MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

ENERGY AND BUILDING TRENDS

15

2014 CALENDAR YEAR EDITION

Comprehensive information on and analysis of New Zealand's energy supply, demand and prices

Energy in New Zealand

New Zealand Government

Energy in New Zealand 2015

Prepared by:

Energy & Building Trends

Evidence, Monitoring & Governance

Ministry of Business, Innovation & Employment

PO Box 1473, Wellington 6140
New Zealand

Email: energyinfo@mbie.govt.nz

ISSN 2324-5913

Important

Use of this publication in paper or electronic form implies acceptance of the conditions of its release, which are that if the information is made available to others, its source must be acknowledged as the Ministry of Business, Innovation & Employment 2015 or by reference to the publication title and date.

Although every attempt has been made to ensure the information is accurate, neither the Crown nor any Minister, employee or agent of the Crown:

- warrants the accuracy, completeness or usefulness for any particular purpose of the information contained in this publication in paper or electronic form; or
- accepts any liability for any loss or damage, however caused, from the reliance on or use of that information, or arising from the absence of information or any particular information in this publication in paper or electronic form.

Acknowledgements

The authors are grateful to the individuals, companies and organisations that provided information and gave generously of their time to assist with the work reported here.

Authorship

This publication was prepared by the Energy and Building Trends team of the Ministry of Business, Innovation & Employment. Principal contributors were Michael Smith, Bryan Field, Cary Milkop, Maria Botes and Greg McDowell. The authors are grateful to New Zealand Petroleum and Minerals for their assistance with reserves information.

Availability

A free electronic version of this publication can be downloaded from: www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/publications/

MB13204 v11

Energy in New Zealand 2015 provides annual information on and analysis of New Zealand's energy sector and is part of the suite of publications produced by the Energy & Building Trends team of the Ministry of Business, Innovation & Employment (MBIE).

The 2015 edition includes information up to the end of the calendar year 2014.

Full data tables may be downloaded from the *Energy in New Zealand* webpage:

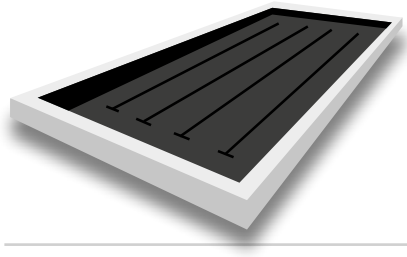
www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/publications/energy-in-new-zealand

CONTENTS

Quick Facts for 2014

40%
of our primary energy supply came from renewable sources

New Zealand produced
18
Olympic-sized swimming pools of crude oil per week



GEOTHERMAL ELECTRICITY GENERATION HIT A RECORD
6,847 GWh
overtaking Gas as the second largest producer of electricity

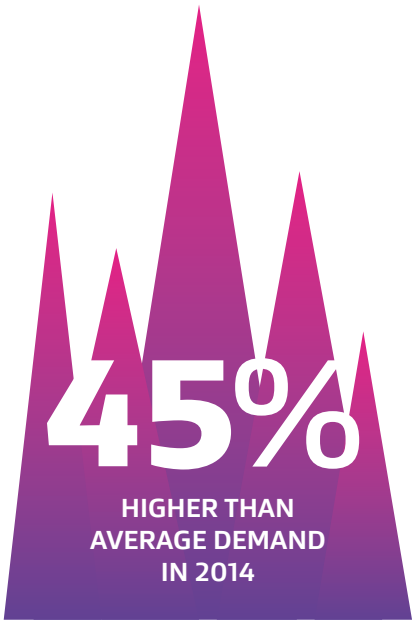
Natural gas used as a feedstock made up
29%
of gas consumption

In 2014, renewable sources made up
80%
of electricity generation

Per week New Zealand used
23
Olympic-sized swimming pools of **petrol** and
24
of **diesel**

New Zealand's annual primary energy supply would supply the USA for about 3 days

PEAK ELECTRICITY DEMAND WAS



45%
HIGHER THAN AVERAGE DEMAND IN 2014

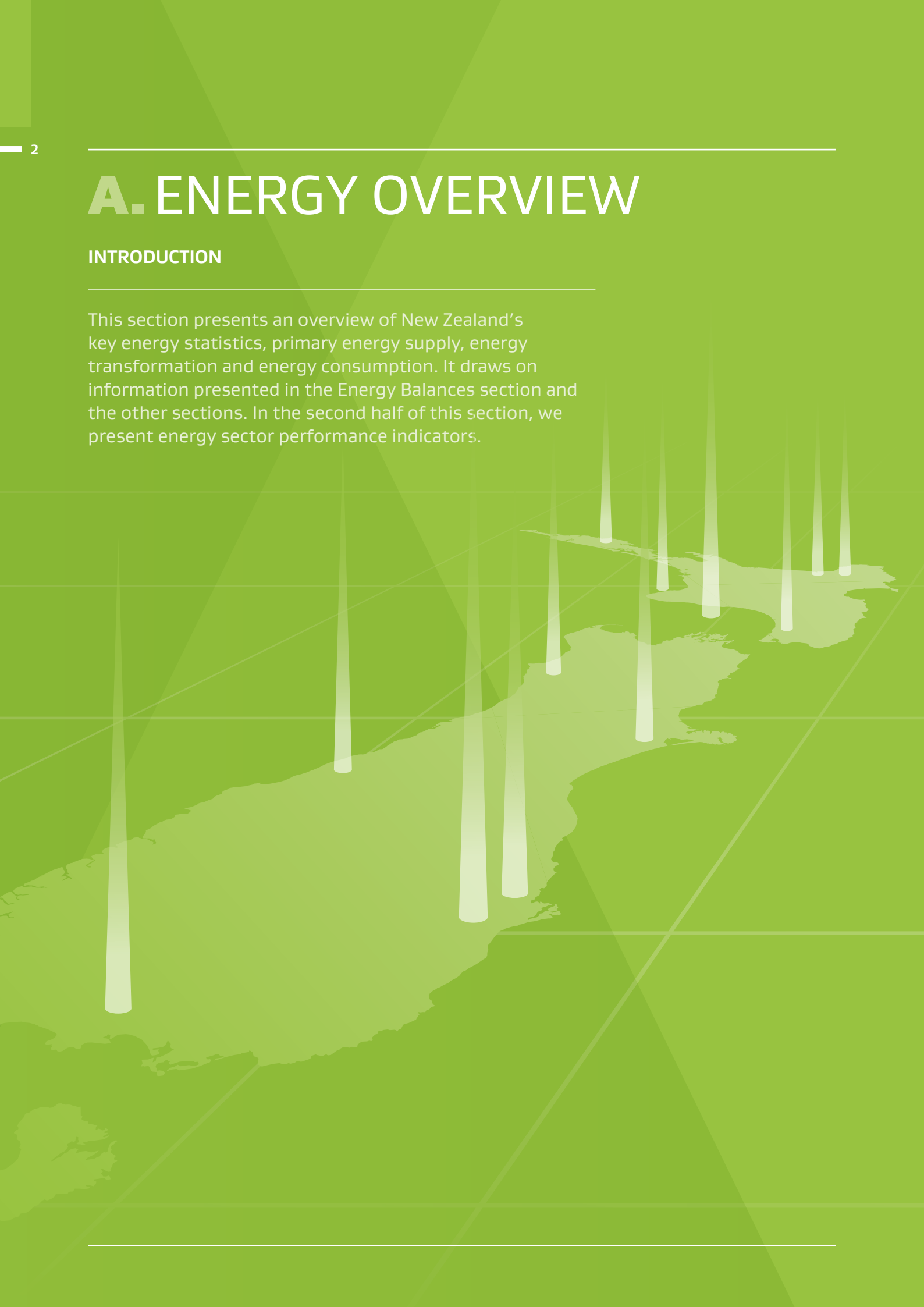
Solar PV generated an estimated
16
GWh
of electricity

. . .about enough energy to supply every household in the Kaikoura District

A. ENERGY OVERVIEW

INTRODUCTION

This section presents an overview of New Zealand's key energy statistics, primary energy supply, energy transformation and energy consumption. It draws on information presented in the Energy Balances section and the other sections. In the second half of this section, we present energy sector performance indicators.



Energy overview

Primary Energy Supply

Total primary energy supply (TPES) is the total amount of energy supplied for use in New Zealand. This is calculated as domestic production plus imports, less exports and energy used for international transport. Figure A.1 shows New Zealand's TPES by fuel since 1974. In 2014, renewable energy made up 39.5% of New Zealand's TPES. This level of contribution from renewable energy was slightly up on last year's value of 38.4%, and was the highest on record. The latest international comparison shows that New Zealand has the third highest contribution of renewable energy to TPES in the Organisation for Economic Cooperation and Development (OECD) (behind Iceland and Norway).[1]

The rapid increase in renewable energy's share of TPES in the last few years has been driven by increased electricity generation from geothermal energy and reduced electricity generation from coal. As geothermal fluid is much lower in temperature than steam produced by a coal or gas boiler, the transformation efficiency of geothermal energy is significantly lower. The low transformation efficiency of geothermal energy (approximately 15%) contributes to New Zealand's relatively high renewable TPES compared with most other countries.

Although geothermal energy's share has increased rapidly over the last five years, oil continues to dominate New Zealand's TPES. In 2014, oil accounted for 31%, gas for 23% and geothermal energy for 22%. TPES was up by 5.7% in 2014 and has increased by an average of 3% per annum since 2009.

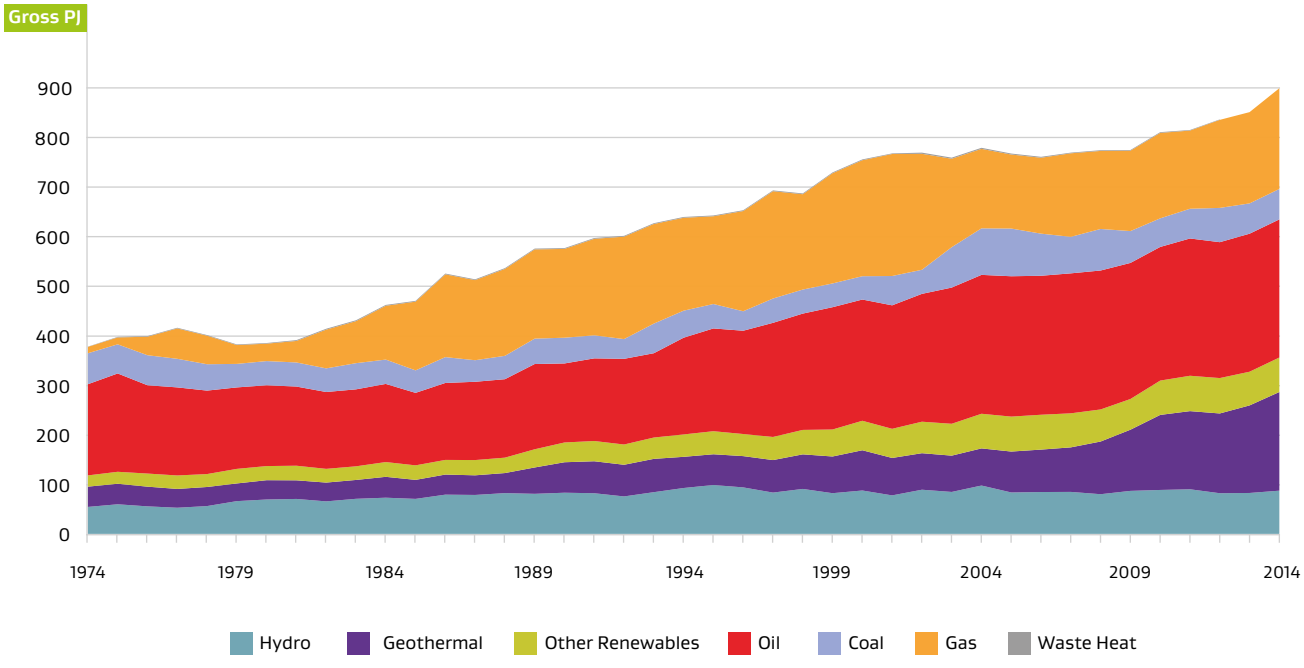
Energy Transformation

Energy transformation refers to the conversion of primary energy (see above) to more useful forms of energy. It includes activities such as electricity generation, oil refining and other transformation (including coal used for steel manufacturing) as well as losses. By convention, energy recorded as an input to energy transformation is recorded as negative; energy output from energy transformation is recorded as positive (e.g. gas used for generating electricity is negative; the electricity generated from gas is positive). For more analysis of oil refining and electricity generation, please read the oil and gas section and the electricity section.

Figure A.2 shows the total energy transformation by fuel from 1990 to 2014. This figure highlights the growth in renewables, mainly because of increased geothermal electricity generation over the last six years. Oil energy transformation is very small because very little oil is lost in the process of oil refining. Total energy transformation is a negative value, and has become more negative over the period shown, especially since the strong uptake of geothermal electricity generation since 2008. In 2014, total energy transformation was -266 PJ, which is 5% larger (more negative) than in 2013. Since 2009, total energy transformation has grown by an average of 4.9% per year.

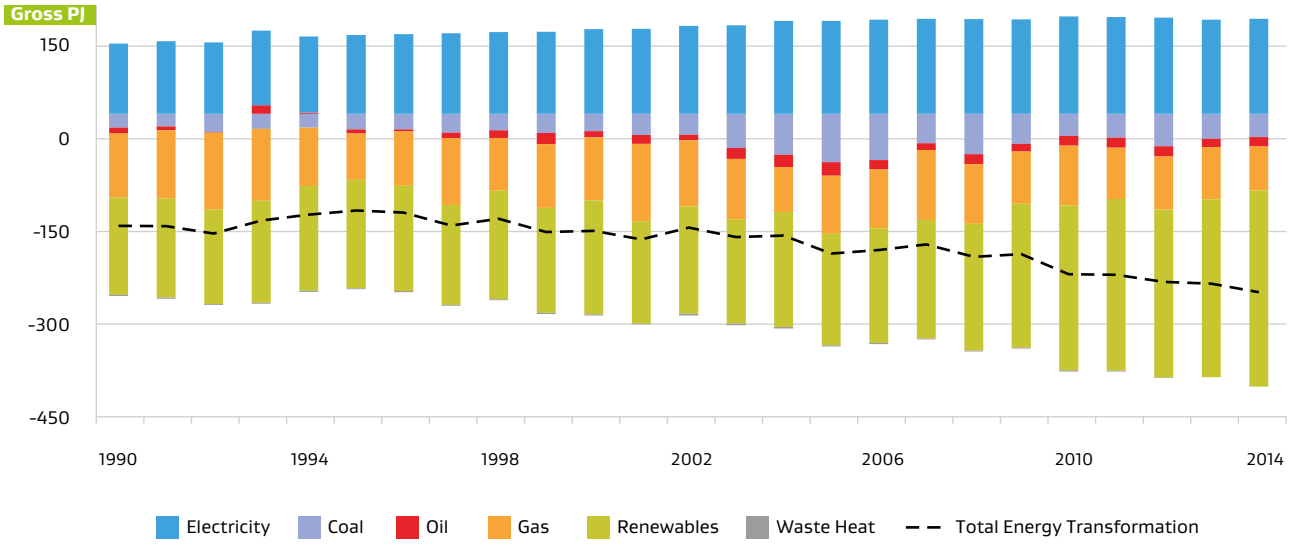
1. International Energy Agency, Renewables Information 2015. The most recent year for which data were available was 2013.

Figure A.1: Total Primary Energy Supply by Fuel



Energy overview

Figure A.2: Energy Transformation by Fuel



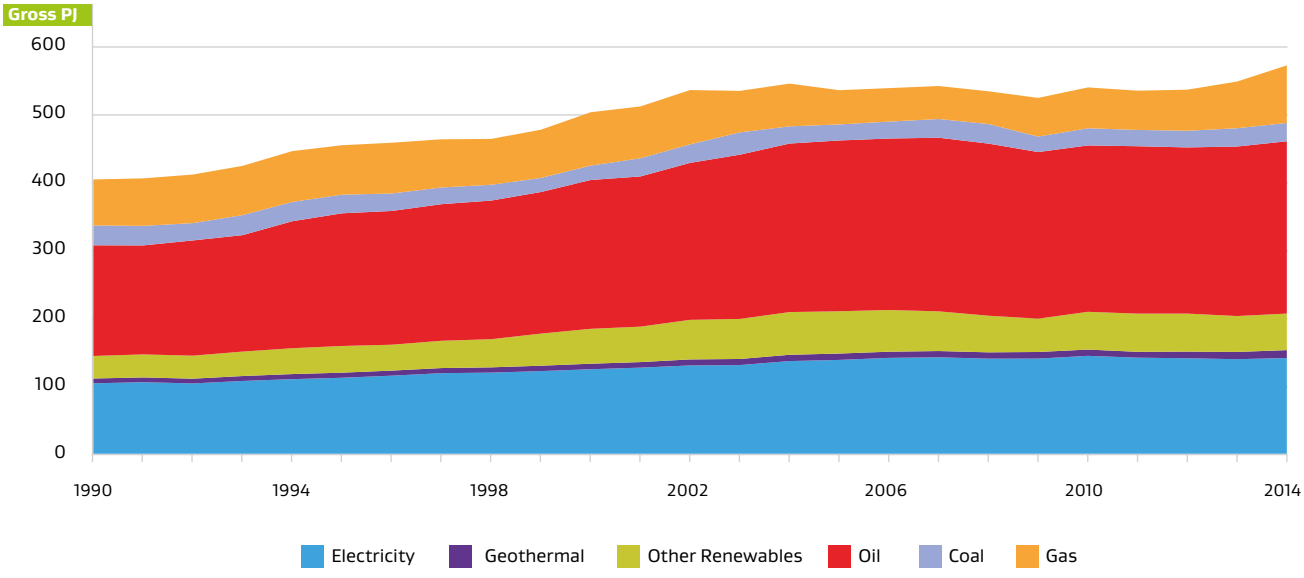
Energy Consumption

Consumer Energy Demand

Consumer energy demand (or total consumer energy) includes all energy used by final consumers. It does not include energy used for transformation, or non-energy use. Consumer energy demand in 2014 rose by 4.3% to 573 PJ. The following figures show the time series of consumer energy demand by fuel (Figure A.3a) and by sector (Figure A.3b). The rise in consumer energy demand in 2014 was a result of increased demand from the primary sector (up 10%), the industrial sector (up 10%) and commercial sector (up 2%), balanced by a drop from the residential sector (down 2%).

Oil (44%) and electricity (25%) made up the bulk of consumer energy in 2014, with the other fuels making up the balance (see Figure A.3c). The industrial (38%) and transport (36%) sectors consumed the bulk of consumer energy in 2014 (see Figure A.3d). The biggest mover over the year was the industrial sector, whose demand grew by 20 PJ (10%), and which saw gas demand increase by 16 PJ (23%).

