



Energy in New Zealand 2024



Ministry of Business, Innovation and Employment (MBIE) Hīkina Whakatutuki – Lifting to make successful

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Overview

This report presents comprehensive information on, and analysis of, New Zealand's energy supply and demand for the 2023 calendar year.

Key results for 2023:

- **Electricity generation from renewable sources reached its highest level on record**, with the renewable share of electricity generation increasing to its highest level since 1981.
- **Gas production was up slightly** in 2023. Contributing to this increase was to higher production at the Maui field following the completion of its infill drilling in 2022.
- Overall energy consumption in New Zealand remained relatively unchanged in 2023 compared to the year before, with **30 per cent of total energy consumption coming from renewable sources** in 2023.
- **Residential electricity consumption surpassed the industrial sector for first time to become the largest consumer of electricity**. This was due to the continued steady growth in the number of residential users combined with the continued steady decline in industrial consumption.
- **National average energy intensity was unchanged following steady declines over the last five years**. This was mainly due to slower economic growth, particularly in the commercial sector which has relatively low energy intensity and is a large contributor to national economic activity.
- **Consumption of petrol and aviation fuels increased**, with the aviation sector continuing to recover following the impact of restrictions on activity and movement as part of the response to the coronavirus (COVID-19) pandemic.
- The 2023 calendar year marked the **first year of fully imported refined petroleum products** following the closure of the Marsden Point Oil Refinery ceasing refining operations in 2022.

Energy

Indicators

SHARE OF ELECTRICITY GENERATION FROM RENEWABLES REACHES THE HIGHEST LEVEL SINCE 1981

The share of renewables in electricity generation reached 88.0 per cent in 2023, up by 1 per cent on 2022’s previous record high since the early 1980s. This increase was due to higher levels of electricity generation from hydro, wind, and solar, leading to less reliance on coal- and gas-fired generation to meet demand.

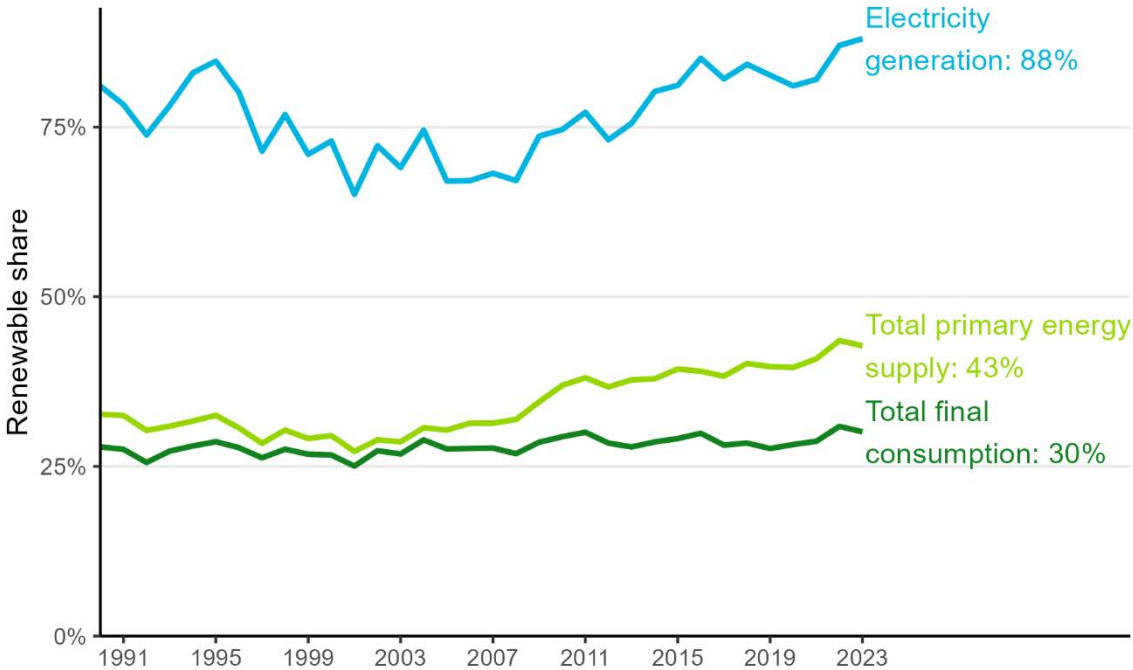
The share of renewables in total final consumption fell slightly from 2022’s record high, down 0.8 percentage points to 30.1 per cent in 2023. Contributing to this was increases in the consumption of refined oil products (such as petrol and aviation fuels) offsetting the increase in the use of renewable electricity.

Total primary energy supply: The total amount of energy available for use in New Zealand, accounting for domestic production and trade.

Total final consumption: Energy consumed by end-users such as factories and businesses.

The share of renewables in total primary energy supply fell slightly, down 0.7 percentage points to 42.8 per cent. This was driven by an increase in the supply of oil products, and a fall in the supply of woody biomass.

Figure 1. Renewables in electricity generation, energy supply, and energy consumption



Energy intensity gives an indication of the relationship between energy use and economic growth. It is calculated as energy use divided by gross domestic product (GDP) and tells us the amount of energy required to produce each dollar of GDP. A fall in the indicator — where less energy is required to produce each dollar of GDP — is viewed as an improvement.

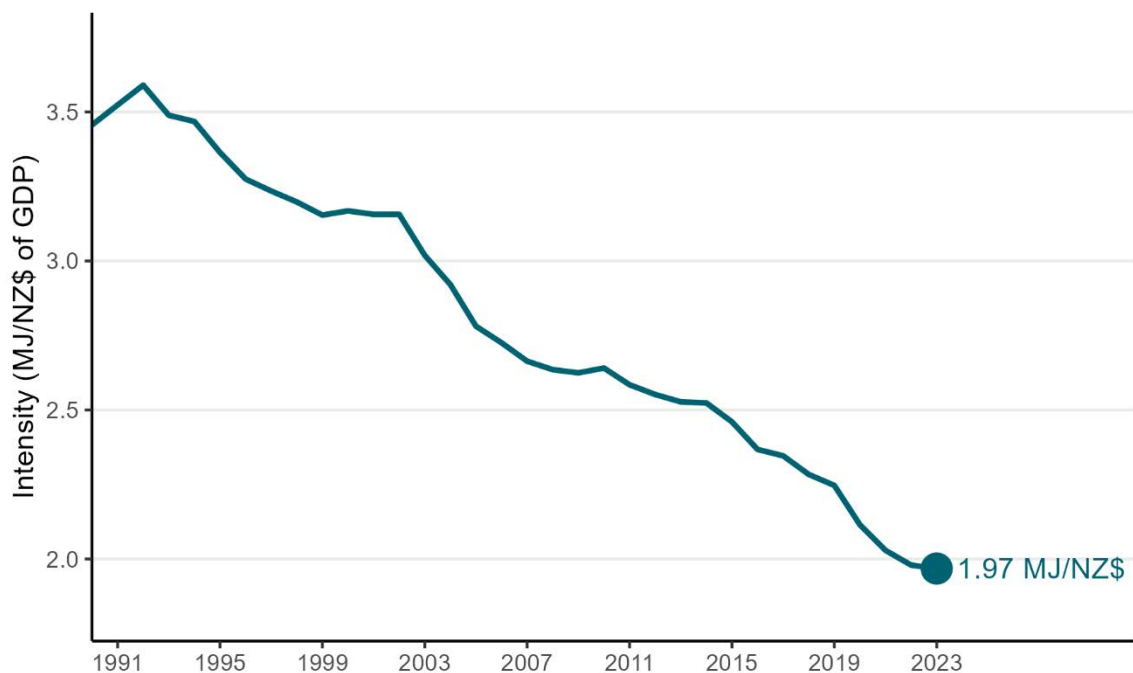
If energy intensity decreases, it is usually due to:

1. Energy users within a sector are finding ways to use energy more efficiently, increasing the energy efficiency of the sector, or
2. Activity shifts from more energy-intensive sectors to less energy-intensive sectors, resulting in a lower overall energy intensity.

ENERGY INTENSITY UNCHANGED AS COMMERCIAL GROWTH SLOWS

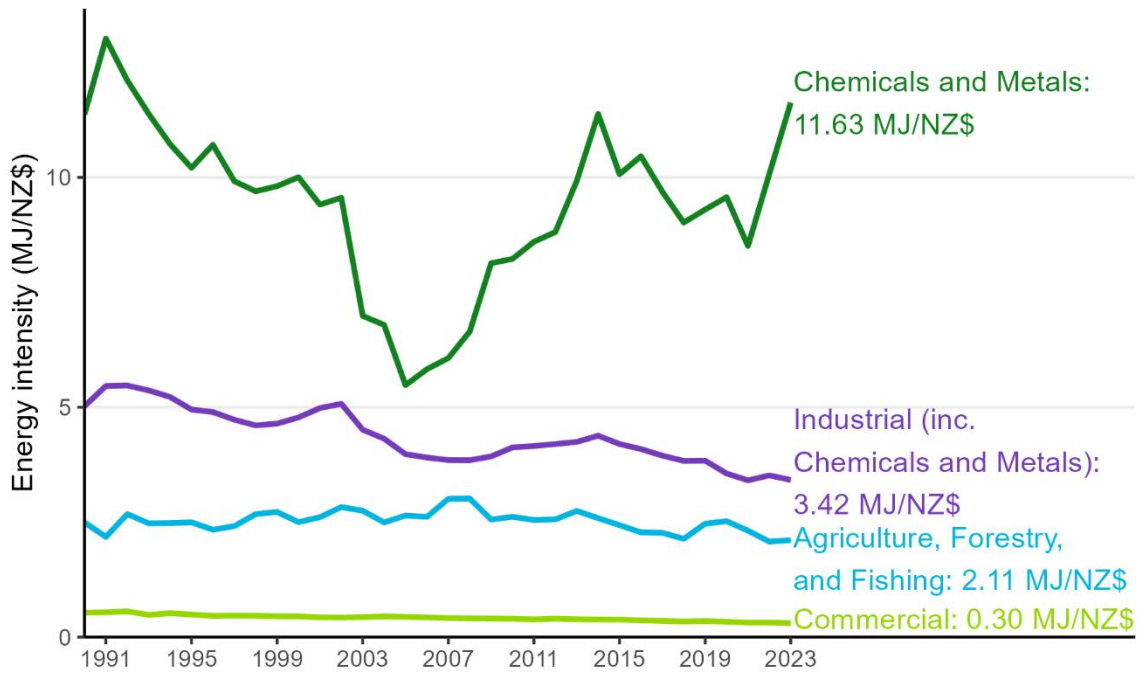
The sustained decline in national energy intensity flattened out in 2023, with national average energy intensity relatively unchanged at 1.97 megajoules per dollar (MJ/\$) in 2023. This was mainly due to a slowing of in gross domestic product (GDP) growth, notably in the commercial sector.

Figure 2. National energy intensity



The decline in national average energy intensity over the last decade had been driven by the commercial sector, which is relatively less energy intensive than other parts of the economy (as it is service based) and is a large contributor to national GDP.

Figure 3. Energy intensity by sector



SELF-SUFFICIENCY REMAINED UNCHANGED

New Zealand relies on a combination of domestically produced and imported fuels to meet its energy needs. A common metric used internationally to measure this is a self-sufficiency indicator, which shows how well we can meet our own energy supply needs through domestic production.

