theecanmole, & investing.com. Last updated September 2023.

Uncertain

Large energy users signal shifts towards new energy futures

NZ Steel – has entered into a partnership with the Government to jointly invest total capital and transition costs of around $300 million to build an electric arc furnace at its steelworks at Glenbrook. The deal involves 30MW of renewable electricity supplied by Contact in a flexible off-peak arrangement that will enable production to be scaled down in times of peak demand or supply shortages.

Fonterra – is forecasting an investment of $790 million, including a government contribution of up to $90 million through the Government Investing in Decarbonising Industry (GIDI) fund to reduce Scope 1 and 2 emissions 50% by 2030, from a 2018 baseline. To achieve this, Fonterra has a request for proposals (RFP) for 1.3TWh of new electricity, for delivery in 2026 or 2027.

Tiwai Aluminium Smelter – The smelter consumes about 12% of the country's electricity per annum. Rio Tinto has signalled that the planned closure date in 2024, when its current electricity contracts ends, is not final. They have entered negotiations to cover their energy needs, however no agreement has been finalised yet. The smelter might enter into a long-term contract and could play a role in dry-year cover, or alternative demand sources for the electricity could emerge such as green hydrogen or data centres.

Channel Infrastructure – and Australia's Fortescue Future Industries (FFI) are investigating the financial, engineering, and commercial issues of turning green hydrogen into green jet fuel. If it were to proceed, a new production facility would be needed, possible making as much as 60 million litres of sustainable aviation fuel (SAF), which would be stored at the former refinery and then piped to Auckland Airport.

Air New Zealand – has entered into a partnership with two US-based firms – LanzaJet and Fulcrum BioEnergy - and will work through to early 2024 on the technical, economic, supply chain, and environmental feasibility of establishing and operating a SAF production facility in New Zealand. Air New Zealand have also opened an EOI to airports to be home to next generation aircraft, which they expect to begin flying from 2026.

Process heat decarbonisation continues to increase with government support, but the future is uncertain

Consistent

Policy is accelerating process heat decarbonisation

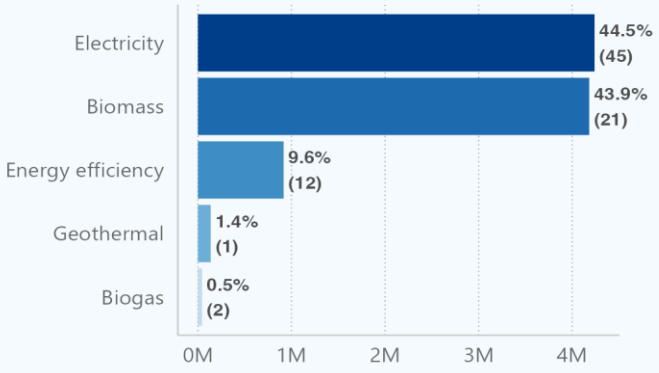
Decarbonising process heat is a large opportunity for New Zealand as it contributes 10% of gross emissions and 27% of energy-related emissions.

A key driver for process heat emission reductions is the Government Investment in Decarbonising Industry Fund (GIDI) administered by EECA. The fund enables partnerships between Government and businesses to accelerate emission reductions through energy efficiency and fuel switching projects.

Collectively, the total reduction in lifetime emissions of the GIDI fund is 9.5 million tonnes. Collectively, 45 electricity projects were awarded $64.3m in government co-funding, equating to an expected 4.2m tCO2e (45%). Recently changes to GIDI include operating the fund on an 'always on' open door application approach, rather than previous set application rounds. In addition, EECA has signed GIDI partnerships with NZ Steel for $140 million for an electric arc furnace and up to $90 million for Fonterra to fund a mixture of biomass and electricity fuel switching and energy efficiency projects.