Figure A.3a: Consumer Energy Demand by Fuel



Energy overview

Figure A.3b: Consumer Energy Demand by Sector

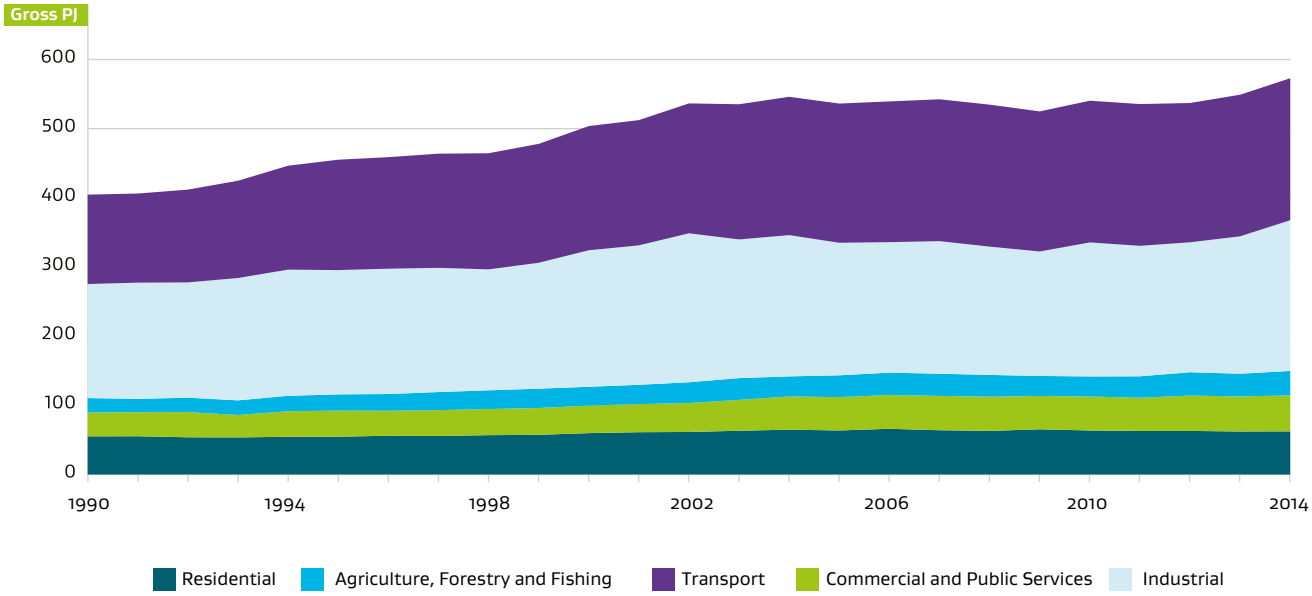


Figure A.3c: Consumer Energy Demand Share by Fuel in 2014

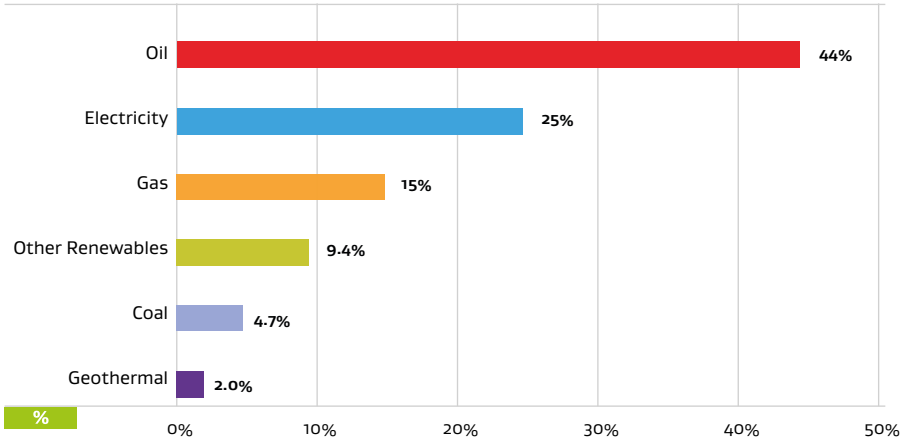


Figure A.3d: Consumer Energy Demand Share by Sector in 2014

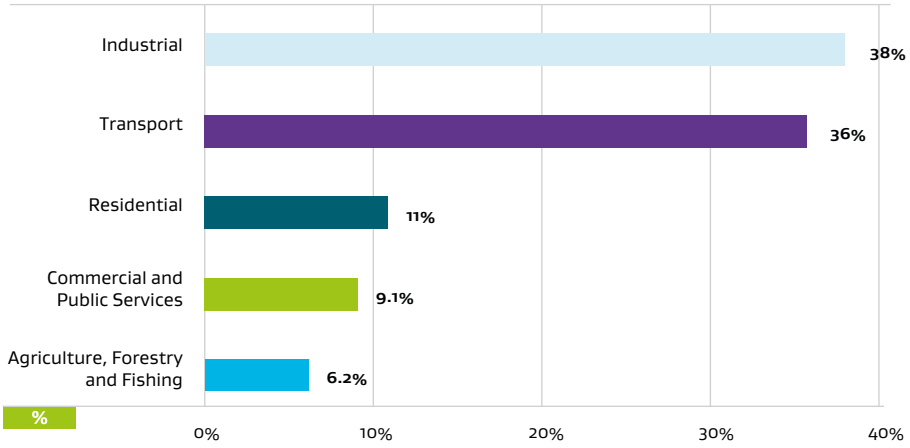
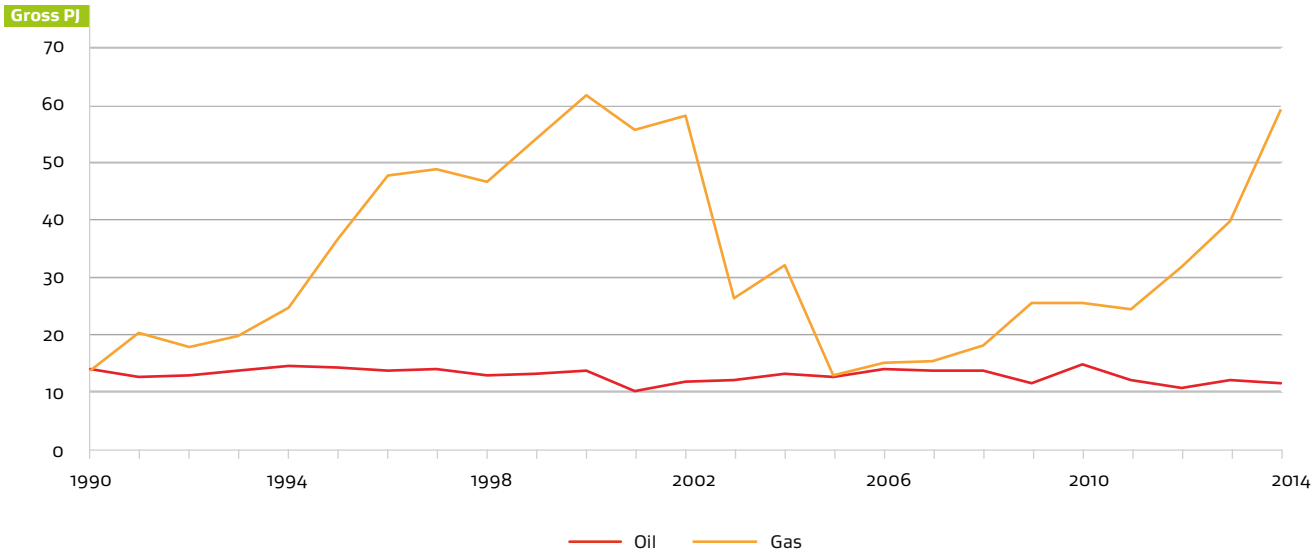


Figure A.3e: Non-Energy Use by Fuel



Non-Energy Use

Non-energy use refers to use of fuels to produce non-energy products. Non-energy products are products where neither the raw energy source used to produce the product nor the product itself is combusted.

Non-energy use in New Zealand consists mostly of natural gas (conversion of natural gas to methanol or urea) with the remainder being oil (e.g. bitumen for roads). In 2014, total non-energy use was 71 PJ, 12 PJ of which was from oil and 59 PJ from natural gas. Figure A.3e shows a time series of non-energy use by fuel since 1990. Non-energy use of gas has returned to the highs last seen around 2000 when Methanex NZ was last running at full capacity.

During 2014 non-energy use of natural gas increased by 50%, due to an increase in methanol production. Methanex NZ's second methanol production train at Motunui was restarted in mid-2012 and their mothballed Waitara Valley plant was restarted in October 2013.

Although methanol can be combusted for energy purposes, the methanol produced in New Zealand is mainly exported for use as a chemical feedstock (e.g. to make plastic). Gas combusted during the production of petrochemicals such as methanol, urea and ammonia is included as industrial sector demand within total consumer energy. Only gas used as a feedstock (and therefore not combusted) in petrochemical production is classified as a non-energy use.

Energy Sector Performance Indicators

Energy sector performance indicators show how well New Zealand's energy sector is performing on a variety of aspects. These include energy intensity and energy self-sufficiency.

Energy Intensity

Energy intensity is a measure of the energy used (in MJ) per unit of gross domestic product (GDP)[2]. It is influenced by the composition of industry within the economy, improvements in energy efficiency and changes in behaviour. For a more detailed analysis of the drivers of energy use in New Zealand, readers are encouraged to read the report *Changes in Energy Use — New Zealand, 1990–2011*[3].

Energy Intensity by Industry

Since 1990, the overall energy intensity of the economy has improved in real terms by an average rate of 1.1% per annum to 2.7 MJ per (2009/10) dollar in 2014. The most significant factor in this 23% improvement in energy intensity has been the rapid growth of the commercial sector (low energy intensity) relative to the industrial sector (high energy intensity). Figure A.4a shows the real GDP by sector in 1990 and 2014, which shows that the commercial sector's GDP (excluding transport) has doubled since 1990.

Figure A.4b shows a time series of the energy intensity of industries within the New Zealand economy. In this chart, the solid lines refer to individual industries, whereas the dashed blue line is the average energy intensity of New Zealand. The individual industries within the New Zealand economy have generally showed improvements in energy intensity since 1990. The trend of the agriculture, forestry and fishing sector's energy intensity has been relatively flat but the level has been quite variable since 1990. The variability of the energy intensity is largely seen in the GDP data, and is related to agricultural production volatility. The commercial sector is the least energy intensive sector at 0.4 MJ per dollar in 2014; this has improved steadily at a rate of 1.2% per annum since 1990. The energy intensity of the industrial sector has improved at an average rate of 0.5% per annum since 1990, while the energy intensity of the chemical and metals manufacturing subsector has more than doubled since 2005. Aside from an

2 Statistics New Zealand has updated the base year for fixed price weights from 1995/96 to 2009/10, meaning values presented in this section are not directly comparable with those from previous editions.

3 www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/publications/changes-in-energy-use

Figure A.4a: New Zealand GDP (Real 2009/2010 Prices) by Sector in 1990 and 2014*

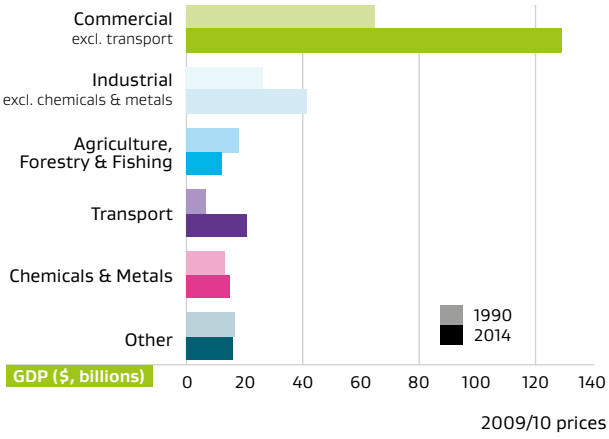
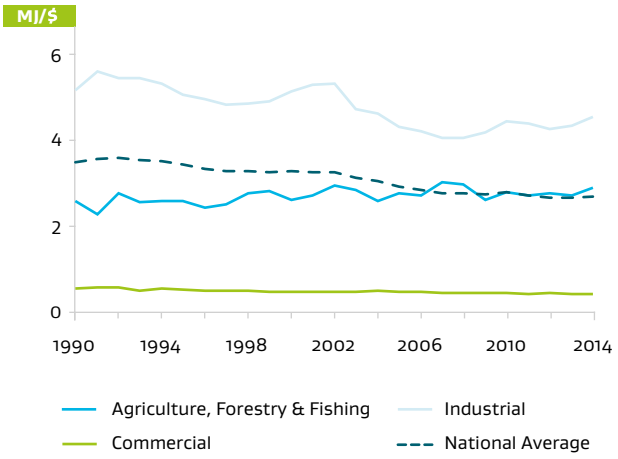


Figure A.4b: Energy Intensity of New Zealand Industries



* Data from Statistics New Zealand. Table reference SNE065AA

increase in 2010, industrial (excluding chemical and metal manufacturing) energy intensity has declined every year since 2002. Factors affecting industrial energy use in 2014 included:

- Upward pressure from Methanex NZ restarting their methanol production train at Motunui and their Waitara Valley plant.
- Steady production at the Tiwai Point aluminium smelter.
- A drop in production in the wood, pulp and paper manufacturing sector.

Energy Self-Sufficiency

Energy self-sufficiency is the ratio of indigenous production of energy to TPES. It is a measure of a country's ability to meet its own energy supply requirements (which includes non-energy uses such as natural gas used as a feedstock to manufacture methanol).

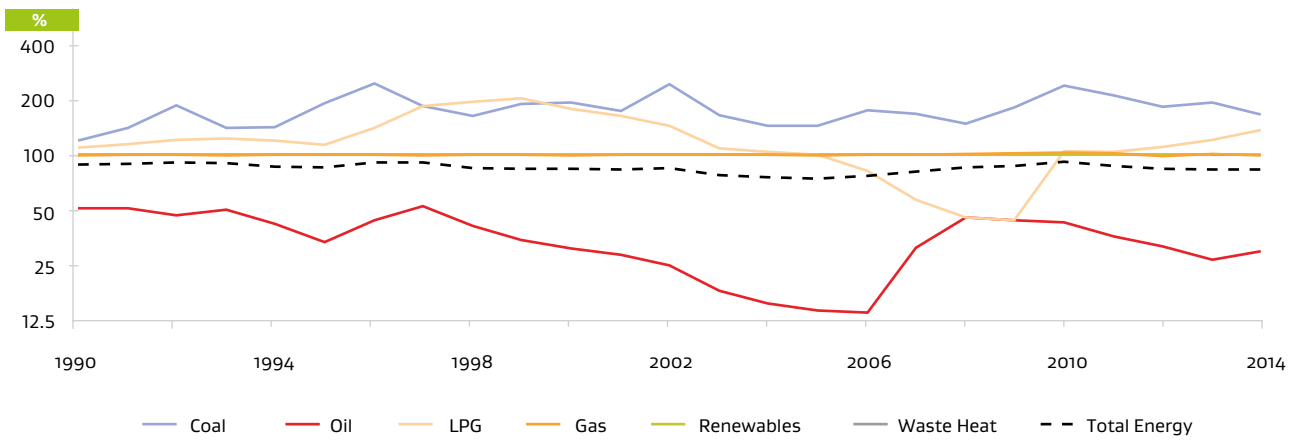
A self-sufficiency value of 100% would indicate that New Zealand produces all the energy it needs, whereas values above or below 100% indicate that New Zealand is a net exporter or importer of energy (respectively). New Zealand meets all of its gas, renewables and waste heat needs through indigenous production.

Figure A.5 shows a time series of New Zealand's energy self-sufficiency. Overall, New Zealand's total energy self-sufficiency was 83% in 2014. This series peaked in 2010 at 92% due to a combination of historically high oil, gas and coal production. The minimum self-sufficiency occurred in 2005 at 74%.

New Zealand is a net exporter of coal. Premium quality coking coal is exported from the West Coast of the South Island and is mostly used for steel manufacturing in Asia. New Zealand is also a net exporter of liquid petroleum gas (LPG) (except during the period 2006–09). Self-sufficiency for LPG peaked in 1999 when the Maui field was producing strongly.

New Zealand is a net importer of oil, although this series should be interpreted with care because almost all domestically produced New Zealand oil is exported. This is because New Zealand crude oil is very high quality (low density and sulphur content) and fetches a premium price on the international market. Cheaper foreign oil is imported to refine at the Marsden Point refinery. Oil self-sufficiency peaked in 1997 at 52%. This was due to a peak in production at the Maui oil (and gas) field. Since then, self-sufficiency fell until 2007, when the Tui and Pohokura fields started producing.

Figure A.5: Energy Self-sufficiency for New Zealand by Fuel



B. ENERGY BALANCES

INTRODUCTION

This section presents annual energy supply and demand balance tables for New Zealand. Energy balances using gross caloric values (GCV)[1] are presented in petajoules (PJ) for 2014 (Table B.2). The energy balances focus on commercial energy – energy forms that are typically produced and sold as a fuel. There are not enough reliable data to include other forms of energy, such as passive solar heating. The entry "0.00" in an energy balance table indicates that the figure is less than 0.005 PJ but greater than 0 PJ, with 0 PJ indicated by a blank entry (this includes cases where no reliable data are available).

1. Also known as higher heating value

Energy balances

Supply

Total primary energy supply 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 total primary energy supply. Indigenous gas production does not include gas that is flared, reinjected, or LPG extracted. The primary energy figures presented are actual data, except for some that go into electricity generation as detailed under 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 ceased methanol-to-petrol production in April 1999) and 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 fuel columns. Transformation of energy from one form to another always results in conversion losses, particularly in thermal electricity generation, because much energy is lost as heat.

Transformation losses in electricity generation are derived from the net electricity generated, with the actual fuel input being used where available and the conversion factors shown in Table B.1 used otherwise. Fuel input to 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.

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,[2] liquid biofuel also appears in Energy Transformation under Fuel Production.

Losses and own use in the energy balances include losses before and after transformation, losses and own use in production, transmission and distribution losses, electricity industry own use free of charge, and oil industry losses and own use (which includes distribution tankage losses, stocks, accounts adjustment and own consumption). Transformation losses are excluded.

Non-energy use is primary energy used for purposes other than combustion, e.g. bitumen used in road construction, and natural gas used as chemical feedstock in the production of methanol and ammonia/urea.

Treatment of Solar Photovoltaic Panels

Estimates of the amount of electricity generated using solar photovoltaics (PV) are included in the energy balance tables in this edition of Energy in New Zealand. The total primary energy supply of solar is the sum of the direct use of solar thermal (i.e. for hot water heating), and the amount of solar energy directly converted into electricity via PV panels. Solar PV electricity generation is estimated using data on the total installed capacity of grid-connected solar PV installations in New Zealand[3], and then converted to output using an assumed capacity factor of 14% (i.e. the solar panels produce their full output 14% of the time).