In 2023, national self-sufficiency remained unchanged in at 73 per cent. Key contributors to New Zealand’s energy self-sufficiency are coal and oil — the two fuels which New Zealand trades internationally.

Self-sufficiency: The ability of a country to meet its own energy supply needs through domestic production.

A value of 100 per cent indicates that a country produces all the energy it needs, whereas values above or below 100 per cent indicates it is a net exporter or importer of energy, respectively.

Electricity

HIGHEST LEVEL OF ELECTRICITY GENERATION FROM RENEWABLES ON RECORD

The level of electricity generation from renewable sources reached its highest level on record driven by increases in hydro, wind, and solar generation. This led to the renewable share of electricity generation reaching 88.1 per cent, its highest level since 1981.

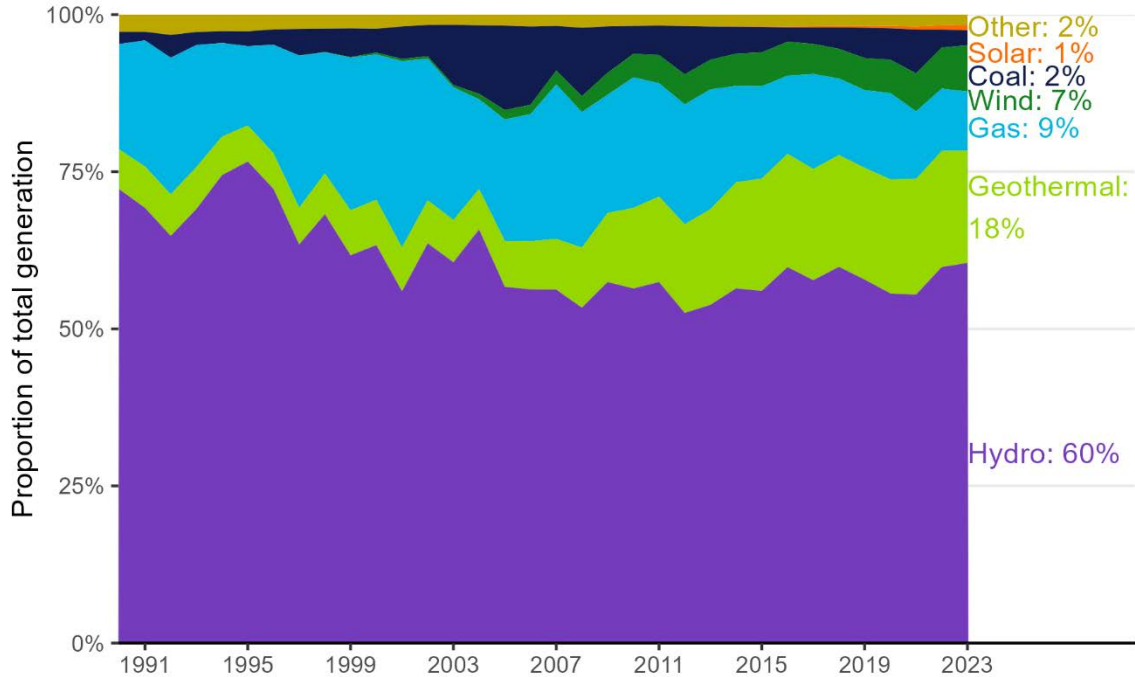
Net generation refers to the amount of electricity generated minus what was used by the generating plant itself (called the 'parasitic load').

Total electricity generation stayed steady in 2023 at 43,488 GWh. Hydro generation, which made up 60.5 per cent of net generation in 2023, increased by 1.1 per cent (296 GWh) to 26,309 GWh. This was the highest level of hydro generation since 2004, driven by heavy rainfall in hydro catchment areas, and follows 2022 which also saw favourable hydro conditions. Wind generation increased by 13.0 per cent (369 GWh) to 3,206 GWh, with new capacity coming online with the commissioning of the Kaiwera Downs Stage 1 and Harapaki wind farms. Solar generation increased by 30.3 per cent (85 GWh) to 367 GWh, mostly due to further installations of distributed solar panels (such as on households). Additionally, November 2023 saw the commissioning of the Kohirā solar farm in Kaitaia, the first utility-scale solar farm in New Zealand.

Geothermal generation was down by 3.4 per cent (275 GWh) to 7,758 GWh. Contributing to this were outages at several plants (both planned and unplanned).

The increase in renewable electricity generation meant less generation was required from non-renewable sources. Gas generation was down 4.9 per cent (212 GWh) to 4,097 GWh, while coal generation dropped by 17.6 per cent (220 GWh) to 1,031 GWh.

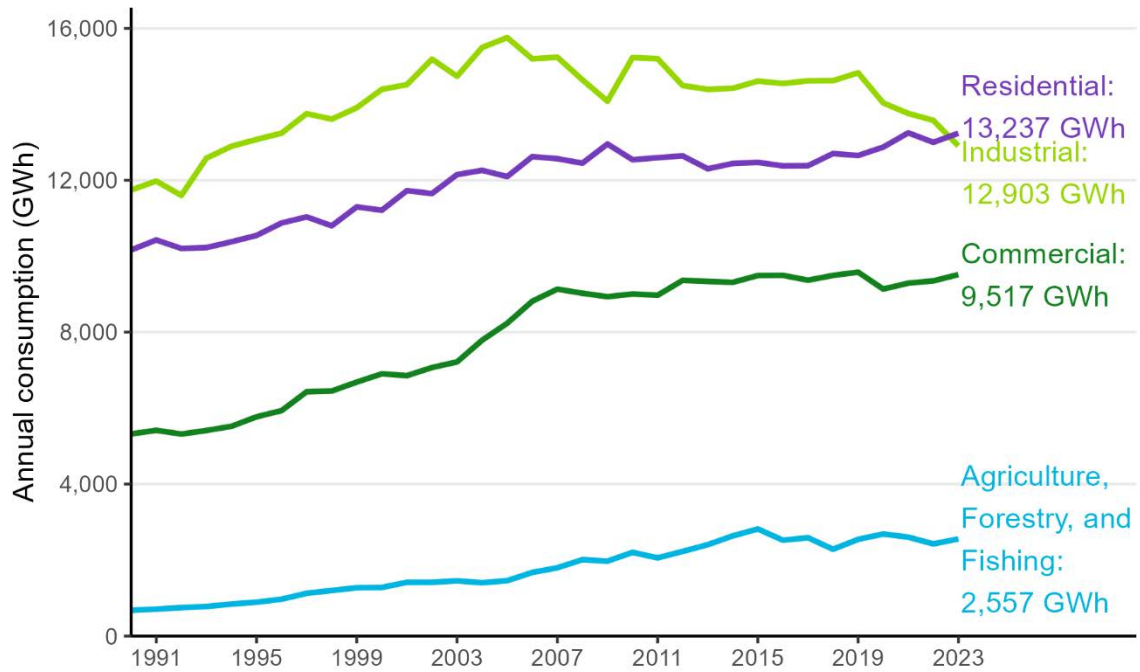
Figure 4. Electricity generation by plant type



RESIDENTIAL SECTOR SURPASSES INDUSTRIAL TO BECOME LARGEST CONSUMER OF ELECTRICITY

National electricity consumption was also relatively unchanged, up 0.2 per cent (69 GWh) to 39,130 GWh in 2023. For the first time, residential consumption surpassed industrial consumption to become the largest sector of electricity consumption in New Zealand. Consumption by the residential sector has grown by 4.6 per cent (587 GWh) over the last 5 years, with over 75,000 new residential connection points added over this period.

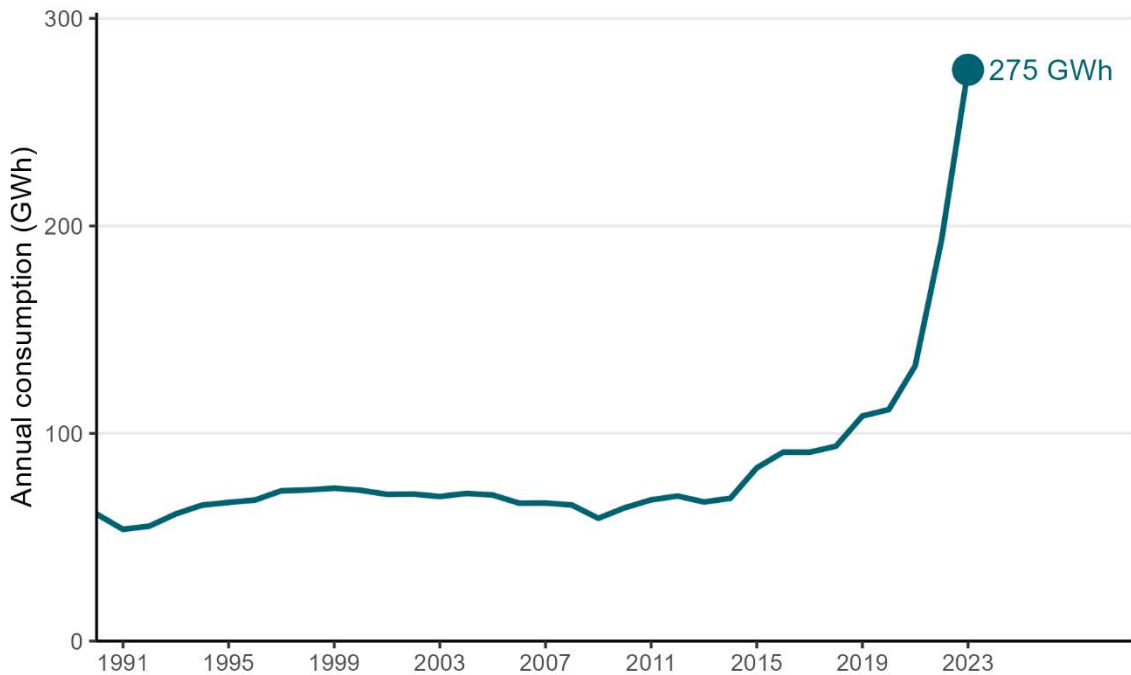
Figure 5. Electricity consumption by sector



Electricity consumption for transport, although starting from a relatively lower base, has seen sustained growth over recent years. In 2023, consumption by the sector increased by 42.4 per cent (82 GWh) to 275 GWh, with increased uptake of electric vehicles (EVs) over the last couple of years contributing to this. There were 76,506 battery electric vehicles in New Zealand’s motor vehicle fleet at the end of 2023, compared with only 29,292 at the end of 2021¹.