Lifetime abatement of GIDI projects

Tonnes of CO_2e and project count by type



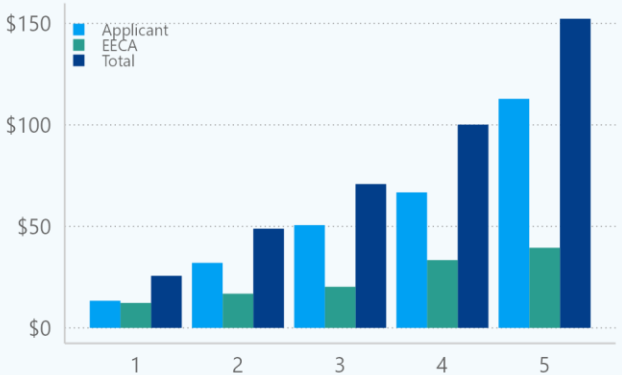
Uncertain

GIDI industrial programme continues to drive electrification

The government's $1bn GIDI Fund was set up in July 2022 and used Climate Emergency Response Funding to fund five separate co-investment programmes. The fifth programme was known as GIDI Industrial which invests in large industrial decarbonisation projects. In the five completed rounds including both iterations 1.0 (Rounds 1-3) and 2.0 (Rounds 4 -5), the GIDI Industrial programme has invested in 81 projects with a total incremental capital cost of $308m. For each round the incremental capital cost has increased from approximately $25 per tonne in Round 1 to $152 per tonne in Round 5. Total increment means the capital (not operational) cost difference between the BAU and the clean energy project – i.e. excluding the change in operational costs across the life of the asset. Based on the average private applicant and Government funding ratio, for every $1 co-invested by Government, the private sector contributes $1.70. In its latest September 2023 market update, EECA provided guidance around the uncertainty for GIDI programme funding through ETS revenues in its current form and assured the industry that existing contracts and approved co-funding would remain in place.

GIDI CAPEX Marginal Abatement Costs

Dollars per tonne of CO_2e abated by round (CAPEX only)



Source: EECA. Last updated December 2023.

Consistent

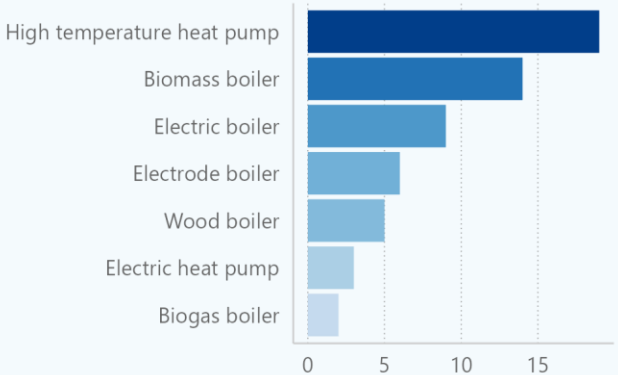
High temperature heat pumps are the most common GIDI technology

Looking across the five rounds of GIDI funding so far, high temperature heat pumps have proven to be the most common decarbonisation technology with 19 projects in total. The government has contributed over $16 million in co-funding towards these projects, achieving a lifetime abatement of 1.3 million tonnes of CO_2 (implying a marginal abatement cost of $12.60 / t). Biomass boilers follow this with 14 projects, while electric and electrode boilers have 9 and 6 projects respectively. Four of the top 7 technologies so far utilised rely on electricity as their energy source.

High temperature heat pumps are increasingly of interest in process heat decarbonisation due to their very high efficiency relative to other technologies, especially fossil fuels. These heat pumps can efficiently provide high-temperature heat for industrial processes, often reaching temperatures as high as 160°C (320°F) or even higher. Unlike fossil fuel-based heating, high-temperature heat pumps use electricity to capture ambient heat, making them highly energy-efficient. There are also operational efficiencies gained through removing the need for fuel storage.

Most common technologies funded

Count of project across 5 rounds so far



Source: EECA. Last updated September 2023.

Electric vehicle numbers continue to push higher boosted by transport policy, but hybrids continue to dominate uptake

Consistent

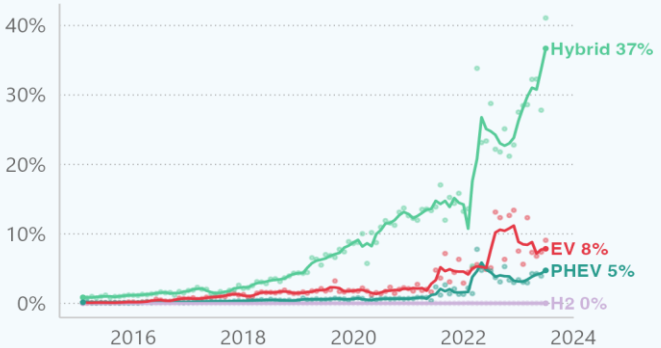
Light EV uptake continues to climb, but hybrids still lead

There are currently around 85,000 plug-in vehicles in NZ, or 2% of the total light vehicle (LV) fleet. Around 2700 plug-in vehicles are being added to the fleet each month (1889 EVs and 812 PHEVs) over the last year. On a percentage basis, 13% of all light vehicles entering the fleet each month are plug-ins. As of February 2023, 54% of vehicles entering the fleet have a battery of some kind (including hybrids). This compares to only 6% in 2019.