Consumption of solar thermal is included in the demand section of the energy balance table under Renewables – Solar, whereas the consumption of electricity generated by solar PV panels appears under Electricity. Solar PV consumption by sector is apportioned using data from the Electricity Authority.

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 (see Total Primary Energy Supply), 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 and is calculated as TPES less energy transformation less non-energy use.

Consumer energy (observed) forms the bottom half of the energy balance tables and it represents reported demand in the agriculture, forestry and fishing; industrial; commercial; transport and residential sectors. With the exception of domestic/national 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.

Annual figures presented for consumer energy (observed) are actual data except for thermal fuels used for cogeneration in the industrial and commercial sectors and biogas, wastes and wood. 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.

International transport includes international sea and air transport. It excludes coastal shipping, national air transport and all land transport.

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

Table B.1: Default Electrical Transformation Factors*

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

* Default efficiencies are only used where real data are unavailable.

† For combined cycle plants, the assumed efficiency is 55%. Currently, however, actual fuel input data are collected for all combined cycle plants.

Geothermal is predominantly based on real plant steam data and uses a 15% efficiency where these are unavailable.

2. A very small amount of liquid biofuel is consumed unblended. However, insufficient data are available on the use of unblended liquid biofuel to include in this publication.

3.Refer to www.emi.ea.govt.nz/

Energy balances

Table B.2: Energy Supply and Demand Balance, Calendar Year 2014

	Converted into PJ using Gross Calorific Values	COAL			OIL							
		Bituminous & Sub-bituminous	Lignite	Total	Crudes/ Feedstocks/ Natural Gas Liquids	LPG	Petrol	Diesel	Fuel Oil	Aviation Fuel/ Kerosene	Others	Total
SUPPLY	Indigenous Production	98.22	4.83	103.06	83.46	10.19						93.65
	+ Imports	10.43	0.00	10.43	234.44	0.04	50.73	35.17	0.27	6.99	5.77	333.40
	- Exports	54.93	-	54.93	78.51	2.79	-	0.14	5.12	-	-	86.55
	- Stock Change	-3.08	0.03	-3.04	-0.37	-0.02	5.40	-0.18	5.07	0.69	-0.58	10.00
	- International Transport						0.00	2.10	10.60	37.66	-	50.36
	TOTAL PRIMARY ENERGY	**56.80**	**4.80**	**61.60**	**239.76**	**7.47**	**45.33**	**33.11**	**-20.51**	**-31.36**	**6.34**	**280.15**
	ENERGY TRANSFORMATION	**-34.39**	**-0.19**	**-34.57**	**-239.45**	**-0.01**	**61.31**	**85.92**	**28.21**	**44.48**	**5.28**	**-14.26**
	Electricity Generation	-13.22	-	-13.22				-0.01	-			-0.01
	Cogeneration	-7.58	-0.19	-7.77								
	Fuel Production				-239.21		61.21	85.71	27.93	44.55	12.93	-6.88
	Other Transformation	-11.81	-	-11.81								
	Losses and Own Use	-1.78	-	-1.78	-0.24	-0.01	0.11	0.22	0.27	-0.07	-7.65	-7.36
Non-energy Use											**-11.62**	**-11.62**
CONSUMER ENERGY (calculated)		**22.41**	**4.62**	**27.03**	**0.31**	**7.46**	**106.65**	**119.04**	**7.70**	**13.12**	**-**	**254.27**
DEMAND	**Agriculture, Forestry and Fishing**	**1.67**	**0.02**	**1.68**		**0.07**	**1.64**	**17.49**	**2.32**	**-**		**21.52**
	Agriculture	1.66	0.02	1.68		0.07	1.51	13.06	-	-		14.64
	Forestry and Logging	0.00	-	0.00			0.01	2.86	-	-		2.87
	Fishing	0.00	-	0.00			0.12	1.57	2.32	-		4.01
	Industrial	**19.63**	**4.30**	**23.93**		**3.04**	**0.15**	**14.59**	**0.95**	**-**		**18.73**
	Mining	-	-	-			0.00	3.17	-	-		3.17
	Food Processing	11.93	4.28	16.21			-	-	-	-		-
	Textiles	0.07	-	0.07								
	Wood, Pulp, Paper and Printing	0.64	0.01	0.65								
	Chemicals	0.00	-	0.00								
	Non-metallic Minerals	5.11	0.01	5.12								
	Basic Metals	-	-	-			-	-	-	-		-
	Mechanical/Electrical Equipment	0.00	-	0.00								
	Building and Construction	-	0.00	0.00			0.01	3.72	0.02	-		3.75
	Unallocated	1.87	-	1.87		3.04	0.14	7.70	0.93	-		11.81
	Commercial	**0.99**	**0.14**	**1.13**		**1.19**	**0.27**	**4.46**	**0.00**	**-**		**5.91**
	Transport	**0.02**	**-**	**0.02**		**0.38**	**104.16**	**83.69**	**4.34**	**12.38**		**204.96**
	Residential	**0.21**	**0.16**	**0.37**		**2.86**	**-**	**0.10**	**-**	**-**		**2.96**
CONSUMER ENERGY (observed)		**22.51**	**4.61**	**27.12**	**-**	**7.52**	**106.22**	**120.33**	**7.62**	**12.38**	**-**	**254.08**
Statistical Differences		**-0.10**	**0.00**	**-0.09**	**0.31**	**-0.06**	**0.43**	**-1.29**	**0.08**	**0.73**	**-**	**0.19**

Energy balances

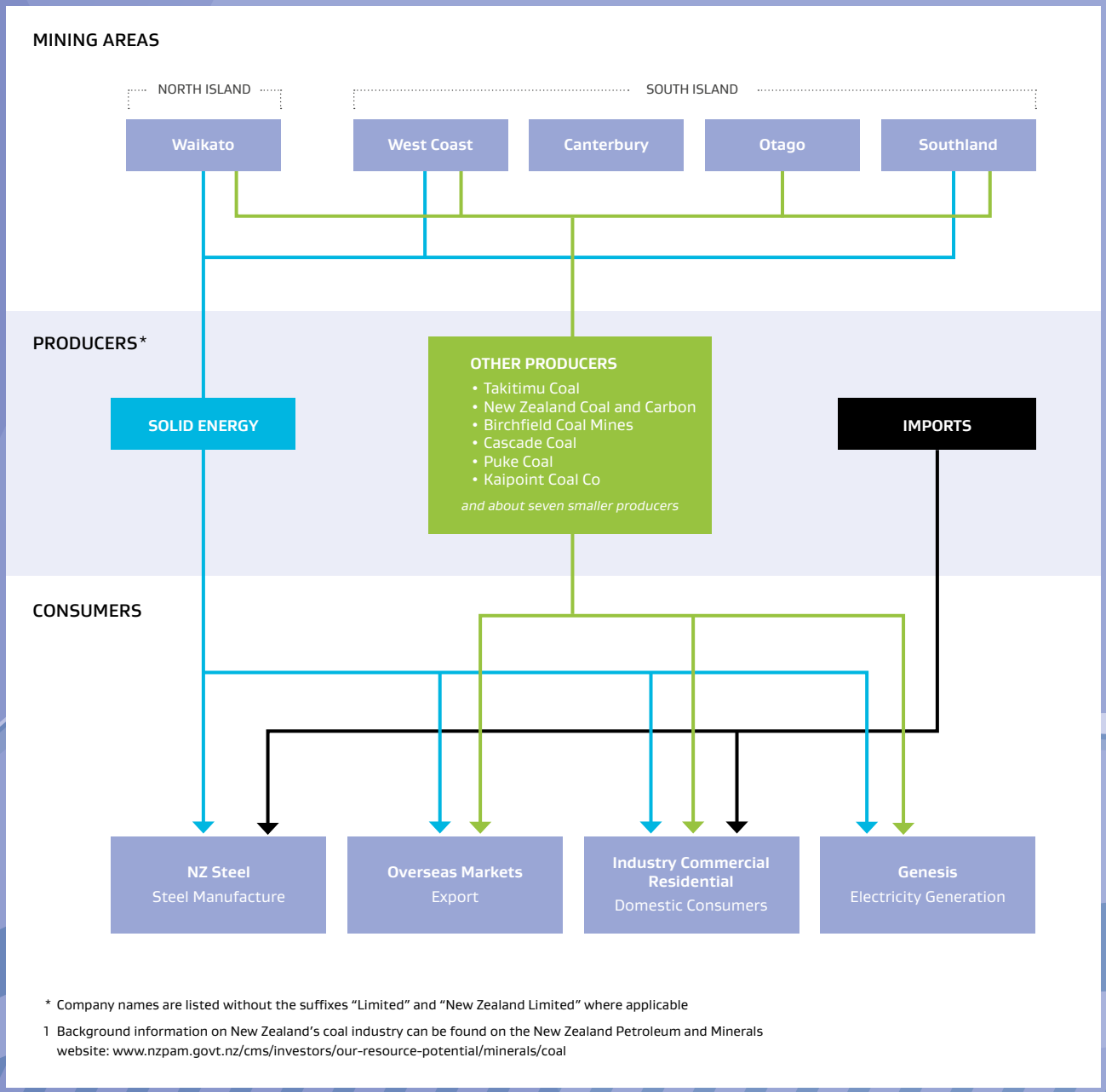
NATURAL GAS	RENEWABLES								ELECTRICITY	WASTE HEAT	
Total	Hydro	Geothermal	Solar	Wind	Liquid Biofuels	Biogas	Wood	Total	Total	Total	TOTAL
204.03	87.61	200.14	0.42	7.95	0.14	3.20	58.28	357.75		0.85	759.34
											343.84
											141.49
-0.37											6.59
											50.36
204.40	**87.61**	**200.14**	**0.42**	**7.95**	**0.14**	**3.20**	**58.28**	**357.75**		**0.85**	**904.74**
-65.44	**-87.61**	**-188.48**	**-0.06**	**-7.95**	**-0.14**	**-2.87**	**-5.06**	**-292.17**	**141.31**	**-0.85**	**-265.97**
-42.05	-87.61	-187.11	-0.06	-7.95		-2.12		-284.85	147.24		-192.89
-16.85		-1.37				-0.74	-5.06	-7.17	9.45	-0.85	-23.18
-					-0.14			-0.14			-7.03
											-11.81
-6.54									-15.37		-31.06
-59.33											**-70.95**
79.63		**11.66**	**0.36**	**-**	**-**	**0.33**	**53.22**	**65.58**	**141.31**	**-**	**567.82**
1.63		**0.73**						**0.73**	**9.55**		**35.12**
1.63		0.73						0.73	8.65		27.33
0.00									0.75		3.62
-									0.15		4.17
68.02		**8.38**				**0.05**	**45.88**	**54.32**	**52.90**		**217.89**
0.06									1.56		4.78
15.83									8.38		40.42
0.56									0.38		1.00
5.12									9.44		15.22
40.00									2.67		42.67
1.67									1.48		8.27
3.44									23.80		27.24
0.74									0.53		1.27
0.45									1.28		5.47
0.16		8.38				0.05	45.88	54.32	3.38		71.53
8.71		**2.25**				**0.28**		**2.53**	**33.53**		**51.82**
0.02						**-**		**-**	**0.22**		**205.22**
6.56		**0.30**	**0.36**				**7.34**	**8.00**	**44.86**		**62.74**
84.94	**-**	**11.66**	**0.36**	**-**		**0.33**	**53.22**	**65.58**	**141.07**	**-**	**572.79**
-5.31		**-**	**-**	**-**		**-**	**-**	**-**	**0.24**	**-**	**-4.97**

C. COAL

INTRODUCTION

This chapter contains information about coal production (supply) and sales to consumers (demand). Information on coal is presented for the 2014 calendar year.

Figure C.1: Coal Industry Summary for 2014

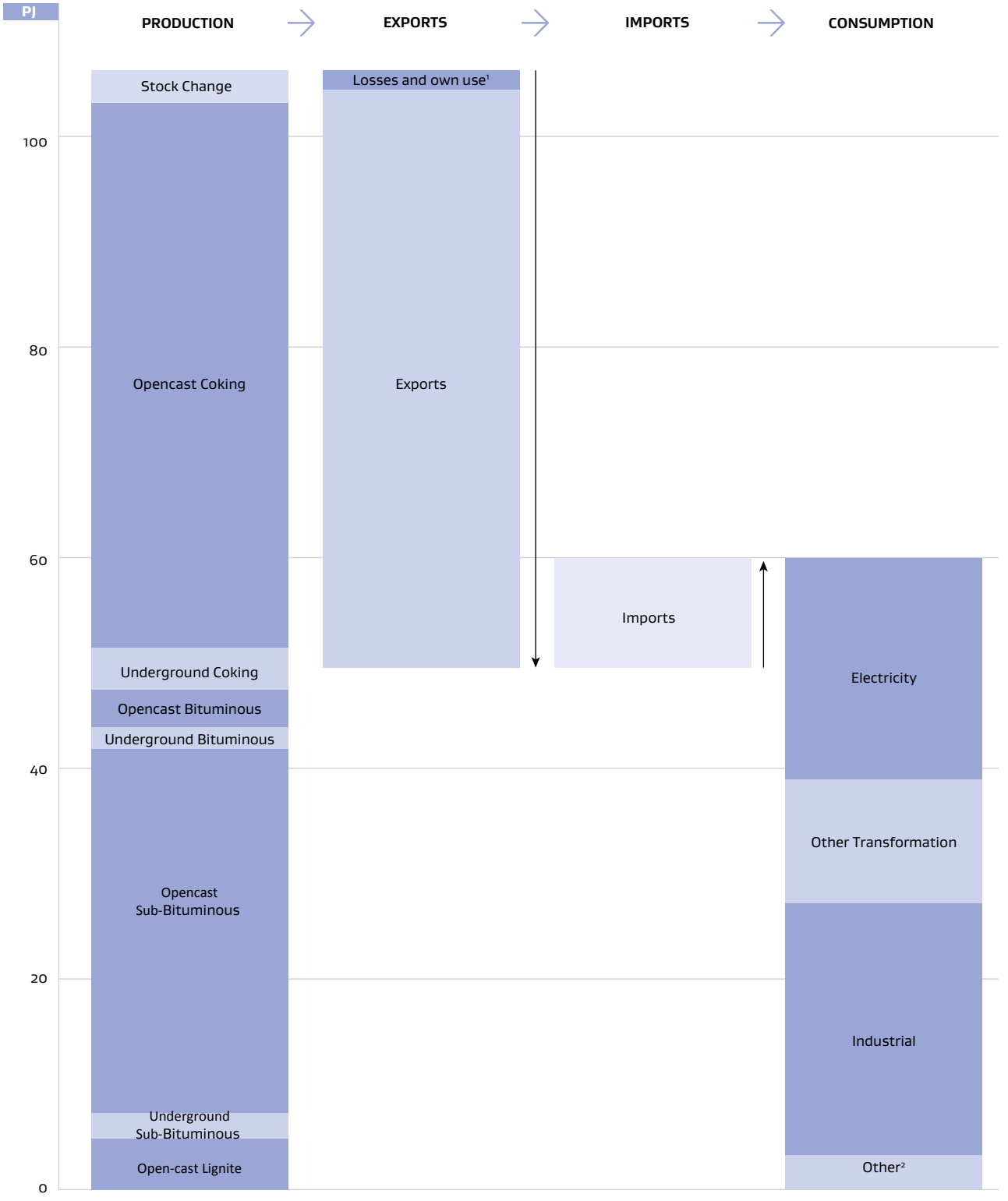


* Company names are listed without the suffixes "Limited" and "New Zealand Limited" where applicable

1 Background information on New Zealand's coal industry can be found on the New Zealand Petroleum and Minerals website: www.nzpam.govt.nz/cms/investors/our-resource-potential/minerals/coal

Coal

Figure C.2: Coal Energy Flow Diagram for 2014



1 Includes use at production sites and distribution losses.
2 Includes commercial, residential, agriculture and transport

Some totals may not add up due to rounding

Coal

Overview

The 2014 year saw a continued decline in international coal prices and domestic production. The annual average global coking coal price in US dollars fell by around 20% in 2014. Solid Energy announced production cuts and job losses at its Stockton open-cast mine, citing the unfavourable export conditions. Genesis Energy announced its intention to use less coal at the Huntly Power Station, with only two of its coal/gas generation units operating by the end of the year.

In 2014, New Zealand produced 4.0 million tonnes of coal, 1.7 million tonnes of which were exported. The corresponding figures for 2013 were 4.6 and 2.1 million tonnes. Despite coal used for electricity generation falling by a quarter, demand by dairy manufacturing sustained its growth in 2014.

Resources

New Zealand has extensive coal resources, mainly in the Waikato and Taranaki regions of the North Island, and the West Coast, Otago and Southland regions of the South Island. It has been estimated that national in-ground resources of all coal are over 15 billion tonnes, 80% of which are South Island lignites.

Lignite is New Zealand's largest fossil fuel energy resource. The main deposits are well known, with technically and economically recoverable quantities in the 10 largest deposits established at over 6 billion tonnes.

Sub-bituminous and bituminous in-ground resources are around 3.5 billion tonnes, but recoverable quantities of these coals are uncertain.

Recoverable coal estimates depend on the assessment of a complex mix of factors including:

- resource size and location;
- geological conditions;
- technical constraints to mining;
- mining economics;
- access to resources;
- project consents;
- market size and certainty;
- market price, which is itself partly set by the import substitute price for some markets;
- distribution costs and infrastructure; and
- the opportunity cost of using the land for other purposes.

Recoverable coal quantities are thus not simple to assess and will change depending on market conditions, and as a result of ongoing exploration and feasibility studies to convert resources to reserves.