¹ <https://www.transport.govt.nz/statistics-and-insights/fleet-statistics/sheet/monthly-mv-fleet>

Figure 6. Electricity consumption in transport sector

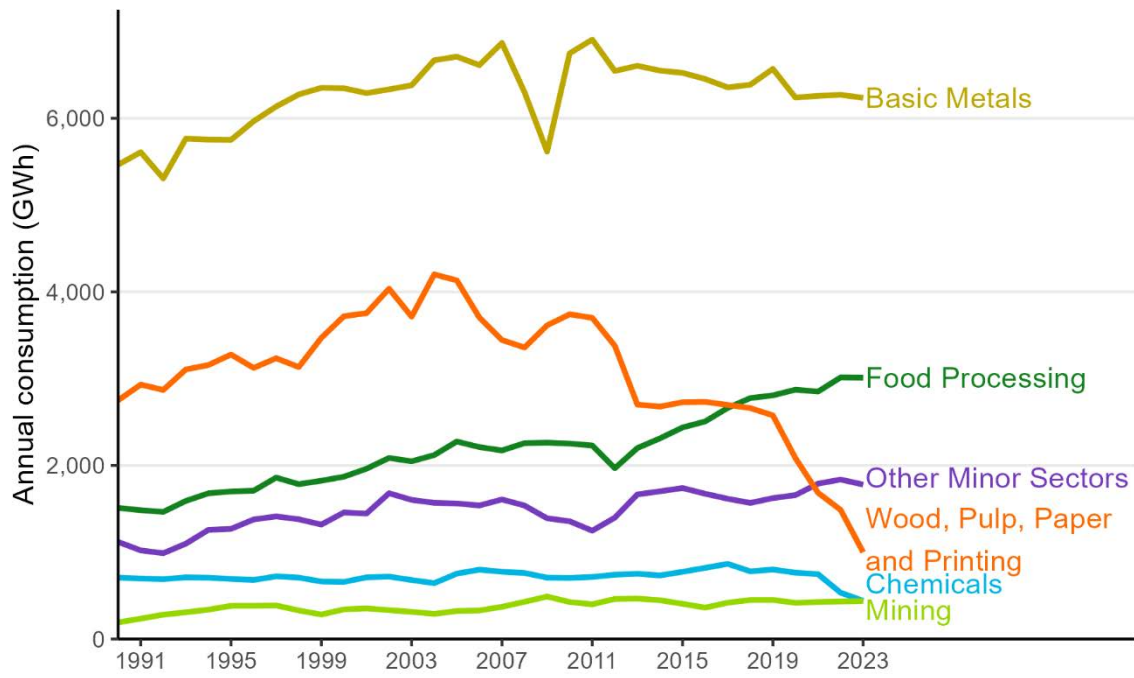


INDUSTRIAL CONSUMPTION CONTINUES DECLINE DUE TO DECREASED DEMAND FROM THE WOOD PROCESSING SECTOR

Industrial electricity consumption decreased by 5 per cent (673 GWh) in 2023 to 12,903 GWh. Electricity use by the industrial sector has been declining in recent years, with decreases in the wood, pulp, and paper processing sector contributing to this.

Electricity consumption in the wood processing sector decreased by 32.8 per cent (488 GWh) in 2023 to 999 GWh. This was 61.2 per cent (1,577 GWh) lower than 5 years ago in 2019. Contributing to this was the closure of Norske Skog Tasman’s newsprint mill in Kawerau at the end of June 2021, as well as a reduction in the activity of the sector in 2023 due to the impacts of Cyclone Gabrielle.

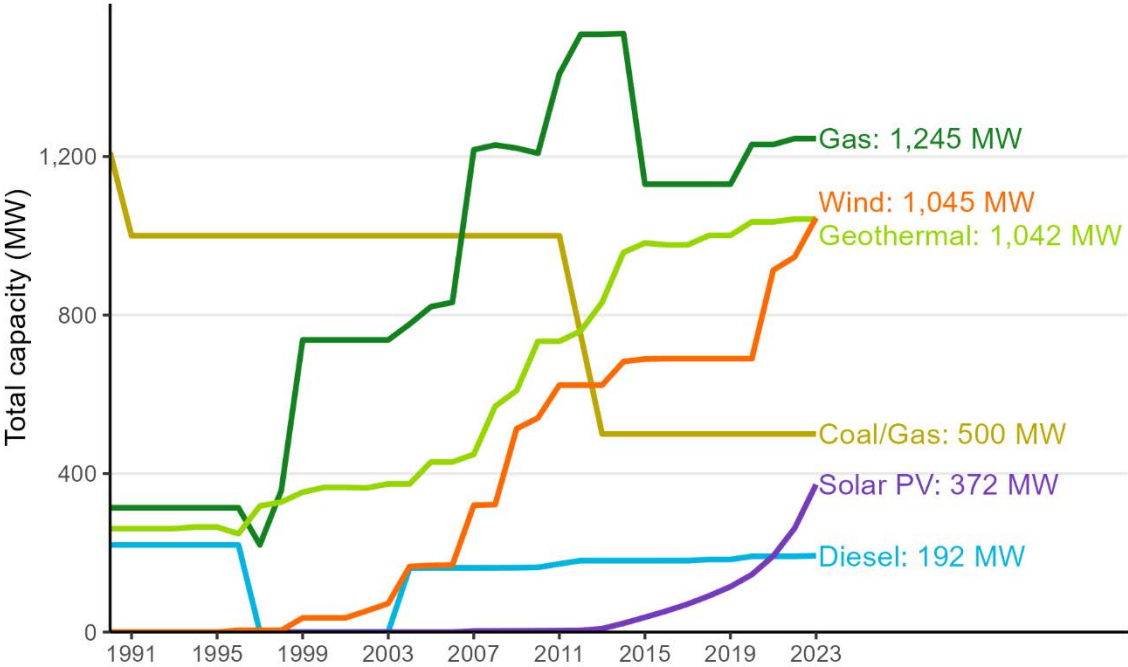
Figure 7. Industrial electricity consumption



WIND AND SOLAR CAPACITY CONTINUES TO GROW

Total generation capacity (excluding cogeneration) increased by 2.2 per cent (210 MW) to 9,931 MW in 2023. This was mainly due to the continued strong growth in solar capacity which increased 42.1 per cent (110 MW) to 372 MW in 2023. While the growth was mainly in distributed capacity, the country’s first utility-scale solar farm also became operational in 2023, adding 33 MW to capacity. Wind capacity also increased by 10.4 per cent (99 MW) to 1,045 MW total capacity with the Kaiwera Downs Stage 1 and Harapaki wind farms coming online. All other plant types remained unchanged for the year.

Figure 8. Operational capacities by plant type (excluding Hydro)



Note: Solar includes both utility-scale and distributed capacity

Renewables

Direct use of renewable energy in New Zealand

Renewable energy is often associated with electricity production, specifically wind, solar, or hydro generation. However, renewable energy is also used for direct heat applications such as milk powder drying, paper making, commercial space heating, or Rotorua's heated pools.

Geothermal

Geothermal energy is extracted from heat deep beneath the earth's surface. Kawerau, where geothermal steam is a significant source of energy for pulp and paper mills, is among the world's largest user of direct geothermal heat concentrated in one location.

Geothermal energy is often used for electricity generation. However, a smaller amount is used for direct heat applications. These uses include drying paper or milk in industrial processes, or in residential or commercial heating, such as the heated pools in Rotorua.

Woody biomass

Pulp and paper mills and wood processors use the majority of woody biomass to provide heat energy and generate electricity. Households use a smaller quantity for space heating.

Black liquor

Black liquor is a dark liquid generated during the paper-making process. Throughout the wood pulping process, chemicals are added to help separate the fibres from the lignin, which acts as a binder holding the fibres together. This resulting combination of chemicals, lignin, and wood fibres is a dark, viscous liquid known as black liquor.

Liquid biofuels

Liquid biofuels are renewable, low-emission fuels that can be blended with petrol and diesel to reduce greenhouse gas emissions from transport. They are also less dependent on new vehicles (for example, electric vehicles or hydrogen fuel cell vehicles) because they can be used in existing internal combustion engine (ICE) vehicles.

Sustainable aviation fuels

Sustainable aviation fuel (SAF) is a type of jet fuel produced from renewable feedstocks, such as vegetable oil or animal fat. It is very similar to traditional fossil jet fuel in its chemical composition and is generally blended with traditional fuel to reduce the emissions of aviation transport.

Biogas

Originating from a variety of non-fossil sources, such as wastewater and sewage, biogas is primarily a mixture of methane and carbon dioxide which is combusted to produce heat and/or electricity.

Sludge gas is derived from the anaerobic fermentation of biomass and solid wastes from sewage. Sludge gas is produced at several municipal wastewater treatment plants around the country, where it is used to generate electricity.

Landfill gas is derived from the anaerobic fermentation of biomass and other organic solid wastes in landfills. About a dozen sites around the country collect landfill gas and use internal combustion engines to produce electricity.

RENEWABLE PRODUCTION AND USAGE FELL IN 2023

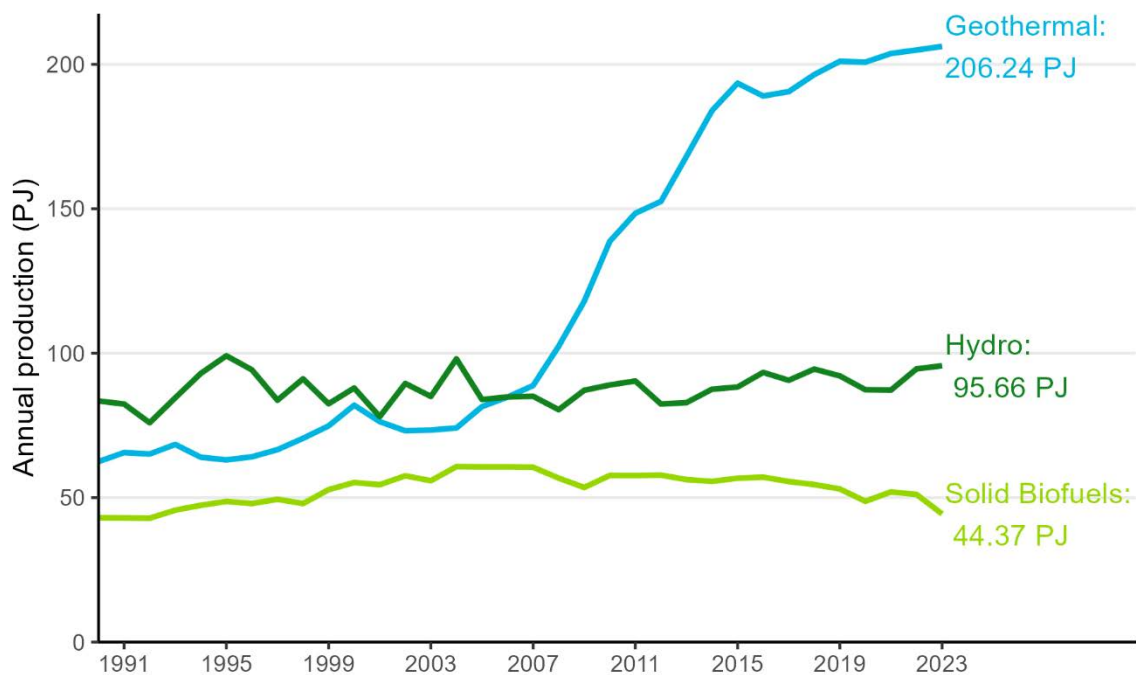
The total supply of renewable energy fell to 363.8 PJ in 2023, a 2.6 PJ drop from 2022. This was driven by a decline in the wood processing sector, which offset increases in hydro, geothermal, solar, wind, and liquid biofuel supply.

Solid biofuel use fell by 13 percent (6.7 PJ) to 44.4 PJ in 2023. In February 2023, Cyclone Gabrielle caused significant damage to several key wood processing and forestry sites. The Pan Pac mill at Whirinaki was closed for much of the 2023 calendar year to repair silt damage. Along with other impacted sites, this meant a decline in electricity and wood energy demand for the sector.

This led to wood energy use falling below levels seen during the coronavirus (COVID-19) pandemic and is the lowest on record since 1992. This contributed to New Zealand's renewable share of energy consumption falling slightly to 30.1 per cent, down from 30.9 per cent in 2022.