This growth in EVs has been supported by the Clean Car Discount (CCD), through which new zero emissions vehicles are eligible for a rebate proportionate to their emissions. As of July 2023, this was reduced from a maximum of $8,625 to $7,015. Meanwhile, highly emitting vehicles in contrast are charged a fee which since July 2023 has increased from $5,175 to $6,900. Non-plug-in hybrids continue to be be eligible for a rebate; however, the threshold has dropped from 146 g CO_2e/km to 100 g CO_2e/km. While it's too soon to see the impact of these changes, in the past six months the trend of hybrid vehicles vastly outstripping plug-ins has continued unabated, while plug-in vehicles continue to grow at a moderate pace.

Light low emission vehicle registrations

Percentage of registrations, rolling 3 month average



Source: NZTA. Last updated August 2023.

Consistent

Small but consistent increase in numbers of heavy electric vehicles

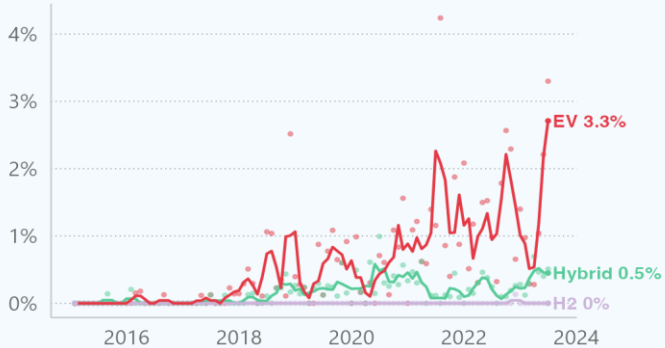
The rate of new electric trucks entering the fleet is beginning to pick up and is currently sitting at 3.3% of all trucks on a rolling 3-monthly basis.

In the past 12 months, there have been 236 heavy electric trucks added to the fleet, or 1.4% of all trucks. This compares with 130 electric trucks in the 12 months prior to that. Unlike light vehicles, the number of battery-electric vehicles strongly eclipses hybrids – of which there were only 48. The number of new electric heavy trucks per month has increased significantly in the last two years. It now averages 12 trucks per month (compared with only five from 2018 - 2020).

Hydrogen fuel cell technology is also expected to be a potential competitor to battery electric trucks; however, hydrogen has not emerged in NZ as yet. Budget 2023 included $30 million over three years to establish a Clean Heavy Vehicle Grant for zero emissions heavy vehicles, including hydrogen fuel cell heavy vehicles as well as electric. However, if hydrogen becomes more common in heavy transport, this will still result in increased electricity demand to power the electrolysis.

Heavy low emission vehicle registrations

Percentage of registrations, rolling 3 month average



Source: NZTA. Last updated August 2023.

Consistent

EV purchase price parity still higher than ICE but has narrowed

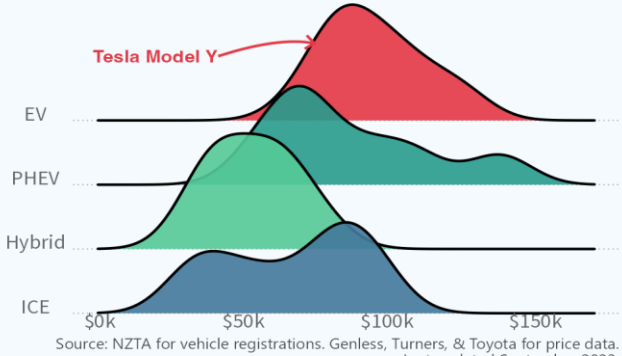
Upfront purchase price is a key barrier to adoption of electric vehicles. EV purchases will start to grow significantly once the purchase price of EVs is on par with internal combustion engine (ICE) vehicles.