Production

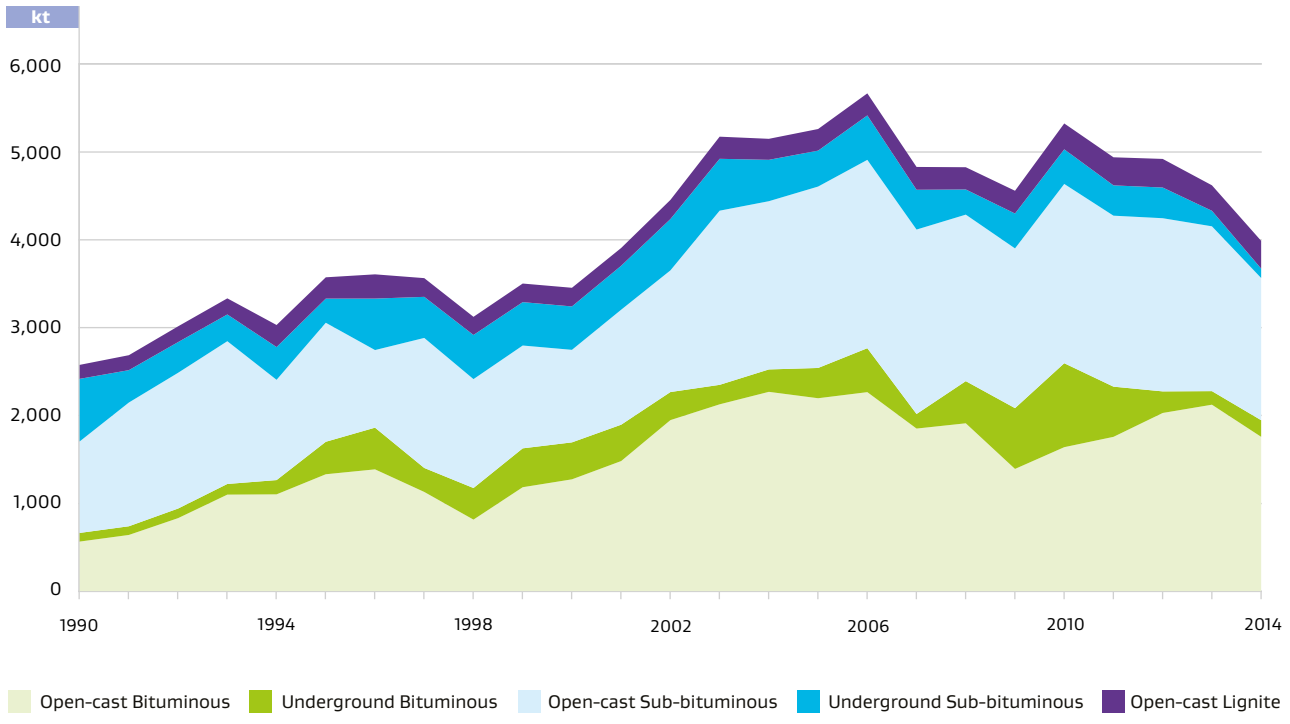
New Zealand coal production in 2014 was 4.0 million tonnes (103 PJ), a 14% decrease from 4.6 million tonnes (119 PJ) in 2013.

About 92% of all production is of bituminous and sub-bituminous coals. Even though lignite makes up 80% of national coal resources, it represented only 8% of total indigenous production in 2014, mostly as a consequence of its low energy content and distance from the main centres of energy demand.

Production is centered in the Waikato (1.1 million tonnes, mainly for several major industrial users and the Huntly power station), on the West Coast (2.2 million tonnes, mainly for export) and in Southland (0.6 million tonnes, mainly for local industrial markets). The remaining production is from Otago and Canterbury. All lignite is produced in the lower South Island and all bituminous coal is from the West Coast. The North Island only produces sub-bituminous coal.

There were three underground and 18 open-cast mines operating in 2014. Just over 60% of national production was from the two large open-cast operations

Figure C.3: Annual Coal Production by Rank and Mining Method

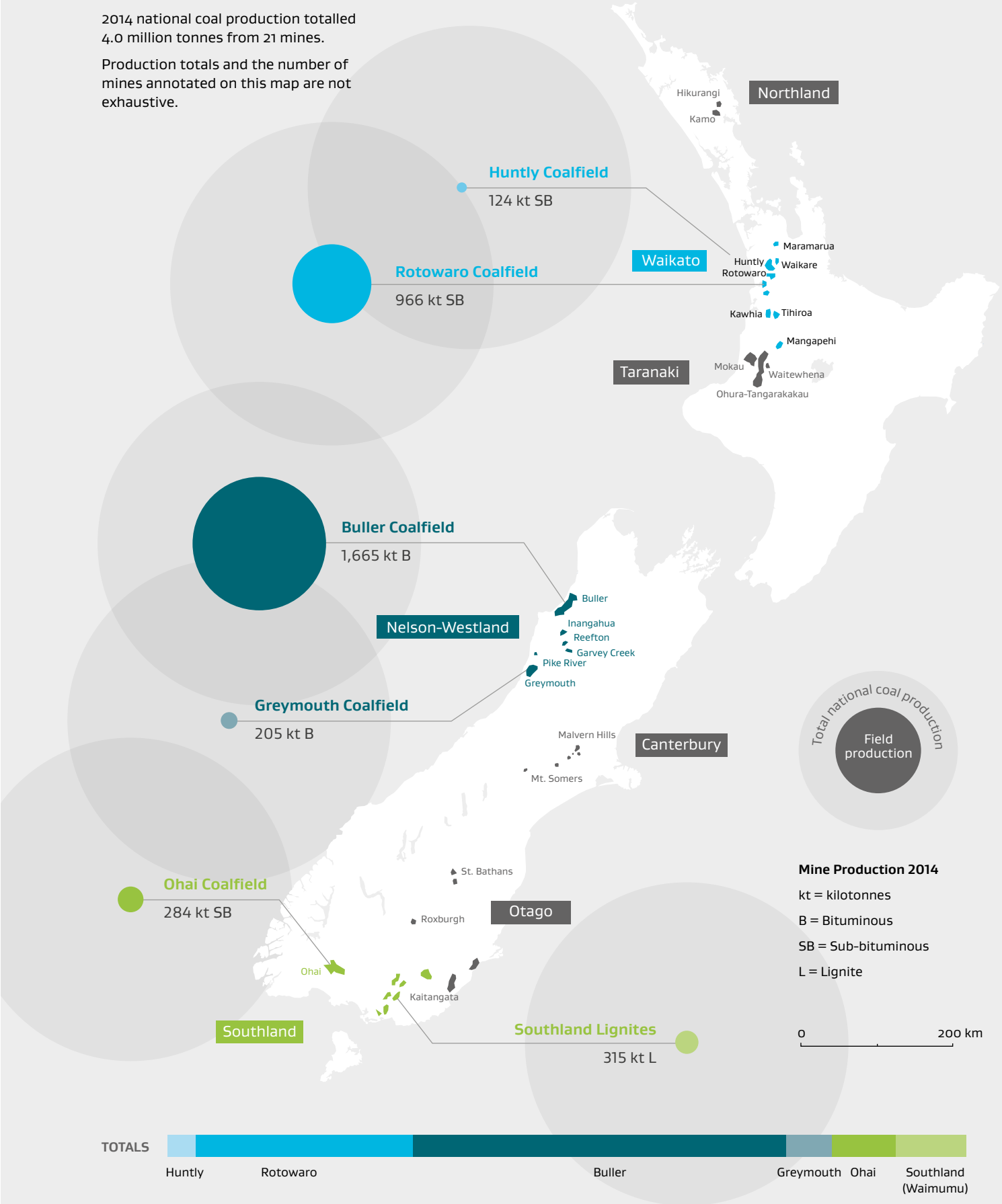


Coal

Figure C.4: Location of New Zealand Coal Resources and 2014 Coal Production

2014 national coal production totalled 4.0 million tonnes from 21 mines.

Production totals and the number of mines annotated on this map are not exhaustive.



Coal

at Stockton and Rotowaro. State-owned Solid Energy was responsible for about 75% of national production. A number of smaller private coal mining companies produced the remainder.

There are currently 48 permits and 21 licences granted by New Zealand Petroleum and Minerals to mine coal, some of which cover small mines that are not producing. There are additionally 6 granted coal prospecting permits and 32 granted coal exploration permits. The Crown owns only about half of New Zealand's coal resources. Mining of privately owned coal is not subject to the Crown Minerals Act 1991, although preceding legislation covers mining of some privately owned coal.

Exports and Imports

Exports of bituminous coal, produced entirely from the West Coast, were 1.7 million tonnes (55 PJ) for 2014, down 17% on 2013 levels. This was due mainly to a reduction in production at Stockton mine, which produces coal primarily for export.

Most of New Zealand's bituminous coal production is exported. These coals are valued internationally for their low ash and sulphur contents, and other characteristics such as high swelling, fluidity and reactivity, which allow them to be blended with other coals for use in the steel industry.[2] New Zealand coal is exported mainly to India and Japan, with smaller quantities going to China and South Africa. Most exports are of coking coal, with smaller amounts of thermal and specialist coals.

Coal imports were estimated at 0.5 million tonnes in 2014.[3] In early 2014, Genesis Energy stopped importing coal, instead choosing to use its stockpile and rely on production from domestic companies.

Consumption

Total coal supplied was 2.9 million tonnes (62 PJ) in 2014, a decrease of 1% from the previous year.

New Zealand's biggest users of coal are the Huntly power station and the Glenbrook steel mill. Huntly power station consumed around 0.6 million tonnes in 2014, 25% less than in 2013. The Glenbrook steel mill consumed over 0.8 million tonnes.

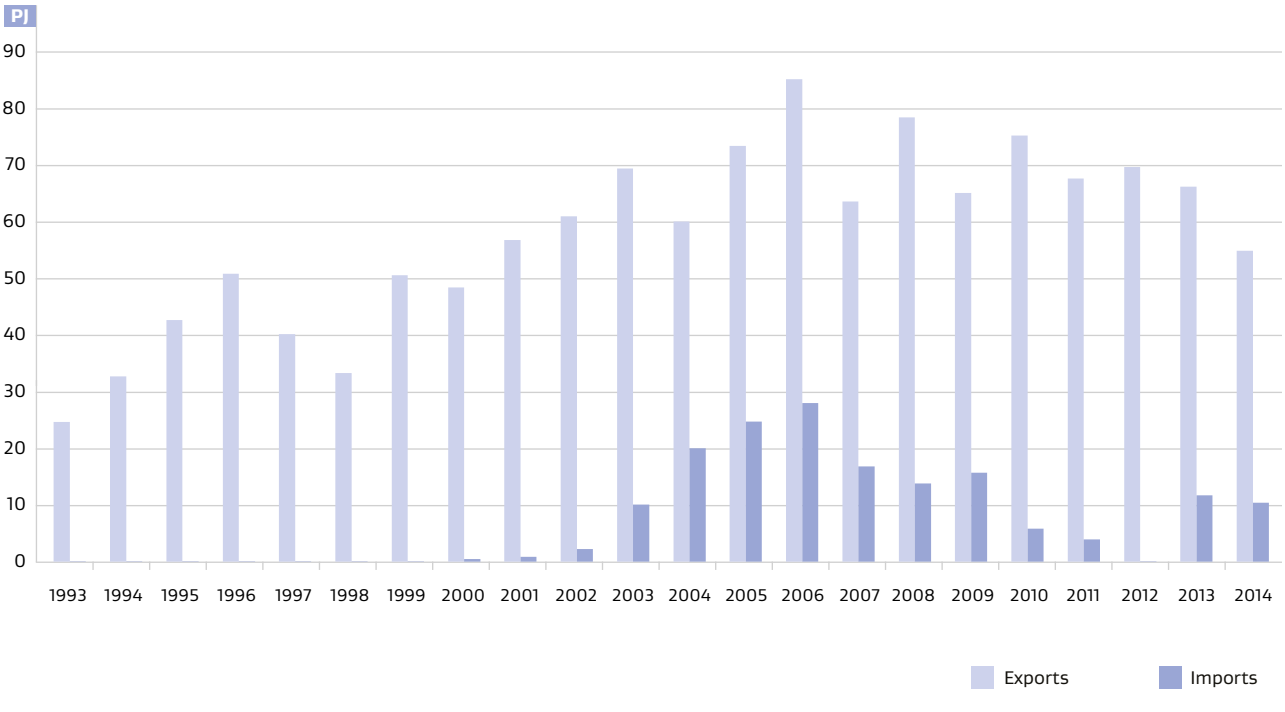
Figure C.6 shows coal consumption by sector for 2014. For the first time since 2002, industrial sector use overtook electricity generation. Industrial sector use accounted for 39% of consumption, while electricity generation (including cogeneration) was 34%. Industrial coal use is primarily for meat, dairy, and cement, lime and plaster manufacturing. This change was mainly caused by reduced demand at Huntly and increased consumption by dairy manufacturers. Cole demand for dairy manufacturing has continued to increase, growing to over 0.6 million tonnes in 2014.

A large portion of New Zealand's coal production for domestic use in 2014 was from the Waikato, underlining the regional interdependence of coal supply, industry and electricity supply. Waikato coal resources are becoming increasingly difficult and expensive to access, and remaining resources for open-cast mining are limited.

2 West Coast bituminous coals are not suitable for use at the New Zealand Steel plant in Glenbrook, Auckland.

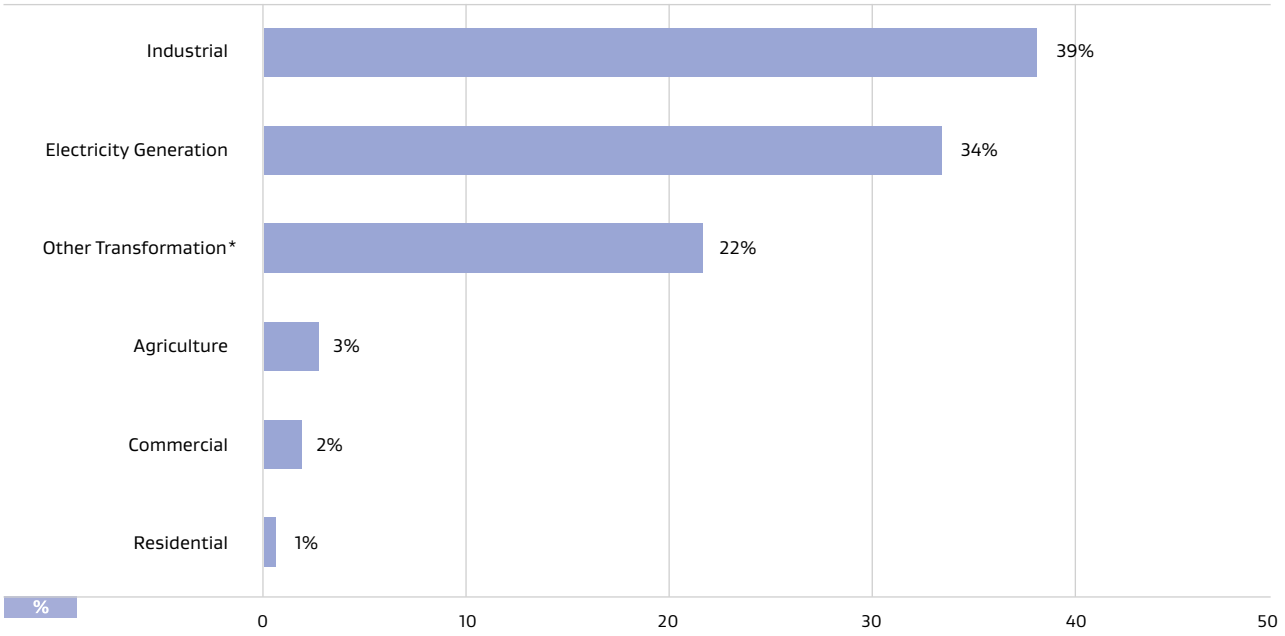
3 Complete import data were not available from Statistics New Zealand.

Figure C.5: Coal Imports and Exports



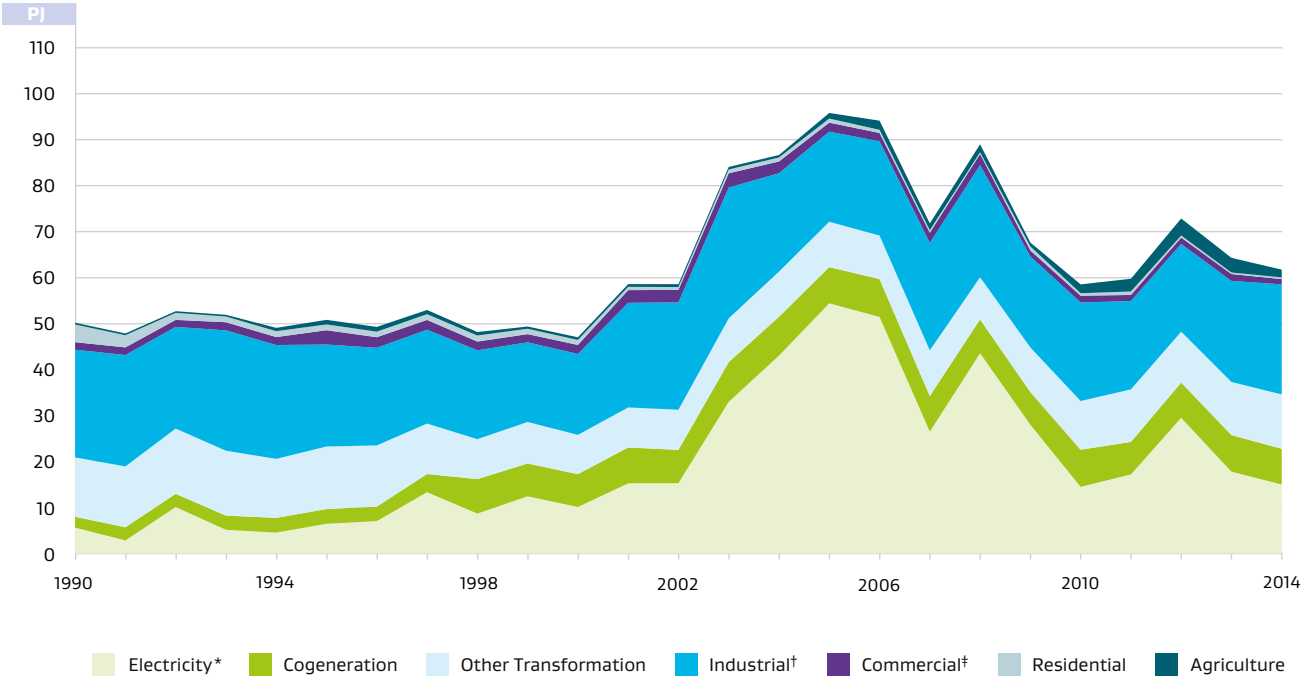
Coal

Figure C.6: Coal Consumption by Sector for 2013



* This includes coal used as a reductant in steel manufacturing

Figure C.7: Summary of Observed Coal Consumption by Sector (PJ)



* Includes losses and own use † Excludes cogeneration ‡ Includes Transport

D. OIL AND GAS

INTRODUCTION

This section of Energy in New Zealand covers all aspects of oil and natural gas. Oil is New Zealand's largest source of energy and it has a strong influence on the economy. Natural gas is currently produced and consumed only in the North Island.