Geothermal and hydro production remained steady in 2023. In contrast, biogas production continued its long-term increasing trend up 4 percent (0.13 PJ) in 2023 to 3.8 PJ, mostly driven by increased use of landfill gas for electricity generation.

Figure 9. Renewable energy production by main types



Coal

New Zealand has extensive coal resources. Our estimated in-ground resources are over 15 billion tonnes, although 80 per cent of this is lignite in the South Island. Sub-bituminous and bituminous in-ground resources are around 4 billion tonnes, but economic reserves are much smaller.

New Zealand's coal industry can be divided into three distinct geological areas.

1. In the North Island, coal production is centred in the Waikato region where large coalfields like Maramarua and Rotowaro produce sub-bituminous coal. This coal is excellent for heating and electricity generation, although its quality is generally not high enough for it to be exported for use in the production of iron and steel. The main consumers of this coal are Genesis' Huntly Power Station and the Glenbrook steel mill. Unlike most steel mills around the world, the Glenbrook mill uses sub-bituminous coal due to the unique processes used at the facility.
2. Coal extracted on the West Coast of the South Island is mostly bituminous coal, along with some sub-bituminous. The bituminous coal is generally exported for use in the production of iron and steel.
3. The rest of the South Island tends to produce either sub-bituminous coal, or the even lower-energy lignite primarily used for industrial process heat.

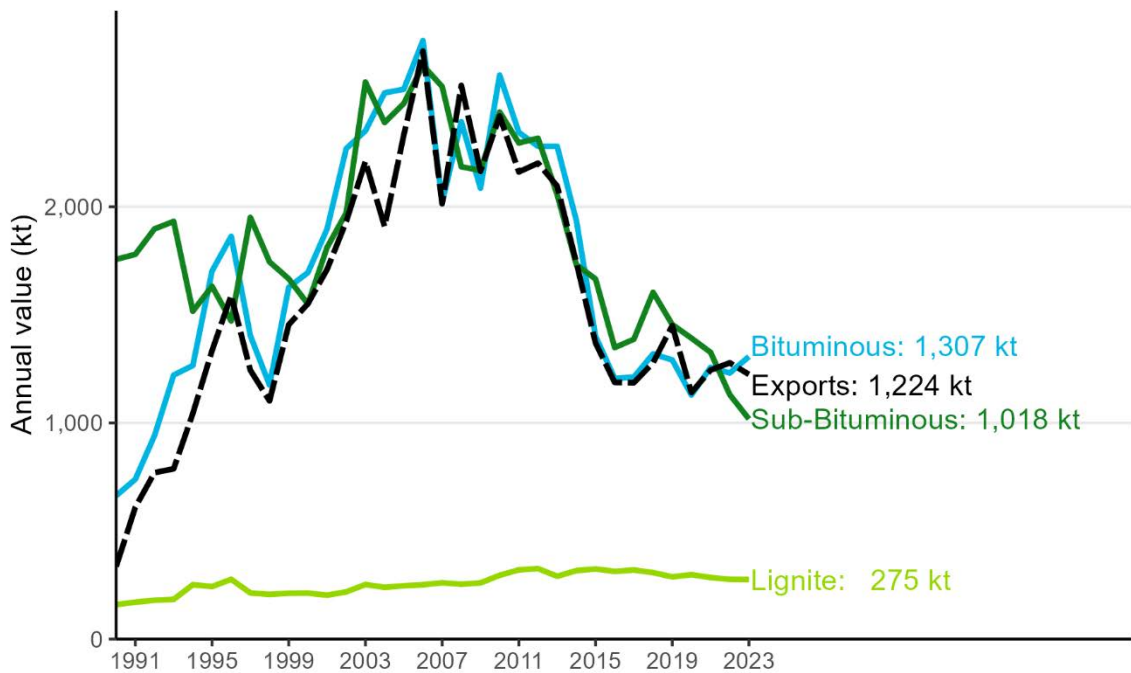
Most of the imported coal is sub-bituminous coal, used for electricity generation and steel production.

COAL SUPPLY AND USE CONTINUE TO TREND DOWN

New Zealand imports most of the coal that is used domestically, while coal mined in New Zealand supplies both the domestic and export markets.

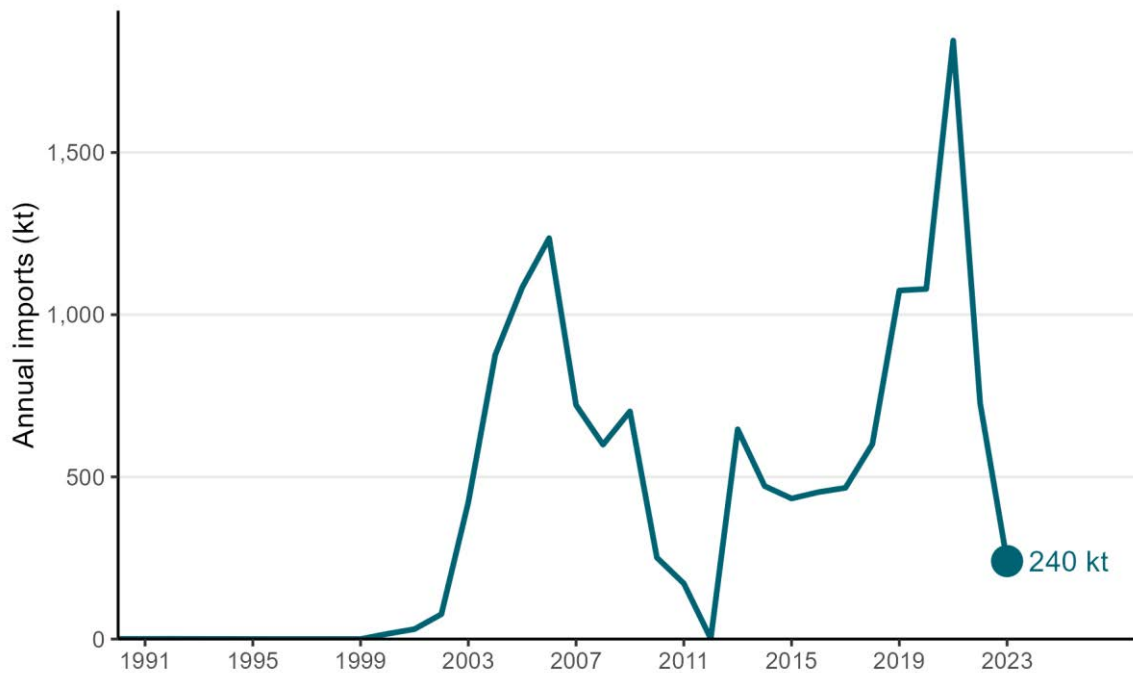
Domestic coal production continued to decline, with a 1.4 per cent (37 kt) decrease to 2,600kt in 2023. At the end of 2023, thirteen mines were operating in New Zealand compared to 18 at the end of 2020. 2023's coal exports decreased by 4 per cent (54 kt) on 2022 figures, totalling 1,224 kt in 2023. Both production and exports have steadily fallen over the past decade, with a small uptick between 2017 and 2019.

Figure 10. Coal production and exports



Coal imports have varied in recent years in response to requirements for domestic electricity generation and movements in international coal prices. Coal imports in 2021 reached their highest level on record and exceeded exports for the first time, as low hydro levels drove an increased demand for coal for electricity generation. Coal imports fell in 2023, down 487 kt (67 per cent) to 240 kt. Contributing to this was companies drawing on high onshore stock levels, a result of high imports between 2019 and 2022.

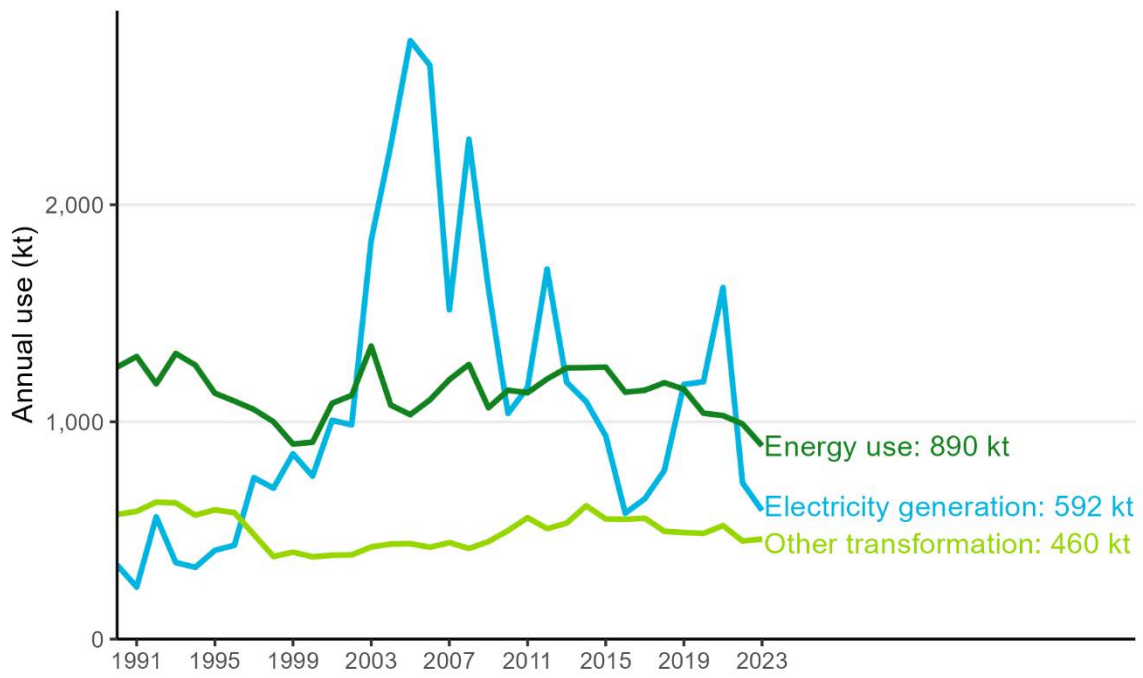
Figure 11. Coal imports



LOWER LEVELS OF CONSUMPTION AND TRANSFORMATION LEAD TO LOWER COAL USE

Total coal use (covering electricity generation, and consumption in sectors) fell 10 per cent (219 kt) on 2022 levels to 1,952 kt in 2023. Driving this was reductions in most sectors, with the largest falls seen in the industrial sector (down 102 kt) and in use for electricity generation (down 95 kt). The exceptions were coal use in transformation processes (which includes the use of coal in iron- and steelmaking) and consumption in the agricultural, forestry and fishing sector which were both up slightly.

Figure 12. Coal end use



Gas

Natural gas is a naturally occurring mixture of gases, consisting mainly of methane, which can be extracted from the ground in a similar way to crude oil. New Zealand's natural gas fields are concentrated around and off the coast of the Taranaki region. Natural gas is difficult to transport by ship, so New Zealand doesn't import or export any natural gas: all natural gas produced in New Zealand is used in New Zealand.

While some large users have direct connections to natural gas fields, most users draw natural gas from a network of pipes maintained by Firstgas. As this network does not extend to the South Island, natural gas is exclusively used in the North Island. A subsidiary of Firstgas, Flex Gas, operates the New Zealand's only natural gas storage facility at Ahuroa.