Since the March 2023 report, many more EVs have entered the NZ market, but the average cost of an EV (including PHEVs) remains markedly higher than an ICE or hybrid equivalent, suggesting price parity has not yet been reached. Research by Bloomberg suggests global price parity with petrol and diesel equivalents between 2025-2028.

The all-time most popular EV in NZ continues to be the Nissan Leaf with 20,129 currently registered – almost three times the next most popular, the Tesla Model 3. However, in the past 12 months, the Tesla Model Y has overtaken the Leaf as the current best seller, with 6,396 registered in the past 12 months. But at $67,500 (excl. rebate) this model is still considerably more expensive than an average ICE vehicle. The cheapest EV is now the GWM Ora at $42,990 (excl. rebate) but there are now seven EVs within $5,000 of this price point.

Distribution of vehicle prices

Top selling vehicle prices, including rebates



Source: NZTA for vehicle registrations. Genless, Turners, & Toyota for price data. Last updated September 2023.

Battery technology and flexible demand is building momentum with new products and technologies on the way

Consistent

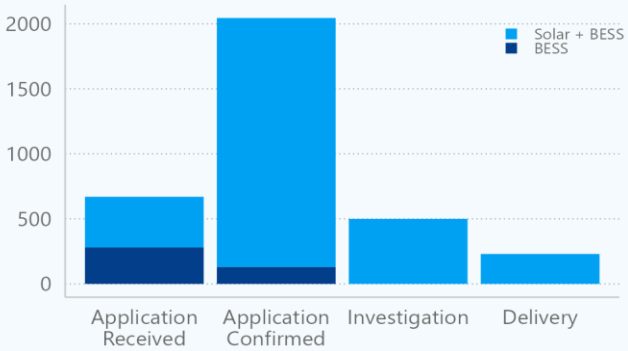
Battery Energy Storage System (BESS) interest is surging

New Zealand is beginning to see signs of growing investment in Battery Energy Storage Systems (BESS). Transpower currently has 410 MW of dedicated BESS in its connection queue, and a further 3,035 MW of solar with BESS firming (330 MW of which is consented and 230 MW of this is currently in delivery). An additional 500 MW is now under investigation and expected to be completed within 12 months. Note that the MW size pertains to the maximum applied for and, in the case of solar, it relates to the total size of the plant which will be greater than the size of the battery. Also, some BESS will be added as a later stage. Nevertheless, this gives an indication of the interest in BESS and firmed solar in the pipeline.

This is consistent with other countries around the world such as Australia, in which BESS is increasingly being seen as a useful and economic way to maximise output from intermittent resources like solar as well as capitalise on increasing variability in wholesale prices. BESS also can also provide valuable demand response to assist the System Operator in managing peak demand. As battery costs continue to fall, BESS is expected to play a key role in providing firm flexibility in the future.

BESS and BESS-firmed solar in the pipeline

MW (maximum) by connection queue stage



Source: Transpower analysis. Last updated September 2023.

Consistent

Non-network solutions are progressing at all system levels

Non-network solutions in the context of the electricity system involve decentralised, off-grid power generation and storage options, such as solar panels with batteries, as alternatives to relying solely on centralised grid infrastructure, which can enhance resilience and sustainability. Several options are being sought and progressed across all levels of the power system.

Wel Networks through Infratec have now built and are currently testing their 35 /33MWh battery energy storage system located on Rotowaro Road, Huntly, Waikato. This battery Energy Storage System (BESS) is nearing completion and is expected to be fully commissioned by late 2023.

Meridian Energy's Ruakākā BESS is well underway at their renewable energy park located near Marsden Point. The 100 MWp (200 MWh) capacity grid-connected battery is scheduled to be completed by 2024, with future construction of a 130 MW solar farm.

Contact Energy continue to progress their BESS plans (100MW / 200 MWh) to FID (expected this coming FY) but are now considering a site near Glenbrook as their preferred location instead of their consented site at Stratford. They believe consent to be straight-forward, and the northern location offers more advantages.

SolarZero entered the reserves market in late 2022 with a staged enrolment of its 30MW of virtual power plant load from 10,500 household battery systems. It is also collaborating with Powerco on a 1MW distributed battery system for network support in Coromandel.

Vector utilise BESS as part of their broad suite of options to manage network capacity and quality. To date, Vector has batteries connected to its 22 kV and 11 kV networks at seven sites across the Auckland region.