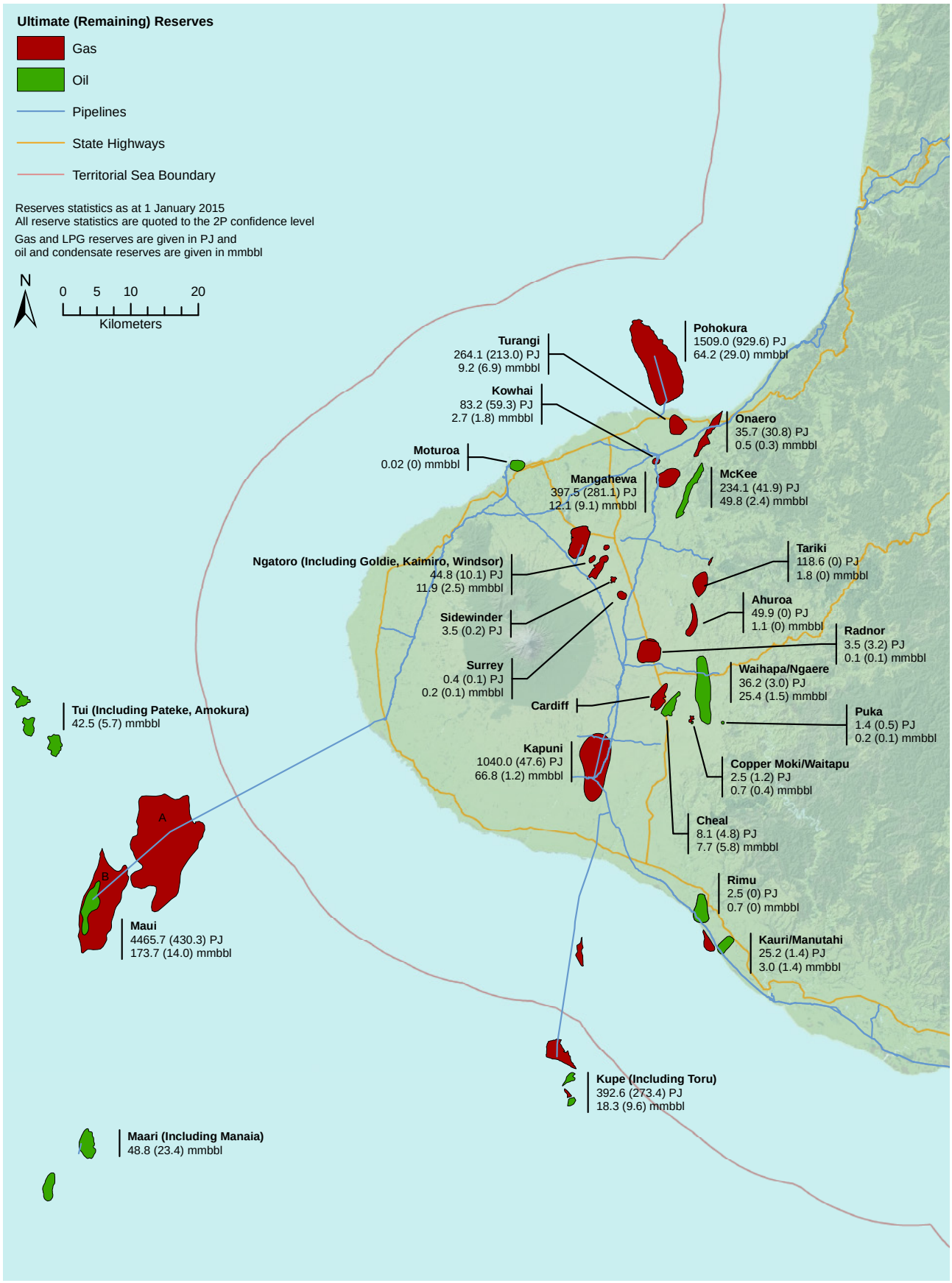
The beginning of this section covers oil and gas reserves. This is followed by oil (production, trade, stocks and consumption) then gas (production, stocks and consumption).

EXPLORATION AND DEVELOPMENT

- Overall, expenditure increased to 2.065 billion dollars, up 31% from 2013. Most of this increase came from existing production permits, although exploration expenditure also rose.
- Production permit expenditure rose 28% to $1.616 billion. Approximately $1.124 billion was spent on well drilling activities and $98 million on seismic projects.
- Exploration permit expenditure jumped 44% to $449 million. This was the highest recorded value ever, with most expenditure coming from two deep-water drilling operations.
- There were 33 wells drilled in 2014, similar to numbers in the last two years. Drilled metreage rose 6% to 99,176 metres for a cost of $1.124 billion, which was an increase of 71%. The reason for the large increase in cost was due to major drilling campaigns involving the Noble Bob Douglas (exploration – Anadarko), Big Ben (development – Todd), Ensco-107 (development – OMV) and Kan Tan IV (exploration – various) rigs.
- 3D seismic acquisition of 5,743 km^2 was down 16%, while 3D reprocessing fell 81% to 212 km^2. Acquisition and reprocessing 2D seismic were up significantly, with the highest figures seen in several years.

Oil and Gas

Figure D.1: Taranaki Oil and Gas Fields



Oil and Gas

Permits

› Fifteen exploration permits were granted under Block Offer 2014, with an overall acreage of 47,690 square kilometres. Six of these permits were onshore (one on the East Coast, two on the West Coast and three within the Taranaki basin) and nine were offshore (including the Northland-Reinga, Pegasus, and Taranaki basins). Three Petroleum Prospecting Permits ('PPPs') and one Petroleum Mining Permit ('PMP') were granted in 2014.[1]

› The number of PMPs and Petroleum Mining Licences (PMLs) rose by 1 to 25, with the Copper Moki field changing from a Petroleum Exploration Permit (PEP) in July 2014. The number of PPPs and Petroleum Exploration Permits (PEPs) rose by 7 to 59.

› Most of the mining permits and licences for the large fields are jointly held, with the bulk of investment coming from foreign companies. There were no significant changes to the companies holding permits at producing fields in 2014.

1. Further information on petroleum exploration is available on the New Zealand Petroleum and Minerals website www.nzpam.govt.nz

Table D.1: National Summary of Activity and Expenditure (All Petroleum Exploration and Mining Permits/Licenses)

National Totals – Activity Statistics Combined for PPPs, PEPs, PMPs and PMLs	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Exploration Wells	-	-	-	-	-	-	-	-	-	18	22
Appraisal Wells	-	-	-	-	-	-	-	-	-	5	1
Development Wells	-	-	-	-	-	-	-	-	-	9	10
Total Wells Drilled	**33**	**34**	**30**	**43**	**34**	**37**	**45**	**52**	**33**	**32**	**33**
Exploration Well Metres Made	-	-	-	-	-	-	-	-	-	43104	51572
Appraisal Wells Metres Made	-	-	-	-	-	-	-	-	-	17482	2943
Development Wells Metres Made	-	-	-	-	-	-	-	-	-	32842	44660
Total Metres Made	**78,237**	**87,533**	**112,369**	**99,854**	**51,037**	**64,596**	**76,026**	**63,669**	**72,177**	**93,428**	**99,176**
Exploration Well Expenditure (NZDm)	-	-	-	-	-	-	-	-	-	$206.78	$468.69
Appraisal Well Expenditure (NZDm)	-	-	-	-	-	-	-	-	-	$93.82	$114.28
Development Well Expenditure (NZDm)	-	-	-	-	-	-	-	-	-	$358.15	$540.93
Total Well Expenditure (NZDm)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**$658.76**	**$1,123.90**
2-D Seismic Acquired (km)	5,466	3,764	13,240	14,424	25,749	12,058	9,751	8,353	220	315	15,524
2-D Seismic Reprocessed (km)	23,808	14,707	30,627	20,019	11,411	6,989	21,512	7,911	6,387	5,917	11,299
3-D Seismic Acquired (km^2)	39	3,120	2,360	935	991	1,151	204	6,864	164	6,825	5,743
3-D Seismic Reprocessed (km^2)	410	247	2,147	407	432	457	1,244	1,214	9,484	1,113	212
Acquisition Expenditure (NZDm)	-	-	-	-	-	-	-	-	-	$66.12	$95.52
Reprocessing Expenditure (NZDm)	-	-	-	-	-	-	-	-	-	$3.95	$2.76
Total Seismic Expenditure (NZDm)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**$70.07**	**$98.28**
PEP & PPP National Expenditure (NZDm)	$280	$186	$133	$200	$314	$191	$246	$159	$212	$313	$449
PMP/PML National Expenditure (NZDm)	$182	$553	$574	$1,359	$963	$1,202	$1,095	$1,084	$1,267	$1,265	$1,616
Expenditure, All Permits – National Total (NZDm)	**$462**	**$739**	**$707**	**$1,559**	**$1,277**	**$1,393**	**$1,341**	**$1,243**	**$1,479**	**$1,577**	**$2,065**
PPPs Granted	-	-	-	-	-	-	-	-	1	0	3
PEPs Granted	29	5	16	19	15	9	10	3	16	11	15
PMPs Granted	2	5	2	2	0	2	1	0	1	0	1
Total Permits Granted	**31**	**10**	**18**	**21**	**15**	**11**	**11**	**3**	**18**	**11**	**19**
Permits surrenderred	-	-	-	-	-	-	-	-	-	12	9
Permits expired	-	-	-	-	-	-	-	-	-	3	2
Permits revoked	-	-	-	-	-	-	-	-	-	0	0
Total Permits Ended	**6**	**14**	**25**	**20**	**13**	**21**	**11**	**14**	**13**	**15**	**11**
Number of PEPs & PPPs at Granted Status	105	104	79	76	89	71	70	73	56	52	59
Number of PMPs and PMLs at Granted Status	14	19	21	23	23	24	23	23	24	24	25

PEPs Petroleum Exploration Permits **PPPs** Petroleum Prospecting Permits
PMPs Petroleum Mining Permits (production permits) **PMLs** Petroleum Mining Licences (production permits)

Oil and Gas

Reserves

- Reserves are the estimated total amounts of oil and gas that are able to be economically recovered from a known petroleum reservoir (coal seam gas reserves are categorised within petroleum reserves, although these reserves are currently zero in New Zealand). Ultimate recoverable reserves are the total reserves before any oil or gas is produced. Remaining reserves are ultimate recoverable reserves, less production to date. The most certain reserves figures are presented as "proved" (1P), followed by "probable" (2P), then "possible" (3P).
- Oil and condensate ultimate recoverable reserves (2P) decreased 1% from 1 January 2014, from 549 mmbbl to 541 mmbbl. This was mainly due to reduced reserves (2P) at the Maari field, down 14% to 49 mmbbl.
- Remaining reserves (2P) decreased 17% from 138 to 115 mmbbl. Remaining oil reserves at Maari fell from 35 mmbbl to 23 mmbbl.
- Ultimate recoverable natural gas and LPG reserves (2P) fell 1%, with Mangahewa providing the largest decrease. Remaining natural gas and LPG reserves (2P) fell 12% from 2642 PJ to 2328 PJ. Mangahewa and Kapuni provided most of this decrease.
- Further data are also available on 3P reserves, LPG reserves, contingent resources, oil and gas initially in place and system deliverability at: www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/publications/energy-in-new-zealand

Table D.2: Oil and Condensate Reserves

		Ultimate Recoverable (1P)			Ultimate Recoverable (2P)			Remaining Reserve (1P) as at 1 January 2015			Remaining Reserve (2P) as at 1 January 2015		
Field	**Type**	**Mm3**	**mmbbls**	**PJ**	**Mm3**	**mmbbls**	**PJ**	**Mm3**	**mmbbls**	**PJ**	**Mm3**	**mmbbls**	**PJ**
Pohokura	Condensate	9.6	60.6	348.3	10.2	64.2	369.2	4.0	25.4	145.9	4.6	29.0	166.8
Maari	Crude Oil	6.0	37.7	242.2	7.8	48.8	313.4	2.0	12.3	79.0	3.7	23.4	150.3
Maui	Condensate	26.1	163.9	907.2	27.6	173.7	961.8	0.7	4.2	23.0	2.2	14.0	77.6
Kupe	Condensate	2.4	14.8	83.0	2.9	18.3	102.5	1.0	6.1	34.2	1.5	9.6	53.7
Mangahewa	Condensate	1.0	6.3	40.2	1.9	12.1	77.3	0.5	3.3	21.1	1.4	9.1	58.1
Turangi	Condensate	0.7	4.4	24.7	1.5	9.2	51.3	0.3	2.1	11.7	1.1	6.9	38.3
Cheal	Crude Oil	0.6	3.8	21.4	1.2	7.7	42.9	0.3	1.9	10.8	0.9	5.8	32.3
Tui	Crude Oil	6.4	40.6	249.5	6.7	42.5	261.2	0.6	3.8	23.5	0.9	5.7	35.2
Kapuni	Condensate	10.5	66.1	376.5	10.6	66.8	380.0	0.1	0.6	3.3	0.2	1.2	6.9
Ngatoro	Crude Oil	1.7	10.4	52.3	1.9	11.9	59.7	0.2	1.1	5.3	0.4	2.5	12.8
McKee	Crude Oil	7.6	47.7	289.2	7.9	49.8	301.9	0.0	0.3	1.8	0.4	2.4	14.5
Kowhai	Condensate	0.3	1.8	11.4	0.4	2.7	16.7	0.2	1.0	6.1	0.3	1.8	11.3
Waihapa/Ngaere	Crude Oil	4.0	24.9	157.4	4.0	25.4	160.5	0.2	1.0	6.6	0.2	1.5	9.6
Kauri	Crude Oil	0.3	2.0	11.9	0.5	3.0	17.3	0.1	0.5	3.0	0.2	1.4	8.4
Copper Moki	Crude Oil	0.1	0.5	3.2	0.1	0.7	4.1	0.0	0.2	1.3	0.1	0.4	2.2
Onaero	Condensate	0.1	0.3	2.1	0.1	0.5	3.1	0.0	0.2	1.2	0.1	0.3	2.1
Puka	Crude Oil	0.0	0.1	0.5	0.0	0.2	1.3	0.0	0.0	0.1	0.0	0.1	0.9
Radnor	Crude Oil	0.0	0.1	0.3	0.0	0.1	0.6	0.0	0.0	0.3	0.0	0.1	0.5
Surrey	Crude Oil	0.0	0.2	1.1	0.0	0.2	1.2	0.0	0.0	0.2	0.0	0.1	0.4
Rimu	Crude Oil	0.1	0.7	4.0	0.1	0.7	4.1	0.0	0.0	0.0	0.0	0.0	0.2
Moturoa	Crude Oil	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Tariki	Crude Oil	0.3	1.8	10.5	0.3	1.8	10.5	0.0	0.0	0.0	0.0	0.0	0.0
Ahuroa	Crude Oil	0.2	1.1	6.4	0.2	1.1	6.4	0.0	0.0	0.0	0.0	0.0	0.0
Total†		**77.9**	**489.9**	**2843.5**	**86.1**	**541.3**	**3147.3**	**10.2**	**64.1**	**378.3**	**18.4**	**115.4**	**682.1**
All Fields#		**83.8**	**527.1**	**3054.5**	**86.1**	**541.3**	**3147.3**	**16.2**	**101.7**	**589.3**	**18.4**	**115.4**	**682.1**

† Arithmetic total.

The All Fields 1P values were estimated based on probabilistic summation using a Monte Carlo simulation. Arithmetic summation of 1P values will return a number with a much lower probability of occurring (0.1^n). 2P values may be totalled safely using arithmetic summation since they are the mid-point of the probability distribution.

Oil and Gas

Table D.3: Natural Gas and LPG Reserves

	Ultimate Recoverable (1P)			Ultimate Recoverable (2P)			Remaining Reserve (1P) as at 1 January 2015			Remaining Reserve (2P) as at 1 January 2015		
Field	**Mm3**	**Bcf**	**PJ**	**Mm3**	**Bcf**	**PJ**	**Mm3**	**Bcf**	**PJ**	**Mm3**	**Bcf**	**PJ**
Pohokura	34756.2	1227.4	1435.0	36548.6	1290.7	1509.0	20721.5	731.8	855.6	22513.9	795.1	929.6
Maui*	105232.5	3716.2	4163.2	112669.9	3978.9	4465.7	3130.8	110.6	127.4	10568.3	373.2	430.3
Kupe*	6698.8	236.6	301.3	8729.0	308.3	392.6	4045.0	142.8	182.0	6075.2	214.5	273.4
Mangahewa*	7127.8	251.7	281.3	10075.4	355.8	397.5	4160.6	146.9	164.8	7108.2	251.0	281.1
Turangi	3466.0	122.4	139.5	6560.8	231.7	264.1	2196.0	77.6	88.4	5290.8	186.8	213.0
Kowhai	1347.5	47.6	54.0	2075.0	73.3	83.2	751.8	26.5	30.1	1480.0	52.3	59.3
Kapuni	37511.0	1324.7	1016.0	38400.0	1356.1	1040.0	927.0	32.7	24.3	1816.0	64.1	47.6
McKee	5068.7	179.0	202.8	5850.3	206.6	234.1	263.3	9.3	10.5	1047.7	37.0	41.9
Onaero	392.0	13.8	19.0	735.0	26.0	35.7	291.0	10.3	14.1	634.0	22.4	30.8
Ngatoro	1416.7	50.0	44.5	1425.5	50.3	44.8	311.2	11.0	9.8	320.0	11.3	10.1
Cheal*	124.3	4.4	5.9	169.6	6.0	8.1	33.7	1.2	1.6	101.0	3.6	4.8
Waihapa/Ngaere	870.7	30.8	35.3	893.7	31.6	36.2	51.5	1.8	2.1	74.5	2.6	3.0
Kauri*	547.0	19.3	23.8	577.9	20.4	25.2	0.1	0.0	0.0	31.0	1.1	1.4
Copper Moki	39.3	1.4	2.0	48.4	1.7	2.5	13.9	0.5	0.7	23.0	0.8	1.2
Puka	22.0	0.8	1.1	28.3	1.0	1.4	3.5	0.1	0.2	9.8	0.3	0.5
Sidewinder	97.1	3.4	3.5	98.7	3.5	3.5	3.1	0.1	0.1	4.7	0.2	0.2
Surrey	8.6	0.3	0.3	9.8	0.3	0.4	0.7	0.0	0.0	1.8	0.1	0.1
Tariki	2809.0	99.2	118.6	2809.0	99.2	118.6	0.0	0.0	0.0	0.0	0.0	0.0
Ahuroa	1296.9	45.8	49.9	1296.9	45.8	49.9	0.0	0.0	0.0	0.0	0.0	0.0
Rimu*	52.9	1.9	2.5	52.9	1.9	2.5	0.0	0.0	0.0	0.0	0.0	0.0
Moturoa	0.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total†	**208885.5**	**7376.7**	**7899.6**	**229055.0**	**8089.0**	**8715.0**	**36904.7**	**1303.3**	**1511.8**	**57099.8**	**2016.5**	**2328.1**
All Fields#	**226905.6**	**8013.1**	**8530.1**	**229055.0**	**8089.0**	**8715.0**	**52890.1**	**1867.8**	**2020.8**	**57099.8**	**2016.5**	**2328.1**

* Includes LPG

† Arithmetic total.