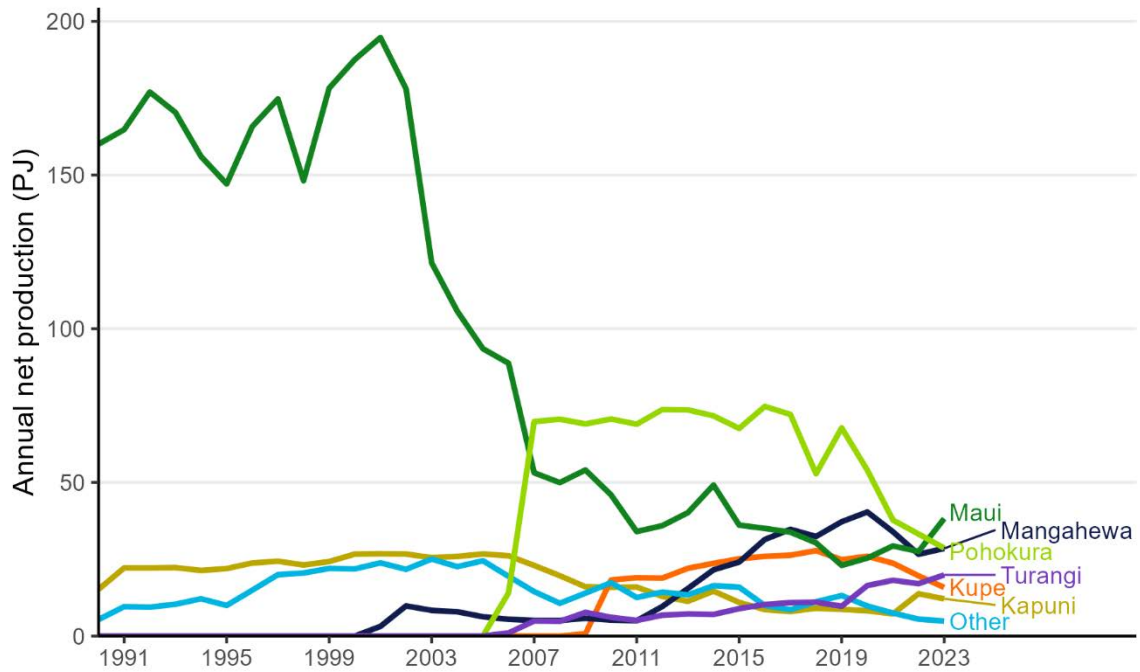
The largest user of natural gas in New Zealand is Methanex, which uses natural gas to produce methanol. Industrial use of natural gas accounts for approximately 60 per cent of all use in New Zealand, while 30 per cent is used in electricity generation, cogeneration, and other transformation activities. The remaining 10 per cent of gas use covers household use as well as use in schools, hospitals, and other non-industrial settings.

GAS PRODUCTION AND CONSUMPTION UP SLIGHTLY IN 2023

Net production of natural gas² for 2023 was 148.1 PJ, an increase of 3 per cent (4.8 PJ) on 2022 production levels. This increase was driven by higher production from the Maui field (up 11.4 PJ on 2022 production) following a drilling campaign in early 2023. There were also increases in production from Turangi (2.8 PJ) and Mangahewa (1.9 PJ) fields. Production at Kupe and Pohokura fields continued to decline into 2023, decreasing by 5.3 PJ and 4.5 PJ respectively.

² Net production refers to production minus gas reinjected, flared, or extracted as LPG.

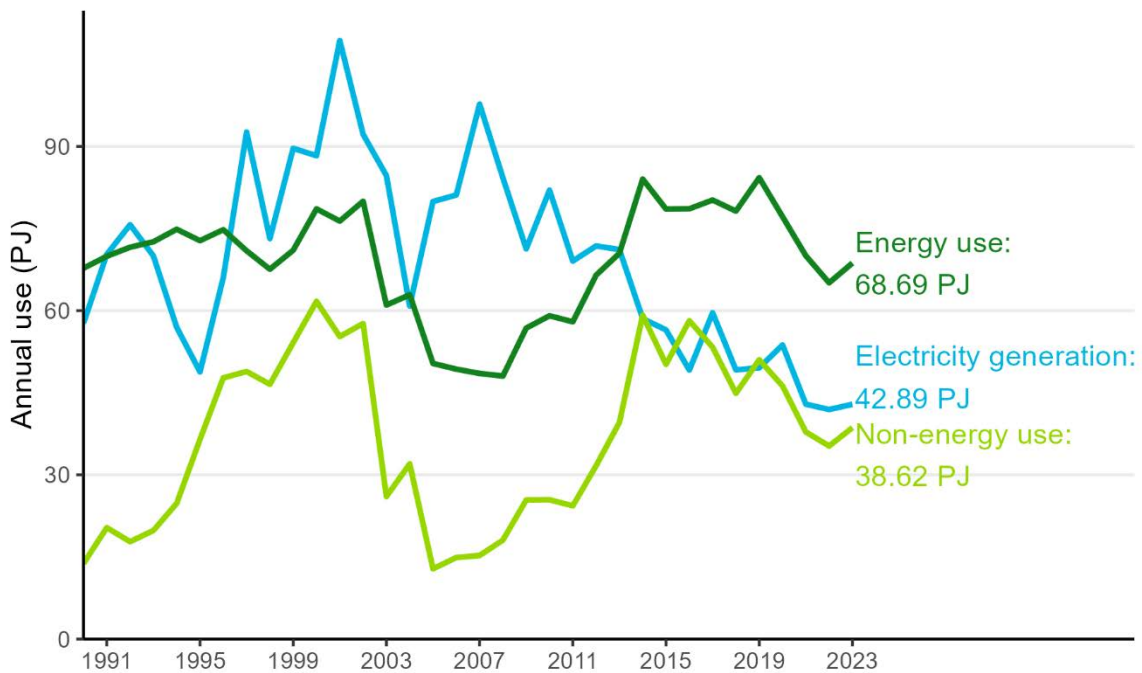
Figure 13. Gas production



ELECTRICITY GENERATION AND INDUSTRIAL USE LEAD TO HIGHER GAS USE

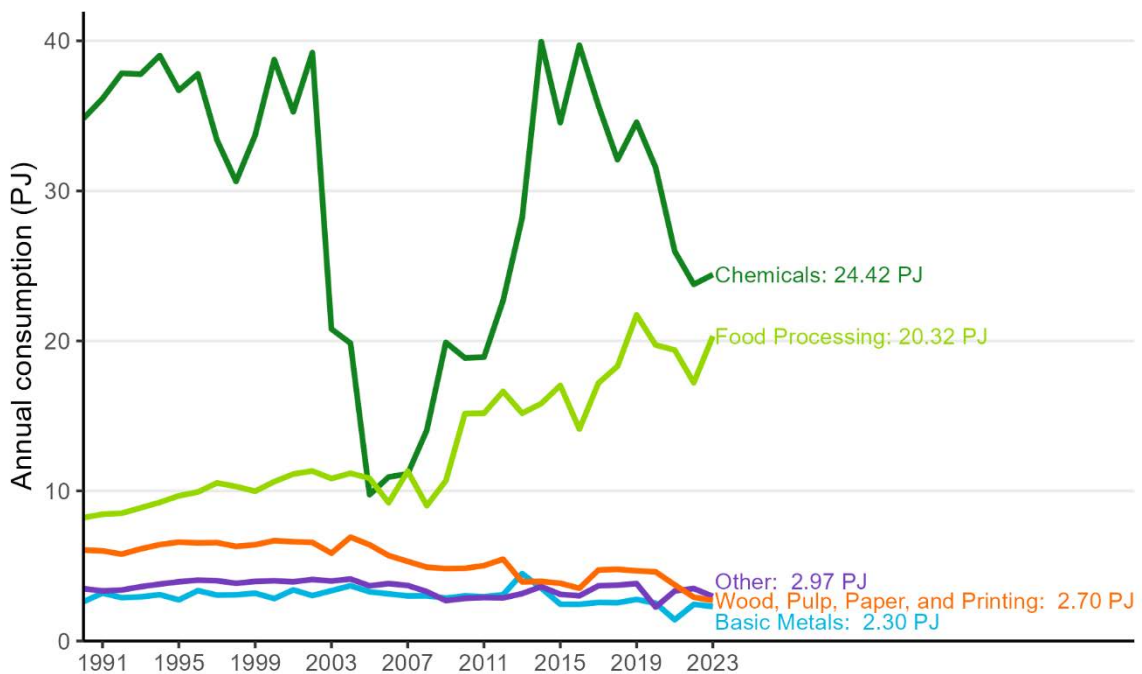
Total natural gas use (covering electricity generation, non-energy use, and consumption) for 2023 totalled 154.08 PJ, an increase of 5 per cent (7.30 PJ) on 2022 levels. This increase was primarily driven by non-energy use of gas (up 3.36 PJ) and consumption in the food processing sector (up 3.11 PJ). Non-energy use includes the use of natural gas as a feedstock, such as the production of methanol or urea.

Figure 14. Gas end usage



Gas use in the wood processing subsector continued to fall with a 7 per cent (0.2 PJ) drop to 2.7 PJ in 2023. Gas usage in the wood, pulp, paper, and printing sector has fallen 42 per cent (1.98 PJ) over the last 5 years.

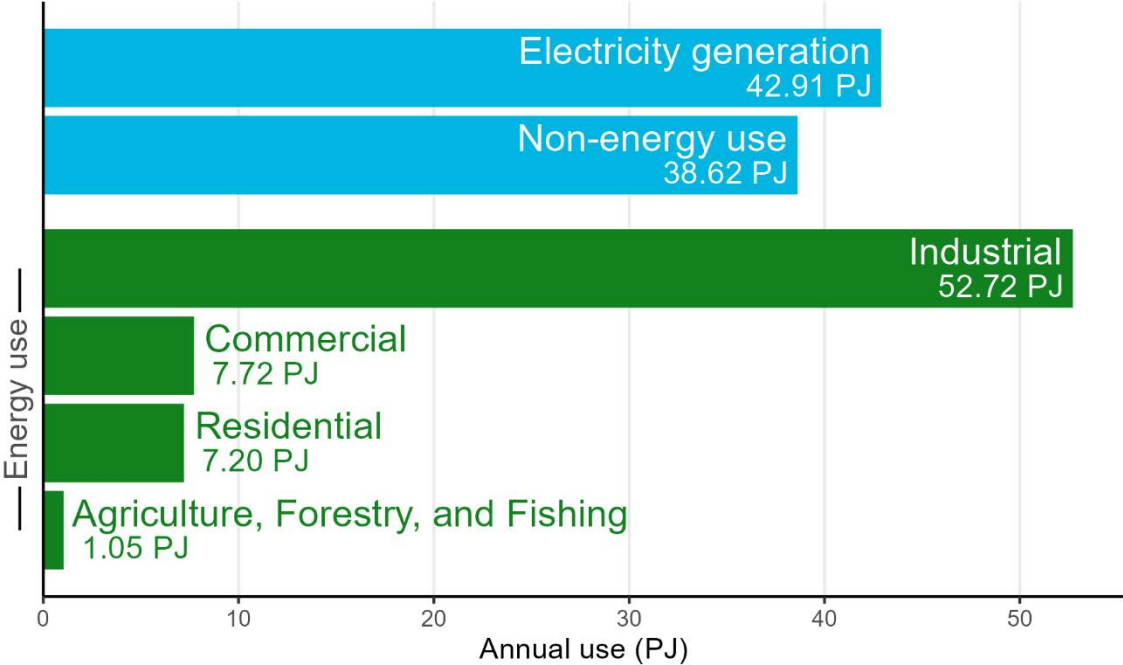
Figure 15. Industrial gas consumption by subsector



Of all the gas used in New Zealand in 2023, the majority was used by the industrial sector - either being burnt for heat (35 per cent of all use) or being used as a feedstock (26 per cent).