EEA/EECA's FlexTalk trial is currently evaluating the processes that need to be in place to apply the OpenADR 2.0 communication protocol to achieve actively managed EV charging, enabling flexibility services to be utilised in the New Zealand electricity sector.

Consistent

New Dispatch Notified Load product unlocks new flexibility

As System Operator (SO) we traditionally facilitate demand response participation via a Dispatchable Demand (DD) product, which is the full-scale demand-side equivalent of generation. However, it requires SCADA indications are provided to us and 24hr communications available. It is intended for large industrial consumers, or potentially the load side of Battery Energy Storage Systems (BESS).

As part of the recent real-time pricing changes, the Electricity Authority has developed a new product called Dispatch Notified Load (DNL), which is like Dispatchable Demand, but it requires a lower level of compliance, so it is intended to allow smaller load stations to participate in the wholesale market. As SO we have implemented the enabling changes in our systems earlier this year. Participating load stations are expected to have a total capacity between 1 and 10 MW (above this we require real time consumption data through Transpower's SCADA system.)

Demand-side organisations may actively participate as DD or DNL in the wholesale market. This means that participants signal their load quantities and price responsiveness through their bids, and their load is optimised and scheduled by the market system. Although DD and DNL are dispatched similarly to generation, they are fundamentally different in that they are reducing their load to avoid high electricity spot prices. DD and DNL are not directly compensated like generation, but participants benefit by getting better cost certainty in the spot market.

Importantly, the DNL product is also available to flexibility aggregators. Solar and battery aggregator SolarZero has begun participating in a pilot supported by Transpower and Ara Ake to demonstrate the ability of distributed energy resources to use market mechanisms to provide capacity in low residual situations through the DNL product. As part of this pilot, SolarZero are also aiming to integrate approximately 11,000 individual homes with Virtual Power Plant technology to provide ~30MW of distributed generation into the market.

Distributed solar installations continue to increase with long term costs falling, with growth consistent

Consistent

Residential solar installations run slower than record 2022

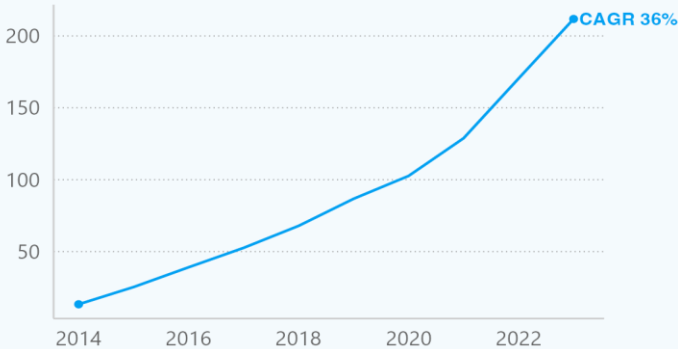
More New Zealand households are installing solar photovoltaic (PV) systems on their rooftops to take advantage of lower electricity costs.

Over the past decade, the total number of solar installations have grown by an average of 36% per year to reach 45,910 ICPs by the end of July 2023 – this equates to approximately 2.5% of households. Almost all of these installations are below 10 kW, however the average size of a new installation has been increasing, from 3.5 kW to 5.7 kW.

Growth has generally been increasing, with a marked uptick since 2020. The amount of residential solar has more than doubled in the past three years. Prior to 2020, residential solar grew at around 14 MW per year. In 2021, this more than doubled to 32 MW and a record 48 MW of residential solar was installed in 2022. 2023 appears to be running at a slightly slower pace, however, with only 18 MW installed to July. Despite this, at the current total installed capacity of 212 MW, we are well on track against the Accelerated Electrification projections to have 300 MW by 2025.

Residential Solar in New Zealand

MW, total installed distributed capacity



Source: Electricity Authority. Last updated July 2023.

Consistent

Commercial solar installations continue strong growth

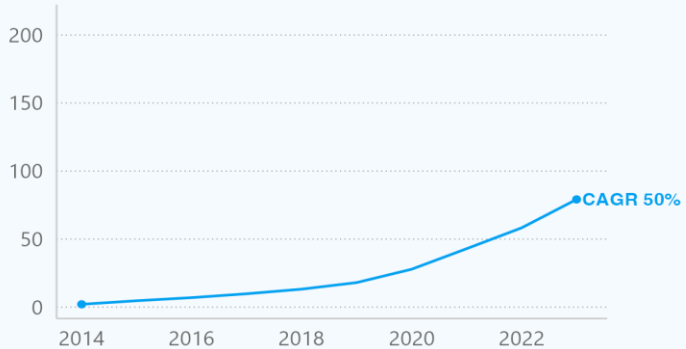
As with residential sites, commercial and industrial solar installations have also been increasing. These installations are embedded and do not include any grid-connected solar installations.