The All Fields 1P values were estimated based on probabilistic summation using a Monte Carlo simulation. Arithmetic summation of 1P values will return a number with a much lower probability of occurring (0.1[n]). 2P values may be totalled safely using arithmetic summation since they are the mid-point of the probability distribution.

Figure D.2: Oil and Condensate Remaining Reserves (2P)

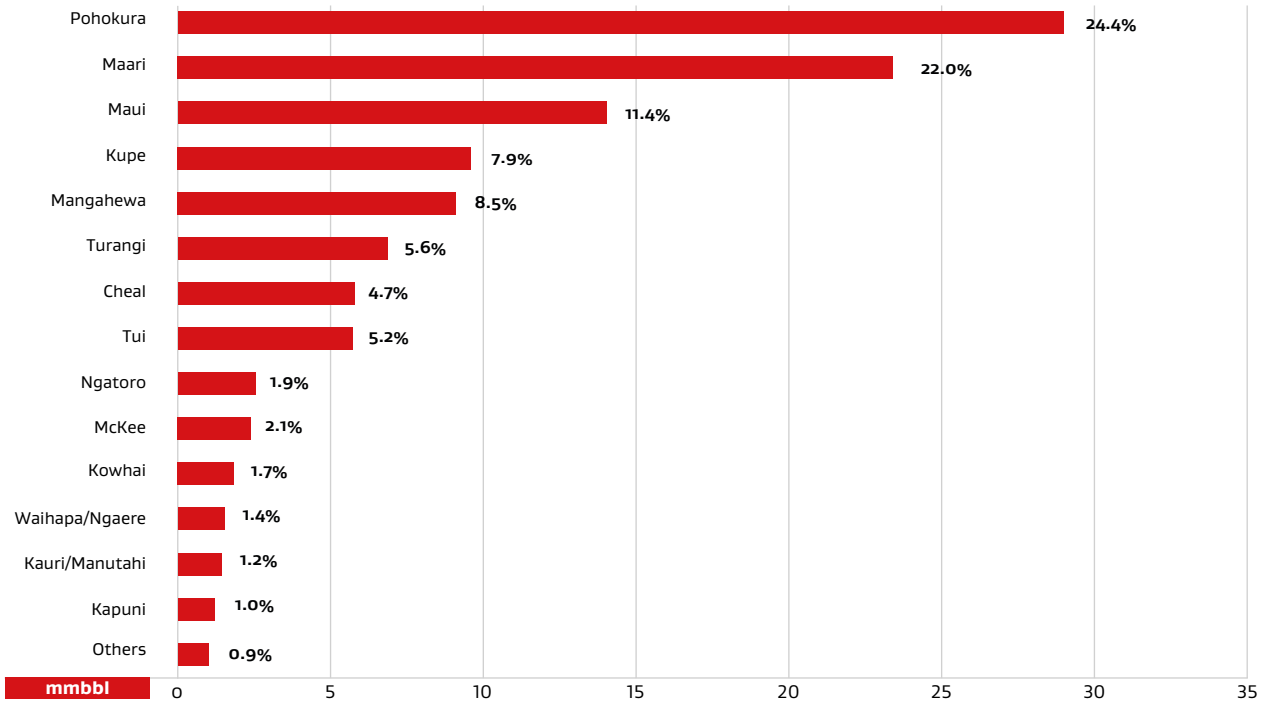
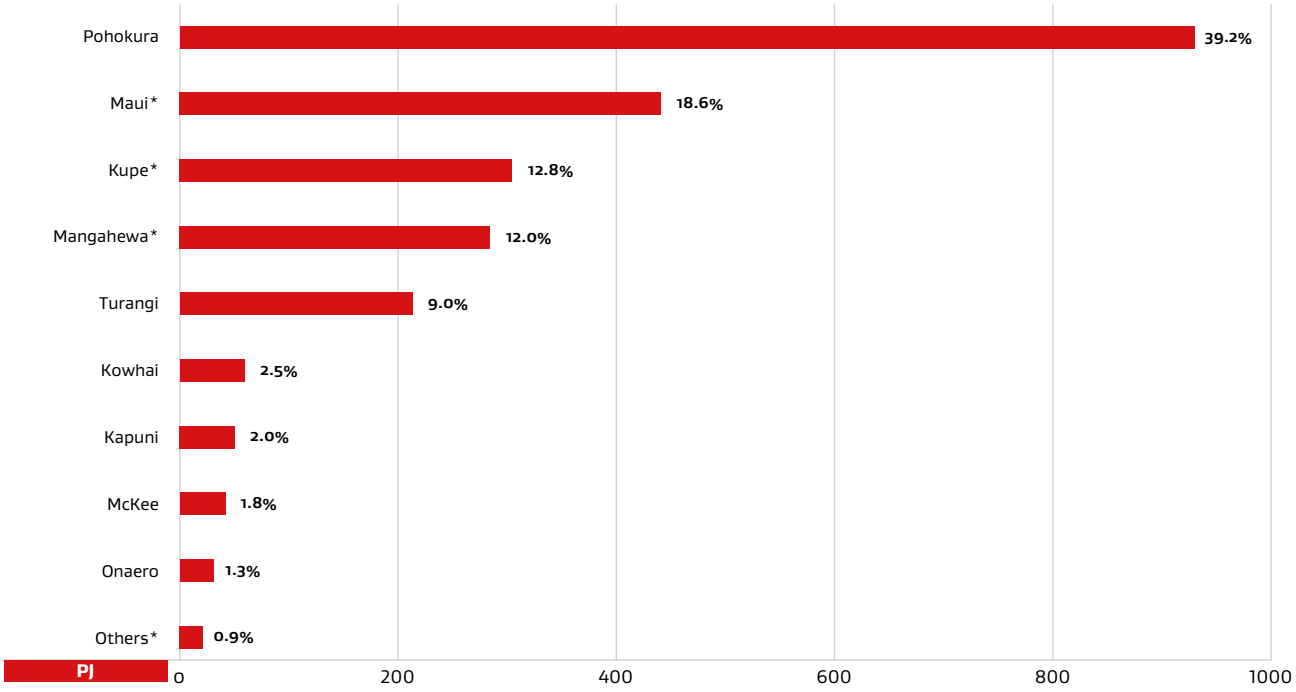


Figure D.3: Natural Gas and LPG Remaining Reserves (2P)

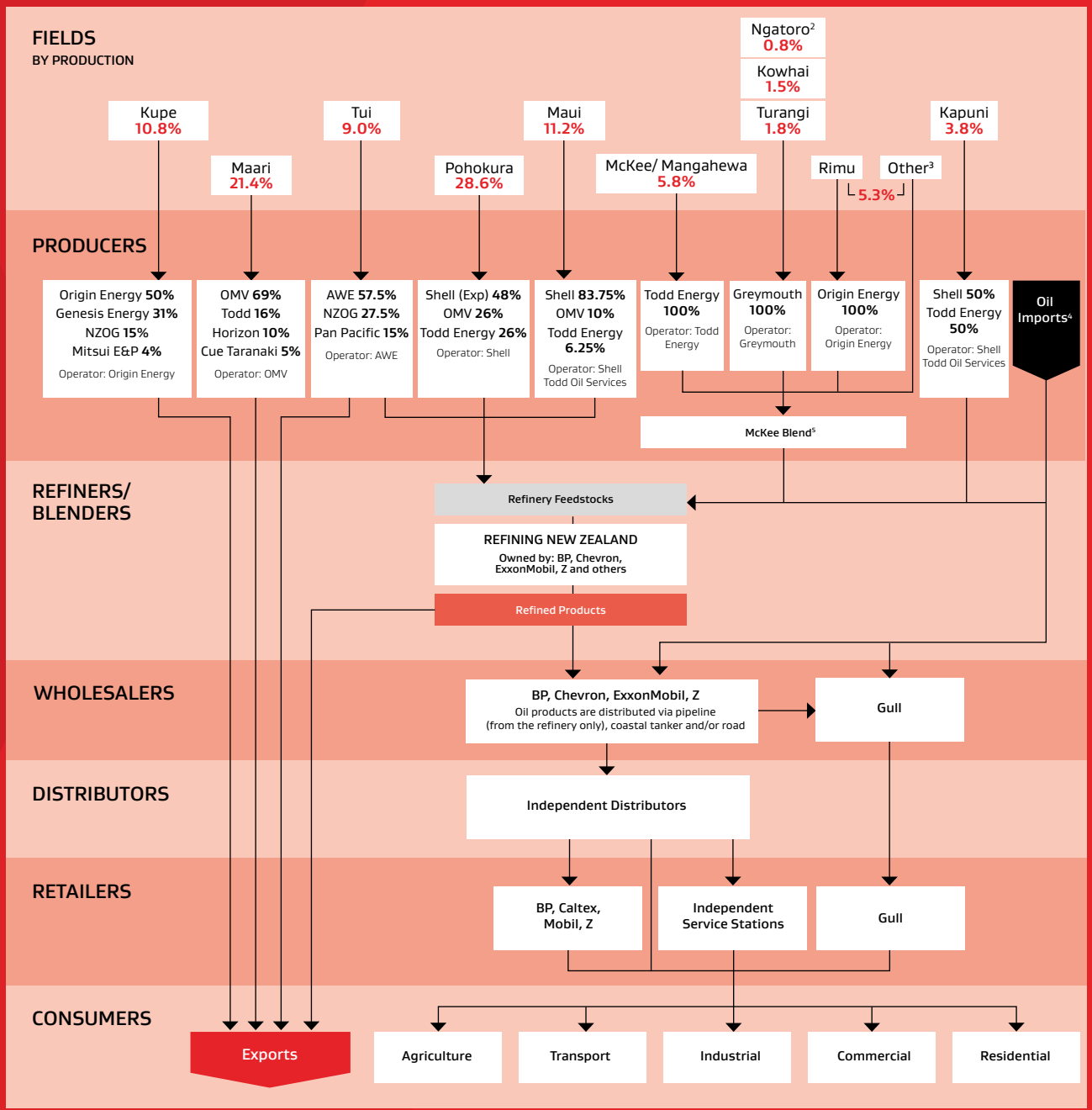


*Includes LPG

Oil and Gas

OIL

Figure D.4: Oil Industry Summary for 2014[1]



Company names are listed without the suffixes "Limited" and "New Zealand Limited" where applicable and subsidiaries are listed as the parent company. The companies are: AWE is Australian Worldwide Exploration Limited, Chevron is Chevron NZ (includes Caltex New Zealand Limited), Greymouth is Greymouth Petroleum Holdings Limited, Mitsui E&P is Mitsui E&P Australia Pty, ExxonMobil is ExxonMobil New Zealand Holdings (includes Mobil Oil New Zealand Limited), NZOG is New Zealand Oil and Gas, OMV is OMV New Zealand Limited (Österr Mineralöl Verwaltung), Origin Energy is Origin Energy New Zealand Ltd and Contact Energy (51% owned by Origin), Shell is Shell NZ Limited (includes Shell Exploration NZ Limited, Shell (Petroleum Mining) Energy Petroleum Holdings Limited, Energy Petroleum Investments Ltd, Energy Petroleum Taranaki Ltd and Taranaki Offshore Petroleum Company), TWN comprises the Tariki, Waihapa and Ngaere fields.

1 Ownership as at 31 December 2014.

2 Kaimiro, Ngatoro and Windsor fields were combined as a single permit area in 2010. All these fields are included here, as is Moturoa.

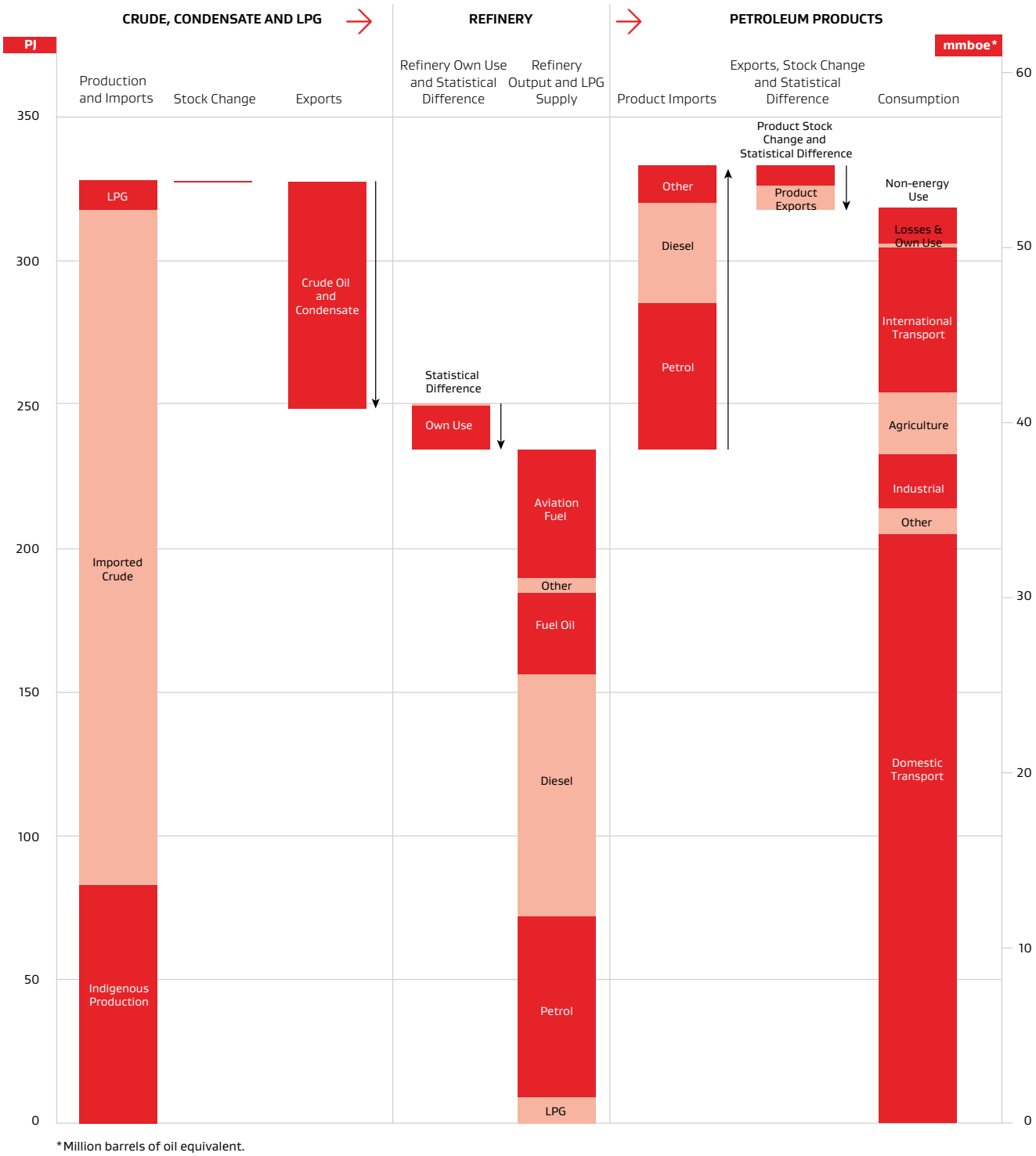
3 Includes Cheal, Sidewinder, Copper Moki, TWN, Surrey, Onaero and Puka fields, and Radnor well . Cheal and Sidewinder are owned by Tag Oil Limited. Surrey and Onaero are owned and operated by Greymouth Petroleum. Copper Moki is owned by New Zealand Energy Corp. TWN is jointly owned by New Zealand Energy Corp and L&M Energy, and operated by New Zealand Energy Corp. Puka is owned by Kea Petroleum Holdings and MEO Australia and operated by Kea Petroleum Holdings.

4 Crude and refined product are imported by the four large oil companies. Refined product is imported by Gull Petroleum.

5 Source: Shell NZ Limited.

Oil and Gas

Figure D.5: Oil Energy Flow Summary for 2014



*Million barrels of oil equivalent.

Oil and Gas

Overview

Units of volume (usually barrels per day, bbl/day) are used for the discussion of oil production statistics alongside the energy units (petajoules).[2]

All statistics apply to the 2014 calendar year. Comparisons are made with the 2013 calendar year, unless otherwise specified. Percentage changes between annual statistics are calculated based on energy units because this allows comparisons among the different oil product types (a litre of petrol and a litre of diesel have different energy contents).

The data used to compile this section are available online.[3]

Indigenous crude production rises

Indigenous production of crude oil, condensate, naphtha and natural gas liquids (herein, collectively referred to as crude oil) increased 12% to 39,600 bbl/day (83 PJ). If the Maari field (which was shut down for 4½ months in 2013) is excluded from this comparison, the production increase would be 5% from 2013. Production at Maari rose 47% to 7,700 bbl/day of crude oil.

Pohokura produced 11,600 bbl/day in 2014. This represents 29% of domestic crude oil production. Pohokura has consistently produced over 10,000 bbl/day since its first full year of production in 2007, with 12,900 bbl/day that year. Maari was the next largest field, producing in 2014 about half the amount it did in 2011. Maui (4,700 bbl/day), Kupe (4,400 bbl/day) and Tui (3,300 bbl/day) complete the five largest producing oil fields in 2014.

Total production was similar to 2012 (40,600 bbl/day), a fall of 2% over two years. While production has declined markedly since 2008 (58,600 bbl/day), the last three years have remained relatively steady if Maari is excluded from the trend.

Data from two petroleum exploration permits (PEPs) have been added to production figures (under 'Others'). These are Puka, which is operated by Kea Petroleum, and Onaero which is operated by Greymouth Petroleum.

Exports of New Zealand's crude oil rose 16% in 2014 to 36,500 bbl/day (79 PJ). New Zealand's locally produced crude oil is generally exported (only 2% of it was sent to the Marsden Point refinery for processing in 2014) because of its high quality and consequent higher value on the international market. Australia generally purchases the majority of this oil.

Refinery Expansion

The refinery processed an average 106,600 bbl/day in 2014, down 1% from 2013. This is a utilisation rate of 79% of its processing capacity. The decrease in processing was due to a shutdown in May to upgrade to a Continuous Catalyst Regeneration (CCR) platformer. The $365 million expansion project is expected to be completed before the end of 2015, which will allow the refinery to process a wider range of crudes and produce more petrol.[4]

In the final quarter of 2014, 117,200 bbl/day was processed, a utilisation rate of 87%. The highest in 2013 was the September quarter with 115,200 bbl/day.