Around 29 per cent of gas use was for electricity generation, and the remaining 10 per cent represented use by households, schools, hospitals, and other businesses.

Figure 16. Gas use by type and sector



NATURAL GAS RESERVES CONTINUE TO FALL

As at January 1st 2024, New Zealand’s gas reserves dropped 20 per cent (335 PJ) to 1,300 PJ. Of this decrease:

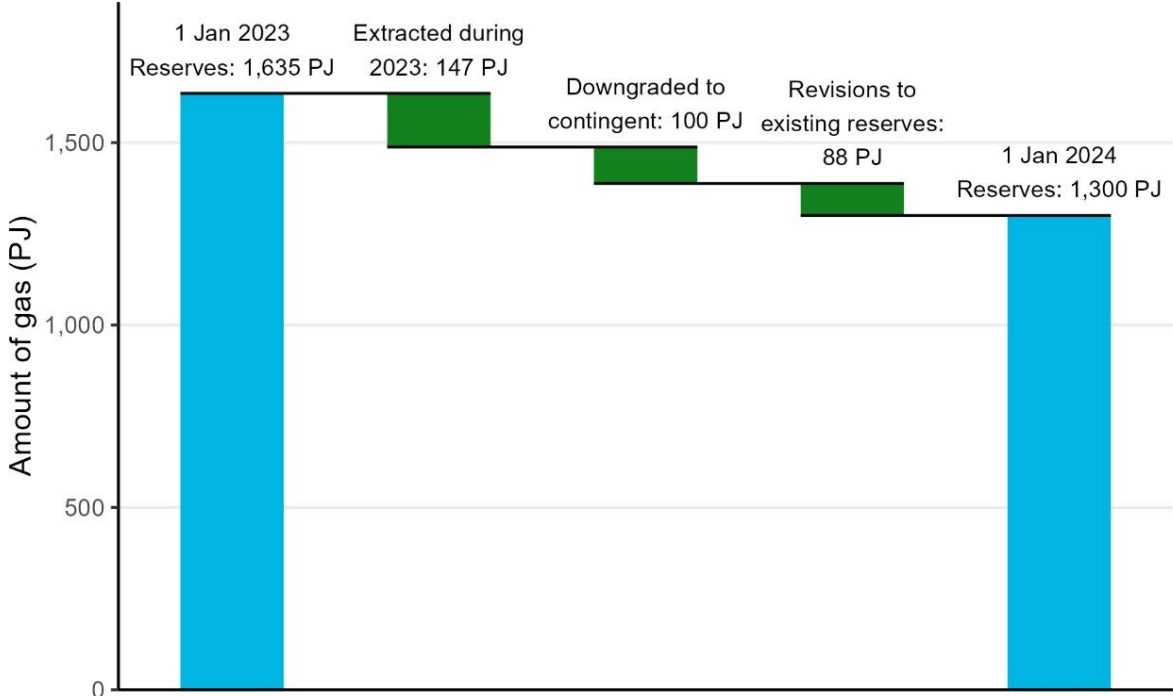
- 44 per cent (147 PJ) was due to gas extraction and use in the 2023 calendar year.
- 30 per cent (100 PJ) was due to reserves downgraded to contingent resources³.
- 26 per cent (88 PJ) was due to reserves being removed altogether because operators now believe the relevant fields hold less gas than previously thought.

Remaining reserves are expected to decrease each year, as field operators extract oil and gas for use. However, the past two releases have shown significant downward revisions in gas reserves data. More information on petroleum reserves and the underlying data can be

³ Contingent resources refer to the oil and natural gas which field operators know remain ‘in the ground’ at their fields, but which they do not expect to extract in the future (because, for example, it would be too expensive, or they lack the technical facilities to do so).

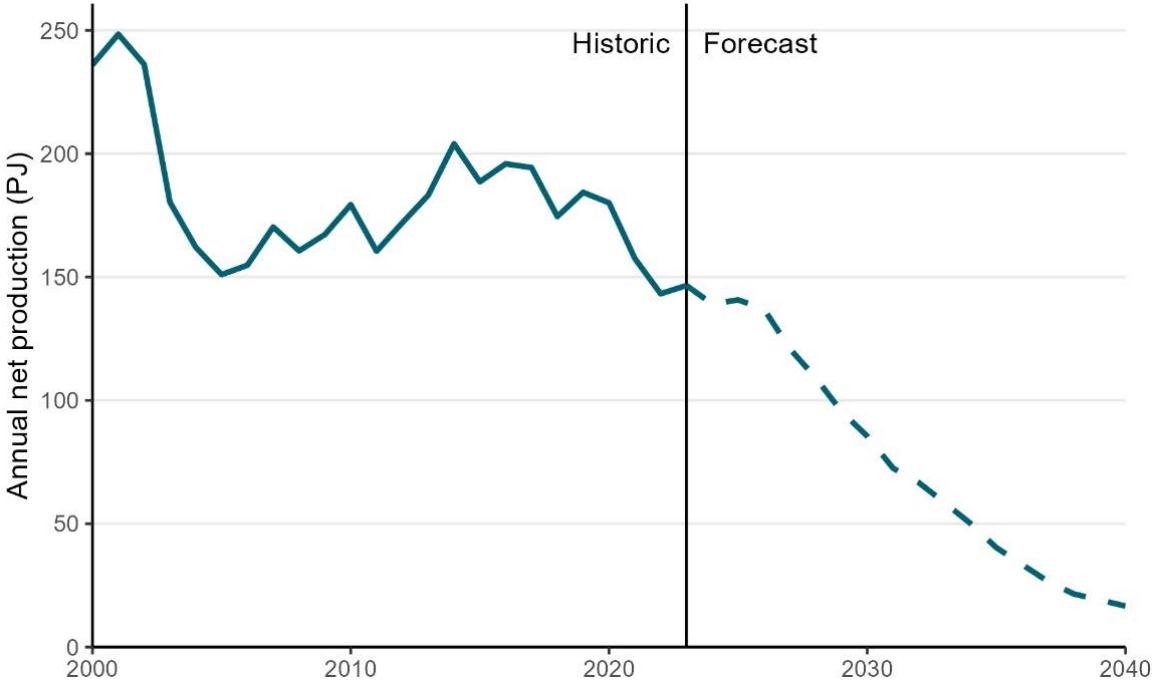
accessed at: <https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/petroleum-reserves-data>

Figure 17. 2P gas reserves figures for 2019 through 2023



Additionally, field operators' production profiles indicate that gas deliverability is likely to dip below recent demand. Production profiles show what field operators are expecting to produce in future years on an annual basis. As at January 1st 2024, operators are expecting to produce 139 PJ of natural gas in the 2024 calendar year, which is 11 PJ less than what has been used in recent years. This was a significant change from previous projections, in which it was expected that deliverability would fall below demand in 2027. Deliverability is expected to stay level around 140 PJ per year until 2026, before declining from 2027 onwards.

Figure 18. Historic gas net production and forecast deliverability based on reserves data



Oil

‘Oil’ is a term that covers a range of different products; from crude oil extracted from oil fields, to refined fuels like petrol and diesel, and non-fuel products like bitumen.

New Zealand is a producer of crude oil, with fields concentrated around Taranaki. Some fields are within Taranaki itself, while some lie offshore. However, the crude oil produced in New Zealand has historically been almost entirely exported, as it is both lighter (that is, containing smaller, shorter-chain hydrocarbons) and ‘sweeter’ (that is, containing less sulphur) than was ideal for domestic refining.

New Zealand’s domestic petroleum needs are served by imports, either of crude oil (which were then refined at the country’s only oil refinery at Marsden Point) or of refined products (such as petrol, diesel, and jet fuel).

The country’s only oil refinery at Marsden Point stopped refining operations on 31 March 2022, transitioning to operating as a dedicated fuel import terminal. As a result, importers switched from importing a mix of crude oil and refined products, to only importing refined products.

SINGAPORE WAS THE MAIN SOURCE OF REFINED OIL PRODUCTS IN 2023

Since the closure of Marsden Point Oil Refinery in 2022, the mix of New Zealand’s oil imports has shifted focussing more on markets for refined products. In 2023, Singapore remained the largest source of oil imports (3,595 kt imported in 2023), followed by Korea (1,717 kt) and Malaysia (904 kt).

Prior to the closure of the refinery, the United Arab Emirates had been NZ’s largest source of oil

imports as this is where the majority of crude oil for processing in the refinery was sourced from.

Energy products that are either extracted or captured directly from natural resources are termed **primary products**.

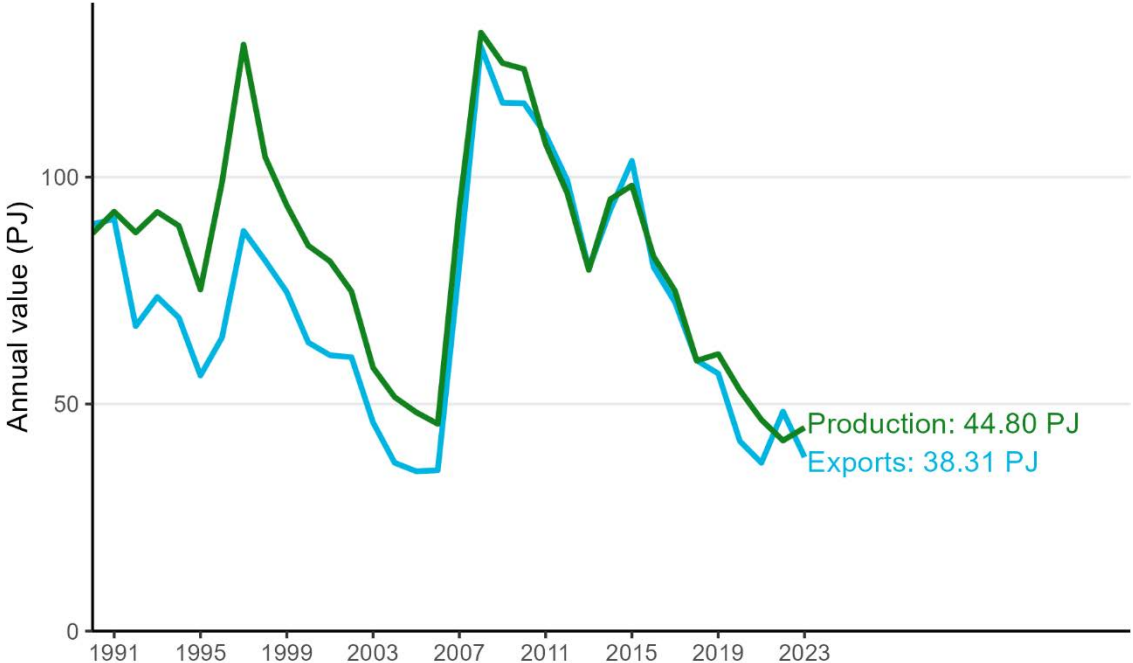
Energy products produced from primary commodities are termed **secondary products**. When discussing oil, these products are sometimes termed ‘refined products’ as they are the product of oil refining.