Over the past decade, the total number of solar installations have grown by an average of 50% per year to reach 3,454 ICPs by the end of July 2023. The majority of installations are still under 10 kW, but the proportion of large installations has been steadily increasing: from 11% in 2013 to 36% so far in 2023. The average capacity for new installations is approximately 32 kW in 2023.

Like residential solar, the pace has been increasing for commercial solar. Prior to 2020, only an average of 3 MW was added each year. However, since 2020, at least 12 MW has been added each year, with 20 MW added in 2022, the largest annual increase so far. 2023 is tracking well at 13 MW as of July. Although commercial solar lags behind residential, it is rapidly catching up, with an average annual growth rate of 50% (compared to 36% for residential).

Commercial Solar in New Zealand

MW, total installed distributed capacity



Source: Electricity Authority. Last updated July 2023.

Consistent

Distributed solar costs forecast to continue sharp decline

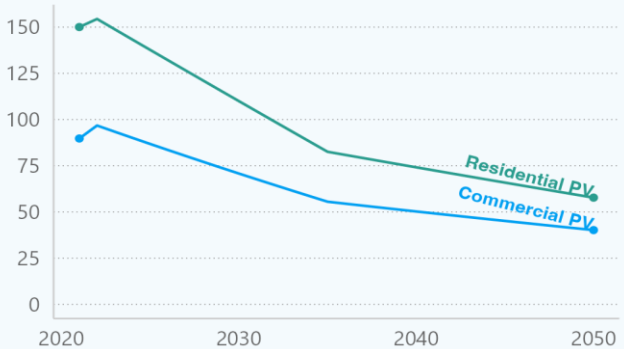
The National Renewable Energy Laboratory (NREL) releases industry updates on forecast solar PV levelised cost of energy (LCOE). Between now and 2030, the cost of solar is expected to fall by 58% and 43% for residential and commercial respectively.

Recent movements in global PV module prices have started to stabilise, after rising significantly in the prior year. Recent cost pressures were driven by the higher cost of polysilicon, a key feedstock to most PV modules, supply chain disruptions caused by the global pandemic, and inflation. Overall, the installed price of a 3 kW system in New Zealand is about $10,000 in 2022 which has increased from $8,000 in 2021. In Australia, an installed 6 kW system is 31% cheaper than a 3 kW system installed in New Zealand.

As a result of supply chain shortages and component price pressures, price increases in PV systems were seen for the first time. Despite this, analysts expect that the pace of installations will continue to increase, buoyed in part by the United States Inflation Reduction Act which analysts expect will more than double annual US solar installations between 2022 and 2025.

Levelised cost of energy for distributed solar

$/MWh (USD)



Source: NREL. Last updated 2022.

Electricity affordability needs to be maintained, as the transition to a highly renewable energy system to meet targets is underway

Uncertain

Average household electricity bills fall, but consumers are concerned

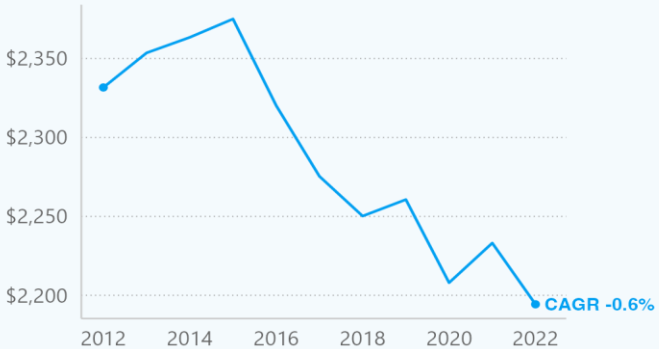
Energy affordability is a core pillar of the energy trilemma. Electrification is only likely to occur if electricity is affordable and competitive against other forms of energy.