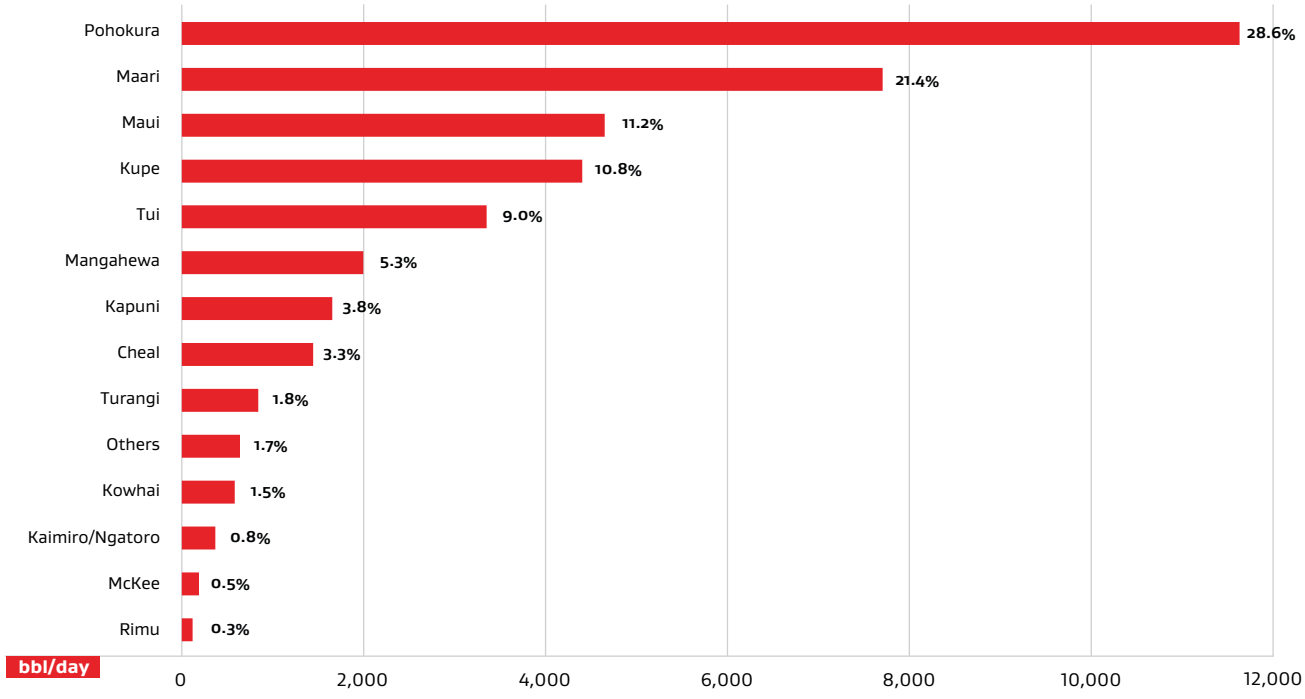
Due to lower refinery processing of crudes and blendstocks, imports of these were down 3.9% to 104,300 bbl/day (234 PJ). Refinery output of oil products correspondingly fell 2% to 102,600 bbl/day, which represented about 82% of total oil products consumption in New Zealand

2. A barrel is 159 litres.

3. Available at www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/statistics/oil

4. See the CCR Project page, available at www.refiningnz.com/investor-centre/growth/ccr-project.aspx

Figure D.6a: Oil Production by Field in 2014



Oil and Gas

Figure D.6b: Annual Crude, Condensate, Naphtha and Natural Gas Liquids Production by Field

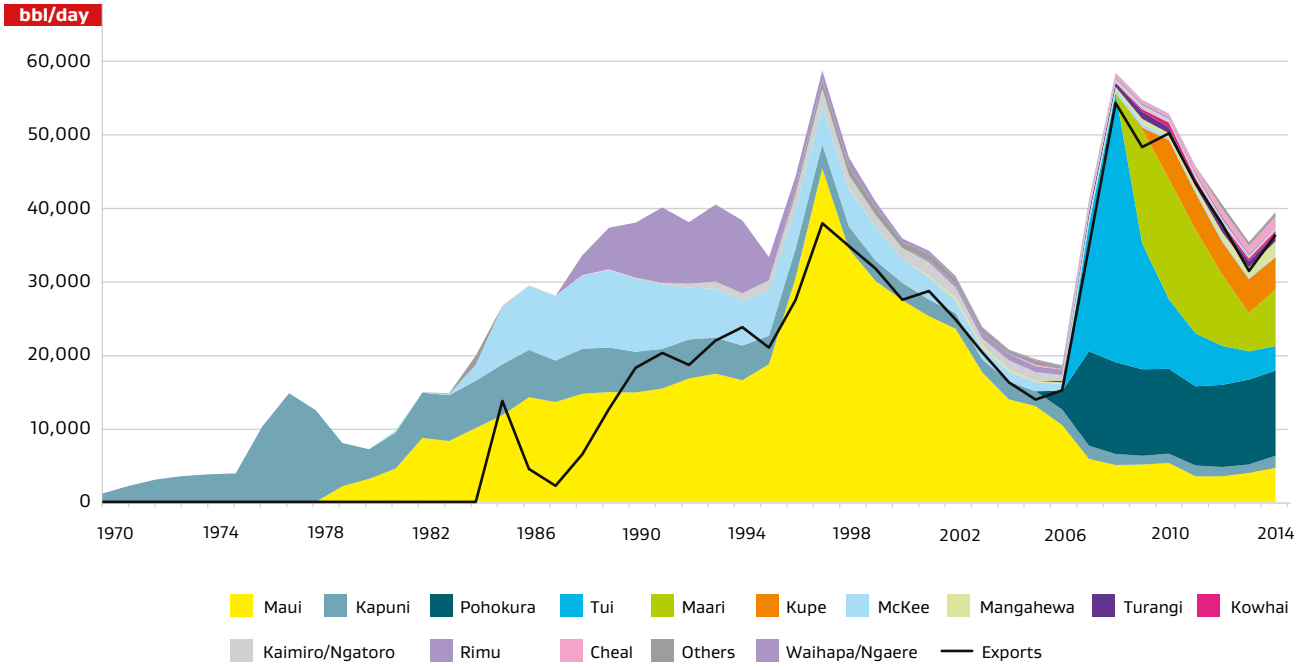
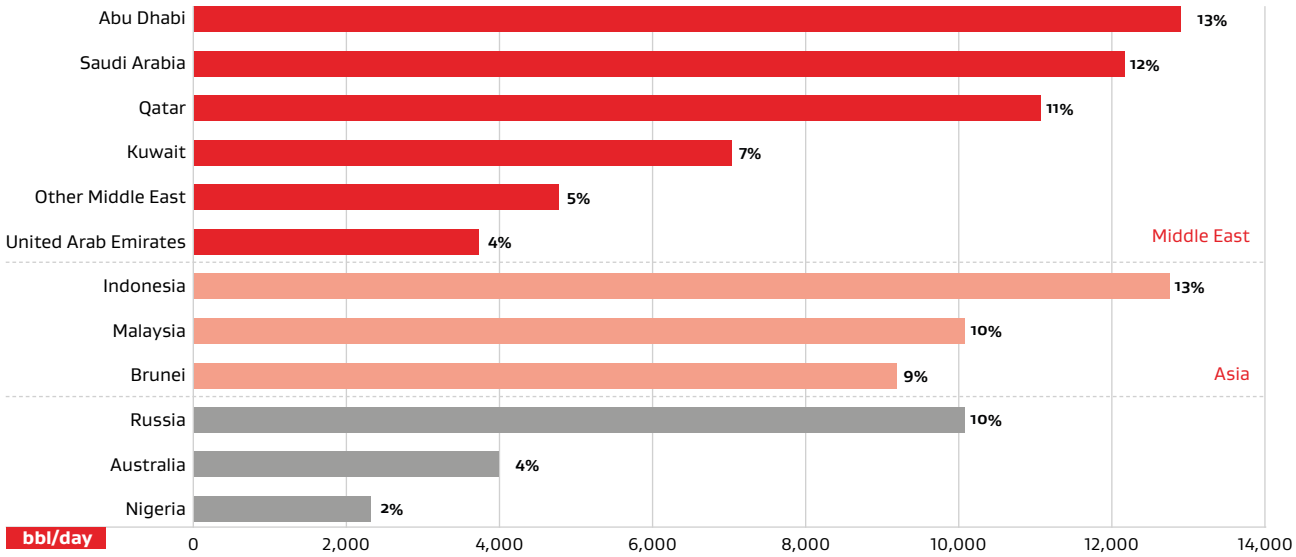


Figure D.7a: 2014 Crude Oil Imports by Country of Origin



(including for non-energy use such as bitumen, and energy transformation). Imports of refined petroleum products rose to meet demand due to the fall in refinery processing, rising 4.7% to 46,500 bbl/day (99 PJ).

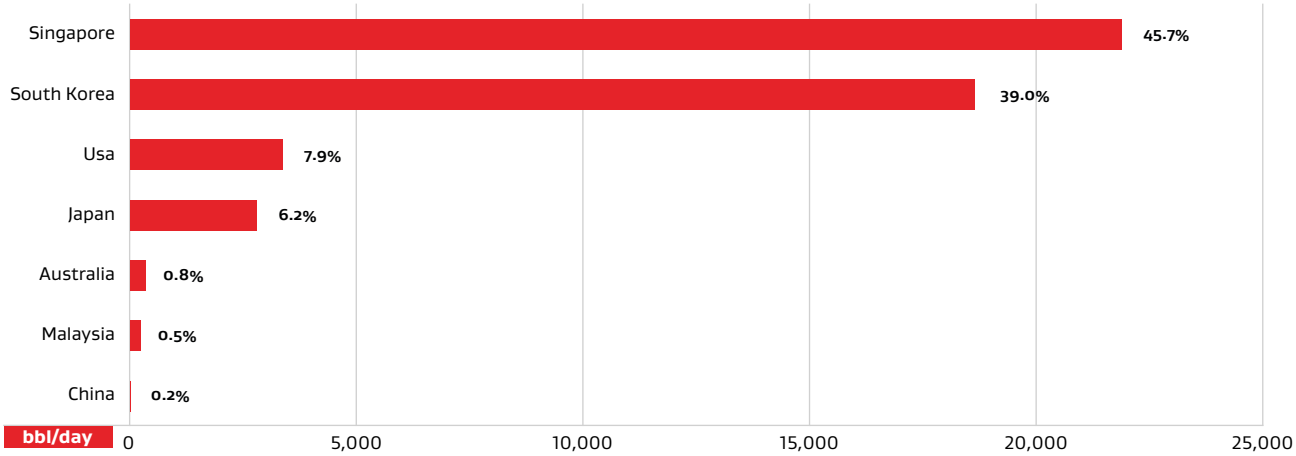
Refining NZ produces a full range of petroleum products and satisfied approximately 62% of domestic consumption (excluding non-energy use) of petroleum products in 2014.[5] This was the lowest level since 2009.

Over 80% of New Zealand's oil product imports came from Singapore and South Korea in 2014, with the USA at 8%.

Figure D.7A shows imports of crude oil by country of origin for the 2014 calendar year. Over half (52%) of all imported oil to New Zealand in 2014 was produced in the Middle East, though this is down from last year when it was 59%. Crude from Asia rose to 32%. Imports from Russia were about the same as last year. The rest of the imports were from Australia and Nigeria.

5. Percentage is calculated as: (refinery output – product exports – international transport)/domestic oil product consumption

Figure D.7b: 2014 Oil Product Imports by Country of Origin



Consumption of Oil Products Up

Observed domestic consumption of all refined oil products rose 1% in 2014 to 124,900 bbl/day (266 PJ). Fuel consumed for international transport (such as shipping or aviation) rose 1% to 22,600 bbl/day (50 PJ). Fuel consumed domestically was at its highest level since 2008.

Diesel consumption continues to increase, rising 4% to 54,000 bbl/day (120 PJ). Diesel is the primary fuel for commercial land transport and tends to be strongly linked to economic performance. Petrol is used mainly for private consumption and remained steady at 52,100 bbl/day (106 PJ).

Figures D.9A and D.9B show the respective breakdowns of petrol and diesel use by vehicle type.

Stock Requirements

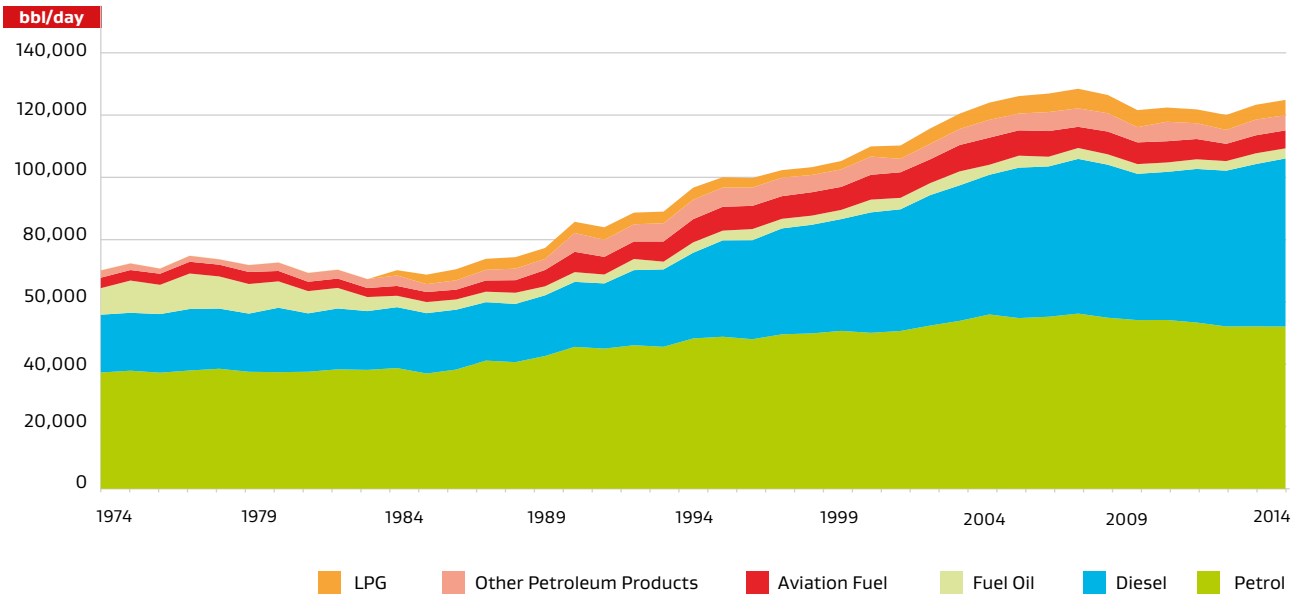
New Zealand has officially been a member of the International Energy Agency (IEA) since 1976. The IEA was set up in 1974 in response to major oil market disruptions in 1973/74. Member countries must demonstrate they have access to stocks of crude oil and/or oil products equivalent of not less than 90 days of their prior year's average net oil imports.[6]

To help meet this requirement, governments can purchase stock tickets which allow access to oil stocks held overseas, should the need arise.

The average monthly stock holding level for New Zealand in 2014 was 96 days of net oil imports. The main stock-holders in the country include the main oil companies, the Marsden Point refinery, and some large companies which import and hold large stocks of oil products for their own use. Lower month-end stock levels (such as in November) can occur, for example, in the event of a delayed arrival of a ship bringing oil into New Zealand.

6. Net oil imports = imports - exports - stock change.

Figure D.8: Observed Oil Products Consumption



Oil and Gas

Figure D.9a: Transport Petrol by Mode in 2013*

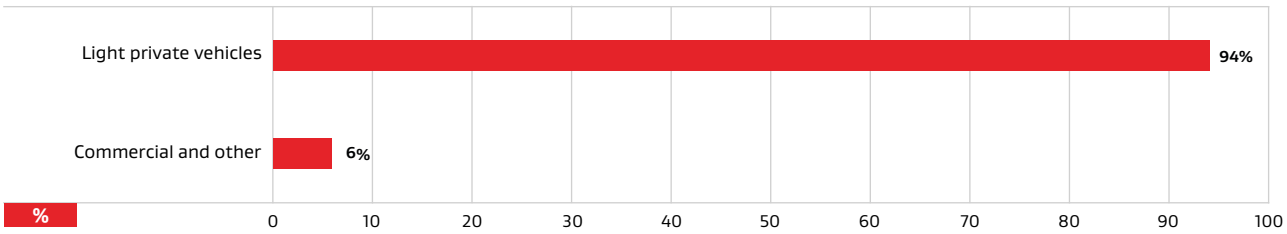
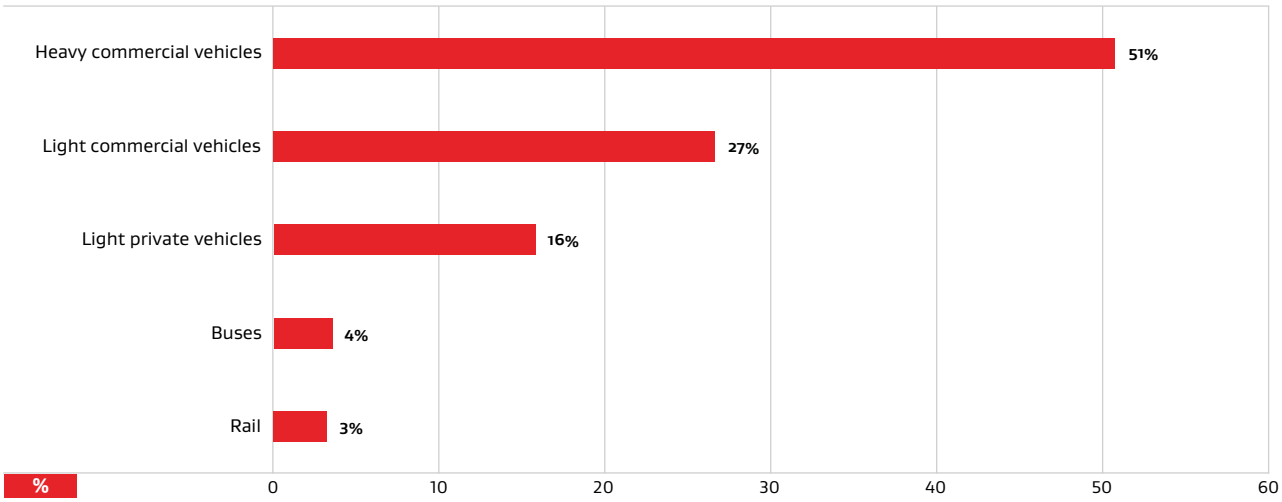
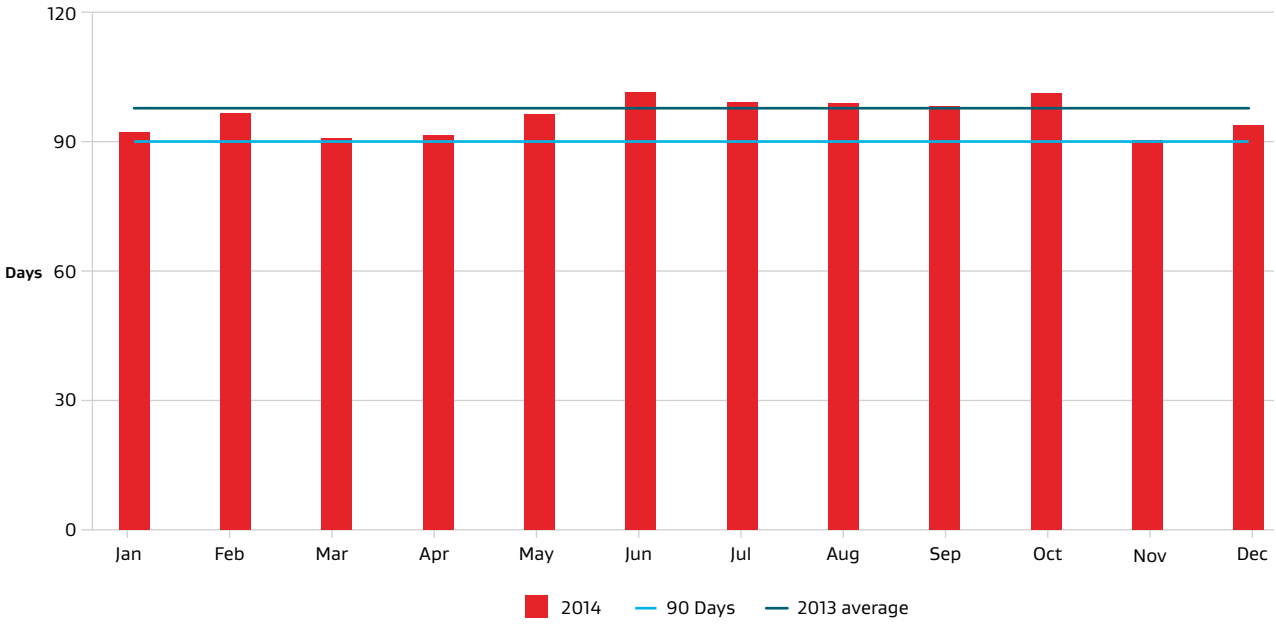


Figure D.9b: Transport Diesel by Mode in 2013*



*This data was estimated by disaggregating transport fuel use using data from the Ministry of Transport's Vehicle Fleet Model.