DOMESTIC OIL PRODUCTION INCREASES

New Zealand’s indigenous production of oil can be split into two broad categories: crude oil (which includes condensates, naphtha, and natural gas liquids), and liquified petroleum gas (LPG). Crude oil is exclusively exported, while LPG is mainly used domestically.

In 2023, indigenous production of crude oil increased by 7 per cent (2.85 PJ) to 44.80 PJ. This was a slight reversal on the steady decline over the last five years and was driven by increased production from Maui (up 2.24 PJ), Maari (up 2.04 PJ), and Cheal (up 0.92 PJ) fields. Production of LPG fell slightly, down 7 per cent (0.58 PJ) on 2022 to 7.15 PJ.

Figure 19. Production and exports of crude oil



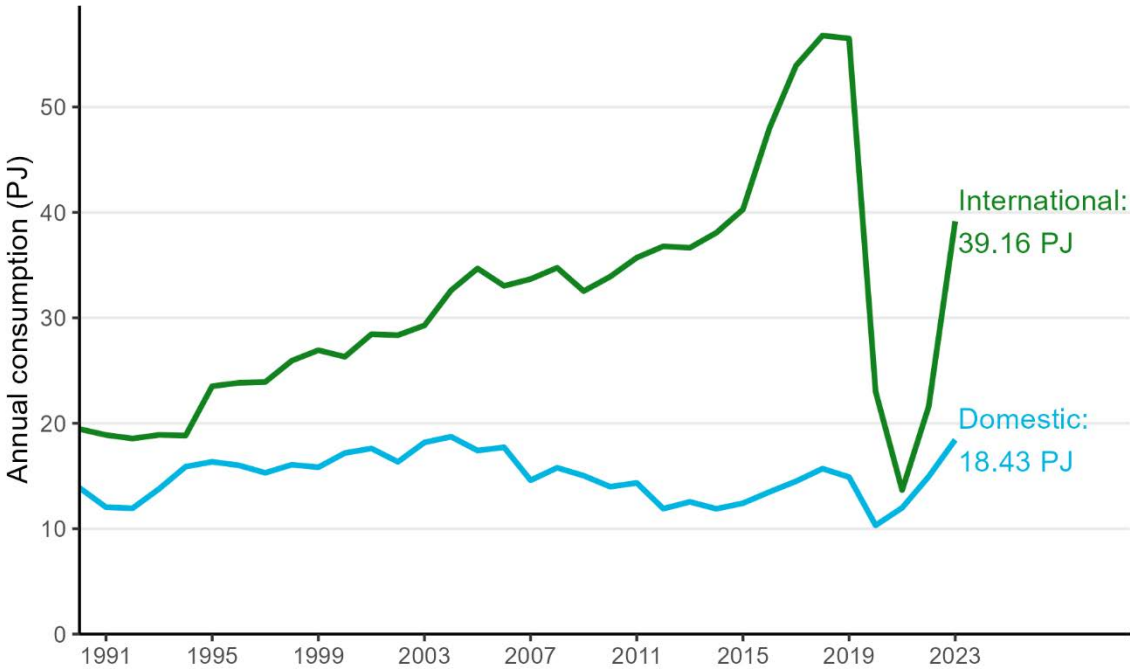
AVIATION FUEL IMPORTS AND CONSUMPTION CONTINUES STRONG RECOVERY

With the Marsden Point Oil Refinery ceasing refinery operations, New Zealand’s oil imports switched from being a mixture of crude oil and refined products, to only being refined products. As a result, there were increases in imports of all refined petroleum products, while crude oil imports fell to zero. Imports of both refined petrol and diesel increased in 2023, up 19 per cent and 15 per cent respectively.

Combined with the continuing recovery in travel activity following the coronavirus (COVID-19) pandemic, this resulted in aviation fuel imports doubling, up 102 per cent (29.70 PJ) to 58.71 PJ.

Total consumption of aviation fuels (covering both domestic and international transport) increased by 58 per cent (21.07 PJ) to 57.59 PJ in 2023. While this hasn’t returned to levels seen prior to the coronavirus (COVID-19) pandemic, it continues to grow with domestic use of aviation fuel in 2023 up 24 per cent (3.54 PJ) on 2019 levels.

Figure 20. Domestic and international aviation fuel consumption

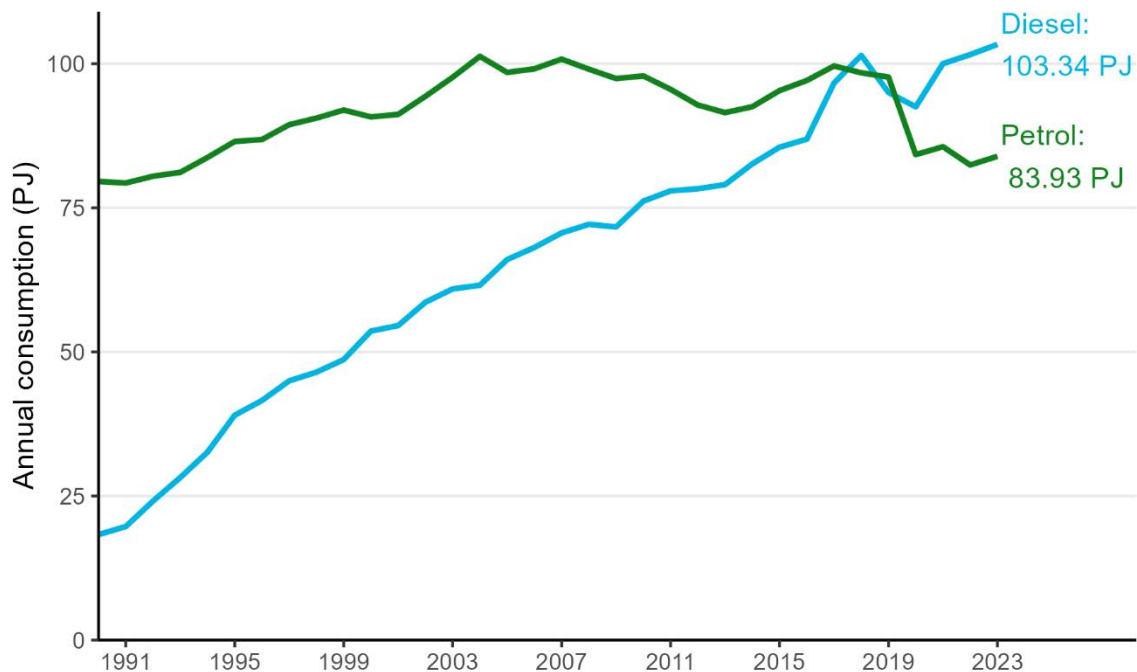


PETROL CONSUMPTION FOR TRANSPORT STILL BELOW PRE-PANDEMIC LEVELS

Almost three quarters of oil consumed in New Zealand is used for domestic transport. This category includes land transport (road and rail), domestic aviation, and domestic water-based transport (eg ferries).

Petrol consumption for land transport increased by 2 per cent (1.51 PJ) to 83.93 PJ in 2023. This was still 14 per cent lower than in 2019, and 9 per cent lower than 10 years ago. Diesel use for land transport also increased by 2 per cent (1.77 PJ) to 103.34 PJ, though this was 9 per cent higher than in 2019.

Figure 21. Petrol and diesel consumption for land transport

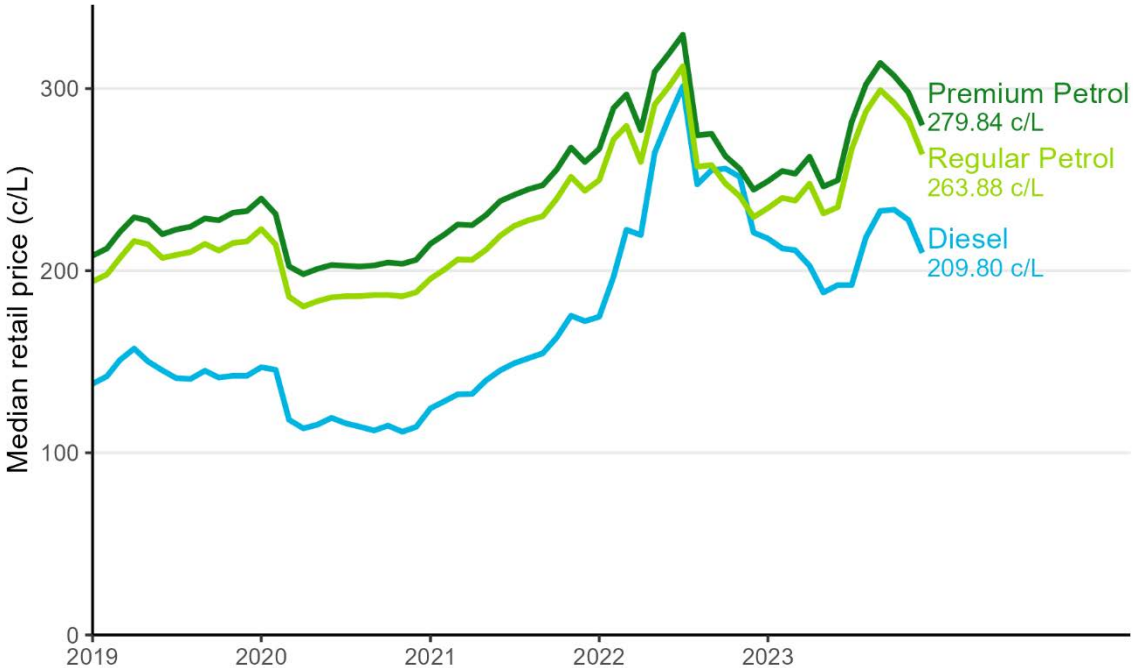


Consumption of petrol for uses other than transport is mostly concentrated in the residential sector. Petrol use in this sector has remained stable over the last five years, increasing by 7 per cent (0.96 PJ) over that period. This consumption rose by 2 per cent (0.26 PJ) in 2023 to 14.13 PJ.

Compared to 2022, premium and regular petrol prices were relatively stable throughout most of 2023, starting the year at 248 cents per litre and 233 cents per litre respectively. The

reintroduction of the fuel excise duty⁴ in July 2023 saw prices briefly reach 319 cents per litre for premium and 304 cents per litre for regular. Petrol prices dropped from that level to end the year at an average 280 cents per litre and 263 cents per litre in the final week of 2023. Diesel prices followed a similar trend, starting at 226 cents per litre for the first week of the year before falling to 208 cents per litre for the final week of 2023.

Figure 22. Monthly median retail fuel prices⁵



⁴ These were temporarily removed in response to high oil prices seen following the Russian invasion of Ukraine.
⁵ Median monthly prices are shown for smoother trend illustration.

Balance Tables

New Zealand's energy production comes from both renewable and non-renewable sources. The energy balance tables show how energy supply and demand by sector varies by energy type.

Domestic energy supply is derived from either indigenous production or imported from overseas sources. In turn, energy types can be transformed into different forms of energy at the cost of losses and inefficiencies, which vary by the transformation process used. Supply, demand, losses, and inefficiencies are reflected in balanced energy supply and demand tables.

Both the energy supply and demand sections of the energy balance tables are calculated from surveys that span different sources. An imbalance exists between demand calculated from reported supply data, and demand observed from reported consumption data.