At a household level, the average price per kWh slightly decreased from $0.31 in 2012 to $0.30 in 2022. Over the same period, the average household consumption per ICP has fallen 6.0%. In 2022, the average household used 7,146 kWh per year, down from 7,602 in 2012. Consequently, the real average household bill has decreased and is now $2,194 per year – a average annual reduction of 0.6% since 2012.

However, the Consumer Advocacy Council recently found that 65% of households were concerned about the cost of electricity – this compared with 58% in 2022. Similarly, 28% of small businesses were feeling the pressure of power bills on their finances in 2023 compared with 21% in 2022. One factor that may be impacting perception of electricity prices is the phasing out of low user maximum daily charges which began in April 2022 and will continue rising annually until 2027.

Average annual residential household cost

NZD (real)



Source: MBIE. Last updated December 2022.

Consistent

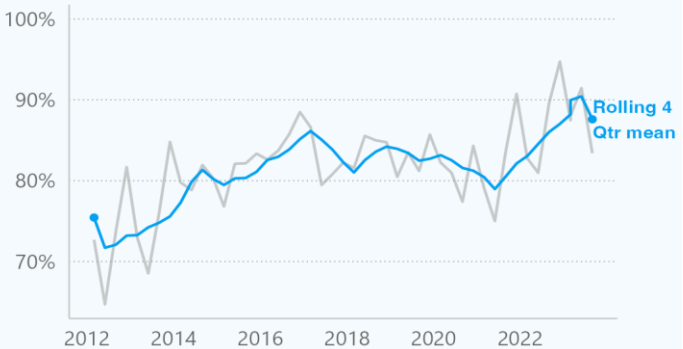
Renewable electricity generation reaches new record

For the majority of the past decade, New Zealand's electricity system had an average of 82% renewable generation. The past couple of years have set new records. In 2022, a rise in hydro inflows and increased wind generation saw renewability of the electricity system increase to 87% for the year, including the December quarter which reached 95% renewable, the highest quarterly renewable share since 1980. This resulted in a decreased reliance on coal and gas for electricity generation.

The first half of 2023 has continued strongly, with the the system operating on 99% renewables for prolonged periods of time. Overall, electricity was 88% renewable in the first quarter, and significantly higher than average hydro inflows led to 91% renewable in the second quarter. However, hydro storage has since reverted to normal levels once again, and the third quarter looks set to fall back to historic levels once again in the low 80s. NIWA have also noted that the El Niño Alert criteria continued to be met during August, leading to forecasts of below normal rainfall in some key hydro catchments and unusually long dry spells, which may put pressure on the renewability of the system.

Renewable share of electricity generation

Average percent, quarterly



Source: MBIE and EM6. Last updated September 2023.

Uncertain

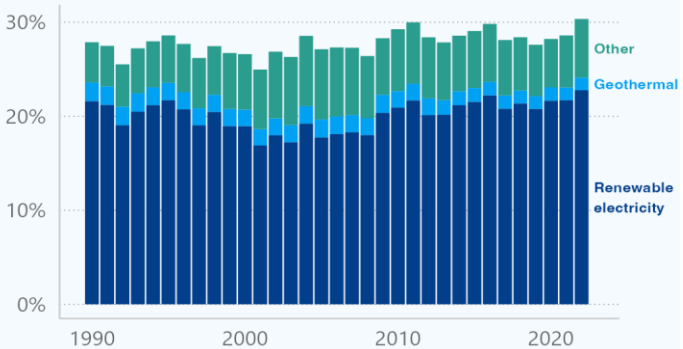
Renewable energy consumption is still a long way short of the target

In 2022, NZ reached its highest share of renewable energy consumption, reaching 30.3% compared with an average of around 28%. 23% of this came from renewable electricity. The remaining 7% was made up of around 1% Geothermal and 6% from other renewables, such as biomass. These proportions have remained remarkably stable for the past few decades, but both other renewables and renewable electricity saw increases this year. However, as the total electricity used has not increased significantly, the main driver of this increase can be attributed to above average hydrological inflows (see Panel left).

The Government has posed an ambitious target of 50% renewable final energy consumption by 2035 to deliver on its decarbonisation goals. This target is in line with WiTMH's Accelerated Electrification scenario. To achieve it, renewable electricity will need to increase from 23% of total consumption to 36%. The remaining 14% will come through other fuel switching possibilities such as gas to hydrogen, and the use of biomass/ biofuel.