Energy supply

Total primary energy supply (TPES) is the amount of energy available for use in New Zealand. Much of it is converted into other forms of energy before it is used.

By convention, fuel used for international transport is excluded from TPES. International transport includes international sea and air transport but excludes coastal shipping, national air transport, and all land transport.

Indigenous natural gas production does not include natural gas that is flared, reinjected, or extracted as LPG. The primary energy figures presented are actual data, except for some that go into electricity generation as detailed under energy transformation.

Energy transformation

Energy transformation includes:

- generation of electricity, including cogeneration
- oil production, including refinery operations and the manufacture of synthetic fuel from natural gas (Methanex stopped the production of methanol to petrol in April 1999)
- other transformation, primarily steel production.

In the Energy Transformation section of the balance tables, 'energy in' is shown as negative values and 'energy out' as positive values in the appropriate columns. Transformation of energy from one form to another always results in conversion losses, particularly in thermal electricity generation, as much energy is lost as heat.

Transformation losses in electricity generation are calculated using the net electricity generated, with the actual input being used where available. The conversion factors shown in Table 1 are used otherwise. Input to electricity generation from biogas, hydro, wind, and waste heat are fully estimated. Quarterly figures for electricity generation are made up of actual data from major generators and the Electricity Authority. Estimates are made where actual data are unavailable at the time of publishing.

Table 1. Default Electrical Transformation Factors

Fuel	Default Efficiency
Biogas	30%
Coal	30%
Gas (Combined Cycle)	55%
Gas (Single Cycle)	30%
Geothermal	15%
Hydro	100%
Oil	30%
Waste Heat	15%
Wind	100%
Wood	25%

Liquid biofuel production (bioethanol and biodiesel) appears as renewable energy supply in the energy balance tables. As bioethanol and biodiesel are generally blended with motor petrol and diesel before consumption, liquid biofuel also appears in Energy Transformation under Fuel Production.

Consumer energy demand

Consumer energy is the amount of energy consumed by final users. It excludes energy used or lost in the process of transforming energy into other forms and in bringing the energy to the final consumers. For example, natural gas is a primary energy source, some of which is transformed into electricity, of which some is lost in transmission to consumers.

Consumer energy statistics can be either calculated from supply-side data or observed from usage data.

- Consumer energy (calculated) forms the top half of the energy balance tables. It is calculated as TPES less energy transformation less non-energy use.
- Consumer energy (observed) forms the bottom half of the energy balance tables. It represents reported demand in the agricultural, industrial, commercial, transport, and residential sectors. With the exception of domestic use of energy for on-road, rail, sea, and air transport in the transport sector, these sectors follow the Australia New Zealand Standard Industrial Classification 2006 definitions. Estimates of on-site cogeneration demand are included in electricity end use.

Where the energy end-use is not available or confidential, the 'unallocated' category is used.

Statistical differences

Statistical differences show the difference between 'consumer energy (calculated)' and 'consumer energy (observed)'. This difference is shown at the bottom of the energy balance tables.

		Coal					Oil							Natural Gas	
		Bituminous	Sub-bitum.	Bituminous & Sub-bitum.	Lignite	Total	Crudes/ Feedstocks/ NGL	LPG	Petrol	Diesel	Fuel Oil	Av. Fuel/ Kero	Others	Total	Total
SUPPLY	Indigenous Production	39.44	21.40	60.84	4.93	65.78	37.66	7.15	-	-	-	-	-	44.80	148.05
	+ Imports	1.14	4.26	5.39	-	5.39	0.13	1.59	105.39	154.87	5.35	58.71	13.21	339.25	-
	- Exports	36.25	0.49	36.74	-	36.74	38.31	-	-	-	-	-	-	38.31	-
	- Stock Change	2.38	(6.08)	(3.70)	(0.05)	(3.74)	(1.74)	(0.00)	(0.79)	3.11	(0.02)	1.32	(1.66)	0.23	(0.90)
	- International Transport	-	-	-	-	-	-	-	-	3.07	4.49	39.16	-	46.71	-
	TOTAL PRIMARY ENERGY	1.95	31.25	33.19	4.98	38.17	1.21	8.74	106.17	148.69	0.88	18.23	14.87	298.80	148.95
	ENERGY TRANSFORMATION	(0.11)	(22.25)	(22.37)	(0.00)	(22.37)	0.66	-	(0.06)	(0.14)	(0.00)	(0.14)	0.01	0.33	(46.76)
	Electricity Generation	-	(5.68)	(5.68)	-	(5.68)	-	-	-	(0.06)	(0.00)	-	-	(0.06)	(32.58)
	Cogeneration	-	(6.76)	(6.76)	(0.00)	(6.76)	-	-	-	-	-	-	-	-	(10.31)
	Fuel Production	-	-	-	-	-	0.66	-	(0.02)	0.13	(0.04)	0.07	(0.07)	0.75	-
Other Transformation	-	(9.68)	(9.68)	-	(9.68)	-	-	-	-	-	-	-	-	-	
Losses and Own Use	(0.11)	(0.13)	(0.24)	-	(0.24)	-	-	(0.05)	(0.21)	0.03	(0.21)	0.08	(0.36)	(3.87)	
Non-energy Use	-	-	-	-	-	-	-	-	-	-	-	(14.95)	(14.95)	(38.62)	
CONSUMER ENERGY (calculated)	1.84	8.99	10.83	4.98	15.81	1.87	8.74	106.11	148.55	0.88	18.09	(0.07)	284.17	63.56	
DEMAND	Agriculture, Forestry and Fishing	0.05	1.56	1.61	0.00	1.61		0.12	2.19	14.79				17.10	1.05
	<i>Agriculture</i>	0.05	1.56	1.61	0.00	1.61		0.12	2.06	11.32				13.50	1.05
	<i>Forestry and Logging</i>	-	-	-	-	-		-	0.03	1.75				1.77	0.00
	<i>Fishing</i>	-	-	-	-	-		-	0.10	1.72				1.82	-
	Industrial	2.36	9.30	11.67	4.73	16.41		3.78	0.24	17.52	0.81			22.34	52.72
	<i>Mining</i>	-	0.01	0.01	-	0.01		-	0.00	4.67				4.68	0.16
	<i>Food Processing</i>	0.54	8.41	8.95	4.67	13.63		-	-	-				-	20.32
	<i>Textiles</i>	0.06	0.02	0.08	-	0.08		-	-	-				-	0.26
	<i>Wood, Pulp, Paper and Printing</i>	0.03	0.09	0.13	-	0.13		-	-	-				-	2.70
	<i>Chemicals</i>	-	0.00	0.00	-	0.00		-	-	-				-	24.42
	<i>Non-metallic Minerals</i>	1.14	0.76	1.90	0.06	1.96		-	-	-				-	1.89
	<i>Basic Metals</i>	-	-	-	-	-		-	-	-				-	2.30
	<i>Mechanical/Electrical Equipment</i>	-	-	-	-	-		-	-	-				-	0.23
	<i>Building and Construction</i>	-	-	-	-	-		-	0.11	7.39				7.51	0.33
	<i>Unallocated</i>	0.59	-	0.59	-	0.59		3.78	0.12	5.45	0.81			10.15	0.09
Commercial	0.14	0.26	0.39	0.10	0.49		1.79	0.43	8.54				10.76	7.72	
Transport	-	-	-	-	-		0.14	83.93	103.34	0.59	18.55		206.55	-	
Residential	0.01	0.10	0.11	0.02	0.13		3.83	14.13	2.59				20.55	7.20	
CONSUMER ENERGY (observed)	2.56	11.22	13.78	4.85	18.63		9.65	100.92	146.78	1.40	18.55		277.30	68.69	
Statistical Differences			(2.95)	0.12	(2.83)		1.87	(0.91)	5.19	1.77	(0.52)	(0.46)	(0.07)	6.87	(5.13)

2023 Balance Tables - Converted into Petajoules using Gross Calorific Values

		Renewables							Electricity	Waste Heat	TOTAL	
		Hydro	Geothermal	Solar	Wind	Liquid Biofuels	Biogas	Solid Biofuels	Total	Total	Total	
SUPPLY	Indigenous Production	95.66	206.24	1.67	11.66	0.24	3.84	44.37	362.85		0.84	623.14
	+ Imports	-	-	-	-	-	-	0.13	0.13		-	344.77
	- Exports	-	-	-	-	-	-	(0.00)	(0.00)		-	75.05
	- Stock Change	-	-	-	-	-	-	-	-		-	(4.41)
	- International Transport	-	-	-	-	-	-	-	-		-	46.71
	TOTAL PRIMARY ENERGY	95.66	206.24	1.67	11.66	0.24	3.84	44.50	362.98		0.84	850.56
	ENERGY TRANSFORMATION	(95.66)	(198.79)	(1.30)	(11.66)	(0.24)	(3.53)	(13.91)	(324.99)	144.58	(0.84)	(250.10)
Electricity Generation	(95.66)	(197.54)	(1.30)	(11.66)	-	(2.73)	(0.02)	(308.85)	152.82	-	(194.35)	
Cogeneration	-	(1.25)	-	-	-	(0.80)	(13.89)	(15.94)	6.57	(0.84)	(27.28)	
Fuel Production	-	-	-	-	(0.24)	-	-	(0.19)	-	-	0.50	
Other Transformation	-	-	-	-	-	-	-	-	-	-	(9.68)	
Losses and Own Use	-	-	-	-	-	-	-	-	(14.82)	-	(19.30)	
Non-energy Use		-	-	-	-	-	-	-	-	-	-	(53.58)
CONSUMER ENERGY (calculated)			7.45	0.36	-	-	0.31	30.59	38.00	144.58	-	546.88
DEMAND	Agriculture, Forestry and Fishing		0.45	-			-	-	0.45	8.90		29.11
	<i>Agriculture</i>		0.45	-			-	-	0.45	8.49		25.10
	<i>Forestry and Logging</i>		-	-			-	-	-	0.25		2.02
	<i>Fishing</i>		-	-			-	-	-	0.17		1.99
	Industrial		4.42	-			0.05	23.01	26.77	49.39		168.33
	<i>Mining</i>		-	-			-	-	-	1.63		6.48
	<i>Food Processing</i>		-	-			-	-	-	10.84		44.79
	<i>Textiles</i>		-	-			-	-	-	0.39		0.73
	<i>Wood, Pulp, Paper and Printing</i>		-	-			-	23.01	22.45	3.75		29.59
	<i>Chemicals</i>		-	-			-	-	-	1.60		26.03
	<i>Non-metallic Minerals</i>		-	-			-	-	-	0.93		4.79
	<i>Basic Metals</i>		-	-			-	-	-	22.47		24.77
	<i>Mechanical/Electrical Equipment</i>		-	-			-	-	-	0.58		0.82
	<i>Building and Construction</i>		-	-			-	-	-	1.59		9.42
	<i>Unallocated</i>		4.42	-			0.05	-	4.32	5.61		20.91
Commercial		2.38	-			0.26	-	2.64	34.26		55.88	
Transport		-	-			-	-	-	0.99		207.54	
Residential		0.21	0.36			-	7.44	8.01	49.44		85.34	
CONSUMER ENERGY (observed)			7.45			0.31	30.46	37.87	142.98			546.20
Statistical Differences			(0.00)	0.36	-	-	0.00	0.13	0.13	1.59	-	0.68