Renewable energy percent

Annual, total final consumption



Source: MBIE. Last updated September 2023.

Progress against the ten Whakamana i Te Mauri Hiko industry themes

is ongoing and may shift further with future energy policy

1 Streamlining our connections process

- Our Connection Management Framework is working as intended; the average size of generation applications has increased.
- Transpower has extended our online publication of customer works to include all types of projects as well as generation connections.
- Transpower is increasing our investigation and delivery capacity, e.g. by combining projects where possible.

2 Integrated system planning

- Transpower submitted its first Major Capital Proposal to the Commerce Commission as part of its Net Zero Grid Pathways (NZGP) project, which aims to ensure New Zealand can take an integrated view of future investment needs. It includes investment to strengthen the grid backbone in the Central N.I, Wairakei and the HVDC.
- Work is beginning on the next stage of the NZGP project, which will form a view on what an optimal decarbonization pathway might look like and the transmission required to get there.

3 Getting the incentives right for electrification and renewables

- The Government has accepted the recommendations from the Climate Change Commission to strengthen the ETS to ensure the NZ ETS and aligned ERP actions prioritise gross emissions reductions.
- EECA-managed funding and support available to transport (LETF) and process heat (GIDI) electrification.
- The NZ Energy Strategy is underway, due in 2024. The Government has recently released a series of related consultations to inform this work.

4 Removing barriers to low carbon infrastructure

- National and Built Environment Act (NBA) and Spatial Planning Act (SPA) have been passed into law as part of the Resource Management Act Reform.
- EECA GIDI fund expansion to include funding for electricity transmission and distribution infrastructure upgrades to support fuel-switching.
- New legislation now requires an emissions plan to be in place for RMA approvals, both for new consents and, from 2025 onwards, existing.

5 Demand-side management of peaks

- EECA's /EEA's FlexTalk project to investigate for flexibility services for smart devices and use of Open ADR.
- MoT have published a draft EV Charging Strategy for NZ.
- FlexForum release a Flexibility Plan 1.0.
- Distribution businesses conducting various projects:. WEL Networks' innovative transformation to a Distribution System Operator (DSO) model and Ara Ake EDB decarbonisation challenge partnering with EDB's.

6 Ensuring generation meets peaks

- Grid-scale generation and flexible BESS projects are being built.
- SO releases information highlighting issues with winter peak challenges and Electricity Authority releases paper on peak demand impacts from removal of RPCD.
- New issues paper released by MBIE on Electricity Market Measures as part of the Energy Strategy consultations.

7 Managing dry year risk

- MBIE's NZ Battery Project moves to next phase with two options to be progressed: Lake Onslow and a portfolio approach.
- Genesis Energy successfully trials Huntly biomass burn.
- Flexible demand projects are being investigated to assist with dry-year management, e.g.: Southern Green Hydrogen project, Tiwai and Methanex flexibility.
- Contact agree a 30 MW demand response deal with Glenbrook smelter to provide both peak and energy flexibility.

8 Protecting system stability

- Transpower continues to monitor risks to system stability.
- Transpower published updates to several sections of the 2022 system security forecast (SSF) in June 2023 as part of its ongoing cyclic reviews.
- Transpower is working with the Electricity Authority on understanding the future security and resilience of the electricity system. An issue paper on Part 8 of the Code relating to common quality was published and consulted on. Work has commenced on developing and evaluating options as part of developing an options paper for publishing early next year.

9 Access to skilled workforce

- As an Accredited Employer Transpower continues to recruit and build our talent pipeline of migrant employees with knowledge and experience not available in New Zealand
- Developed and using a compelling 'employment value proposition' to promote and recruit talent.
- Commitment to the Wonder Project Power Challenge has deepened and continued for a second year.
- Graduate and Internship Programmes provides a talent pipeline (16 and 30 placements in 2024, respectively).
- Head of Sector Workforce Development role appointed to work with Service Providers to ensure future workforce.

10 Collaboration

- Boston Consulting Group (BCG) released a 'Future is Electric' report for which Transpower provided data.
- Transpower is currently working with EECA and EDB's on collecting data on process heat end use and the Regional Energy Transition Accelerator (RETA).
- Transpower is investigating the concept of Renewable Energy Zones in New Zealand.
- Transpower is supporting MBIE on the regulatory settings for offshore wind energy.