Figure D.10: Oil Stocks for 2014



Oil and Gas

Port Offtakes

Figure D.11 is a chart of port offtakes of petrol, diesel and jet fuel in bbl/day during 2014. While ports have been grouped by regions, it should be noted that some regions, such as Whangarei and Auckland, include multiple port terminals.

While port offtakes of petrol, diesel and jet fuel can be thought of as a rough measure of regional demand for these fuels, it is important to note that the oil network in New Zealand often involves deliveries between regions. For example, New Plymouth is often served by Wellington (Seaview), whereas Mount Maunganui supplies some retail sites throughout the North Island. Figures should therefore be interpreted with care.

Auckland, with about a third of the national population and a major airport (a pipeline connects the airport to a terminal in Wiri), had 49,900 bbl/day of diesel, petrol and jet fuel offtakes in 2014. Lyttleton (Christchurch) was next with 16,000 bbl/day.

Oil Prices

Quarterly and annual retail prices for petrol and diesel are collected from Statistics New Zealand. Wholesale diesel data are produced using data collected each quarter from New Zealand's four largest oil companies (BP, Z, Chevron and ExxonMobil).

Retail prices

Retail prices ended 2014 at their lowest levels since late 2010. Petrol prices rose for the first half of the year, peaking at 223 cents per litre before falling to 193 cents per litre. Diesel prices started at 157 cents per litre and ended the year at 125 cents per litre. Prices which consumers pay at the pump can vary greatly both across and within regions, due to regional price variations and discounts offered by fuel retailers.

Figure D.12a shows petrol and diesel prices since 1974 in real 2014 terms. Retail prices are influenced by a range of factors including the importer cost, importer margins and taxes and levies. Excise duty on petrol (both premium and regular) increased by 3 cents a litre from the 1st of July 2014. Road User Charges (RUC) on diesel also increased, by an average of 5.6%.[7] With US shale production creating excess supply and OPEC deciding against cutting its output in response, the international crude oil price fell to a similar level to five years ago. This caused the import cost and then retail prices to fall.

Importers' Cost and Margin

The Ministry monitors liquid fuel prices and gross importer margins on a weekly basis.[8] This weekly fuel price report shows the composition of the retail price of petrol and diesel in order to monitor liquid fuel importer margins.

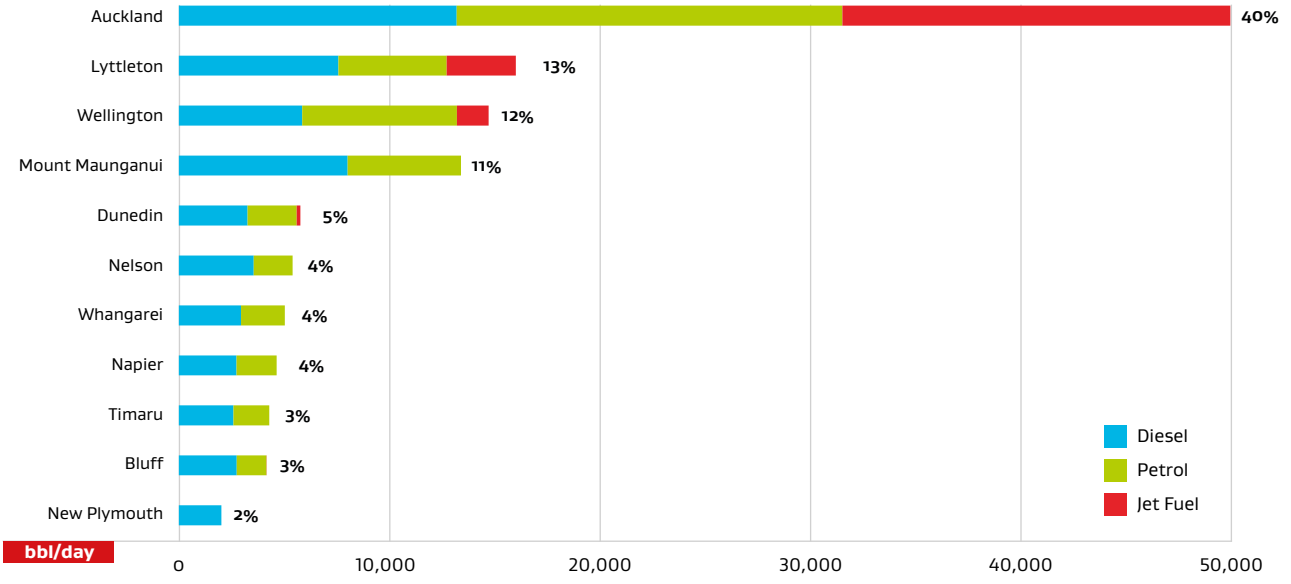
The gross importer margin is the margin available to retailers to cover transport, distribution and retailing costs within New Zealand, as well as their own margin. Importer margins are calculated from retail prices less taxes, levies and import costs. New Zealand import costs are calculated using the Singapore spot market price plus allowances for international freight, wharfage fees and insurance costs. Import costs are predominantly driven by movements in the international price of crude oil and the USD to NZD exchange rate.

Importer margins on both petrol and diesel continued their growth in 2014. Figure D.12b expresses importer margins in real 2014 terms and shows that they reached the highest that they have been since early 1998. While they have been growing since 2009, in real terms they are still around half the level they were in the 1980s pre-deregulation. Annual average real importer margins rose by 8% for regular petrol and 19% for diesel in 2014, relative to 2013. The average import cost of fuel for petrol and diesel fell by 7% and 10% respectively in 2014.

7. These are charged on a per-kilometre basis, depend on the vehicle and are increased in line with increases in petrol excise duty

8. Available at www.mbie.govt.nz/info-services/sectors-industries/energy/liquid-fuel-market/weekly-oil-price-monitoring

Figure D.11: Diesel, Petrol and Jet Fuel Offtakes by Port in 2014*



*Data sourced from Coastal Oil Logistics Ltd, which is jointly owned by BP, Z, Exxon Mobil and Chevron (Caltex).

Figure D.12a: Petrol and Diesel Prices (Real 2014 Prices)

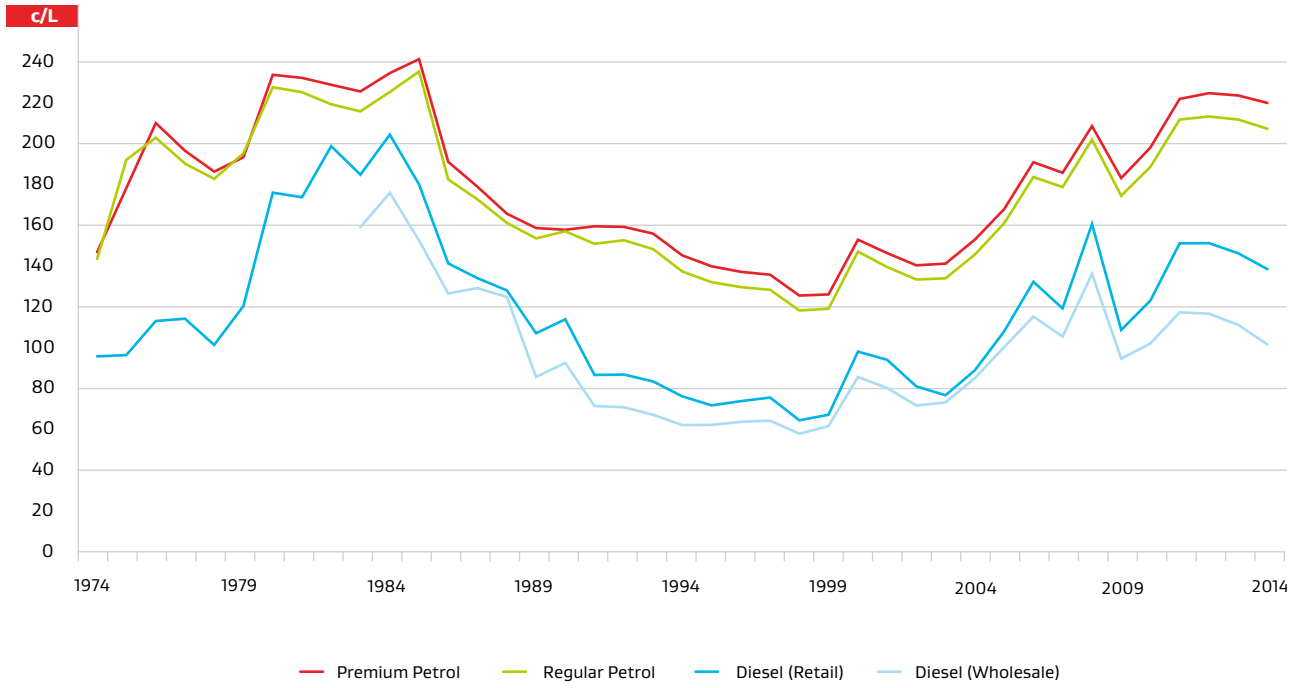
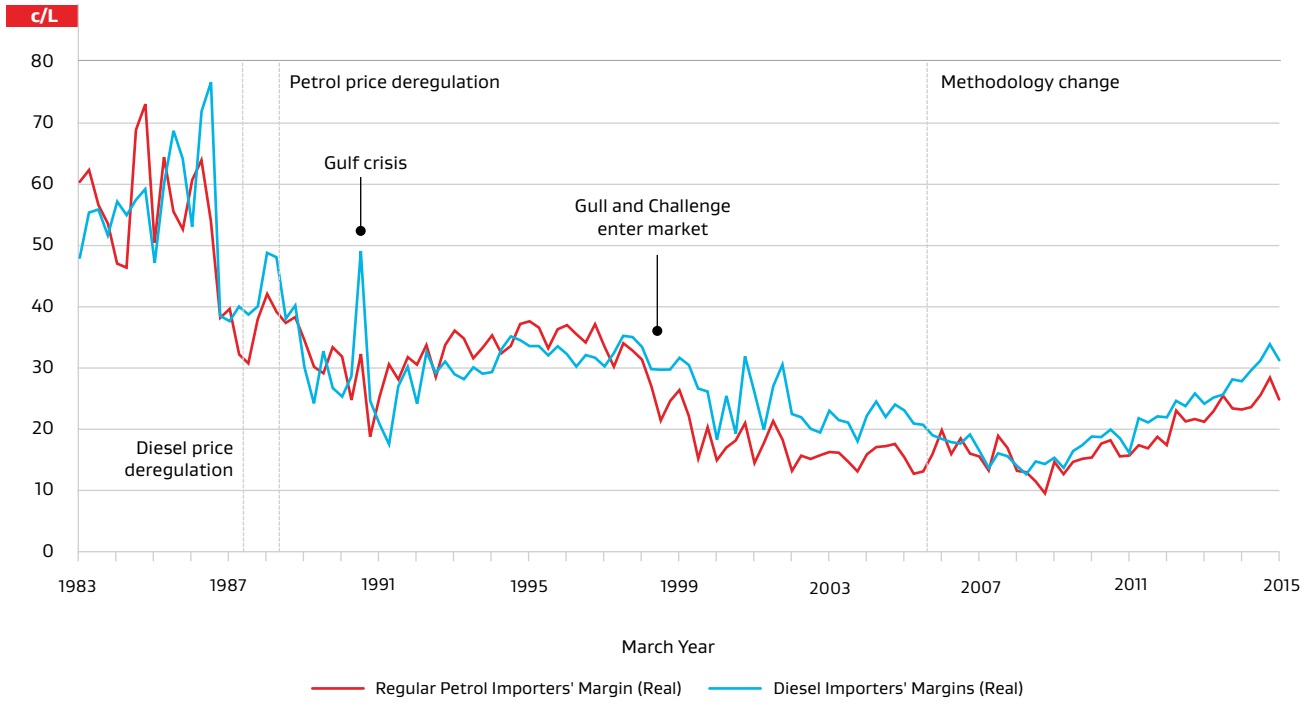


Figure D.12b: Importers' Margin (Real 2014 Prices)



International Comparisons

New Zealand's petrol and diesel prices can be compared to those of its major OECD trading partners for whom data is available.[9] Figures D.13a and D.13b are based on data using US dollars per unit using purchasing power parity.[10]

New Zealand's premium petrol prices in 2014 were among the lowest. Many OECD countries do not have regular petrol, so this comparison has been excluded. New Zealand's retail diesel prices were the lowest in the OECD in 2014, as shown in Figure D.12b. Only taxes paid at the pump are included, meaning that RUC for diesel are not included. Most other OECD countries have taxes and levies paid at the pump.

9. Care is needed in interpreting this data, as product specifications, statistical methodology and information available can differ considerably among countries. Taxation forms a large component of some liquid fuel prices, notably for petrol (around 50% or more for most countries, except for the North American countries, for which the share is closer to 30%).

10. For more information on purchasing power parity, see www.oecd.org/std/prices-ppp/purchasingpowerparities-frequentlyaskedquestionsfaqs.htm

Figure D.13a: Premium Petrol Prices (using PPP) in OECD Countries for 2014

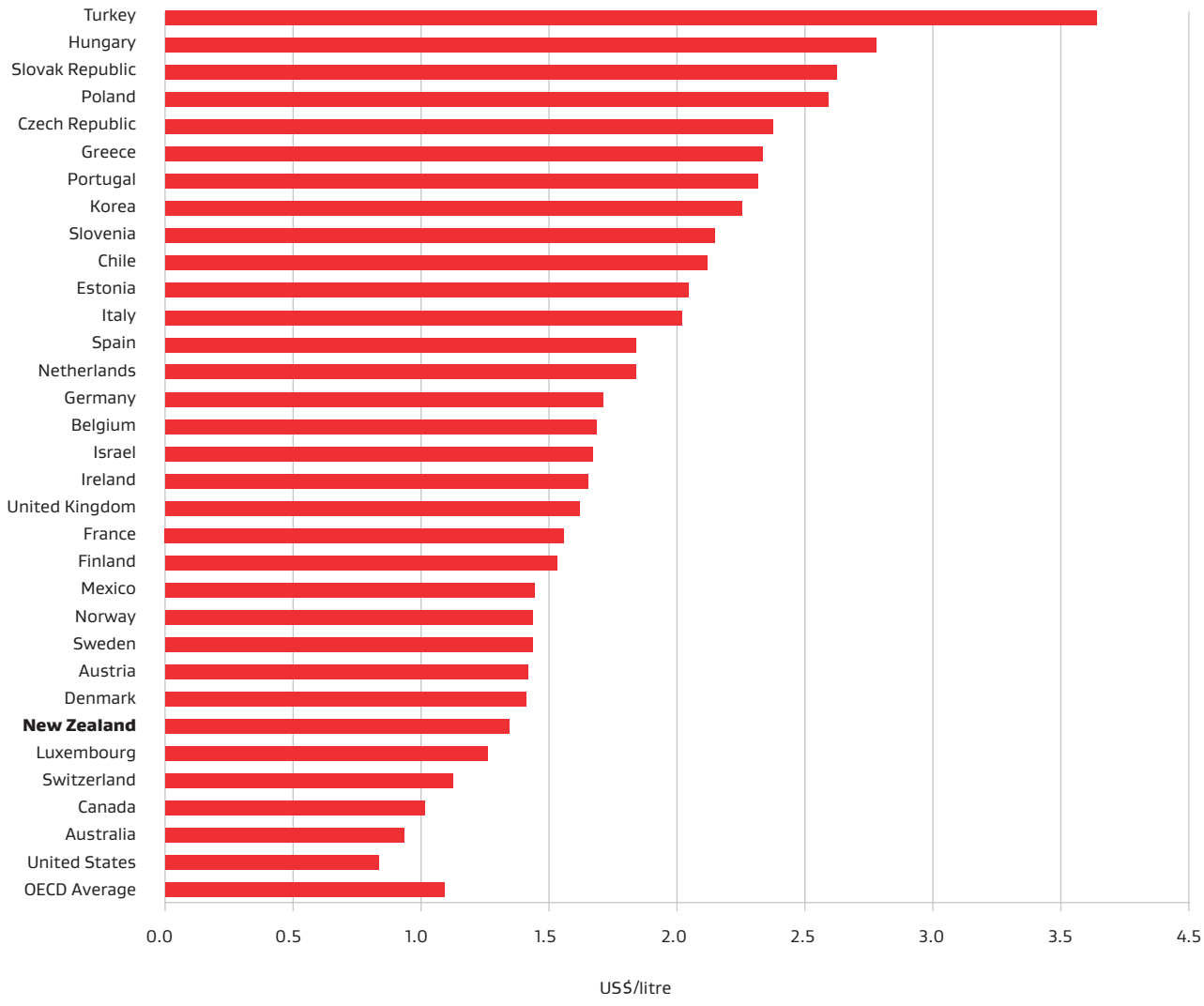
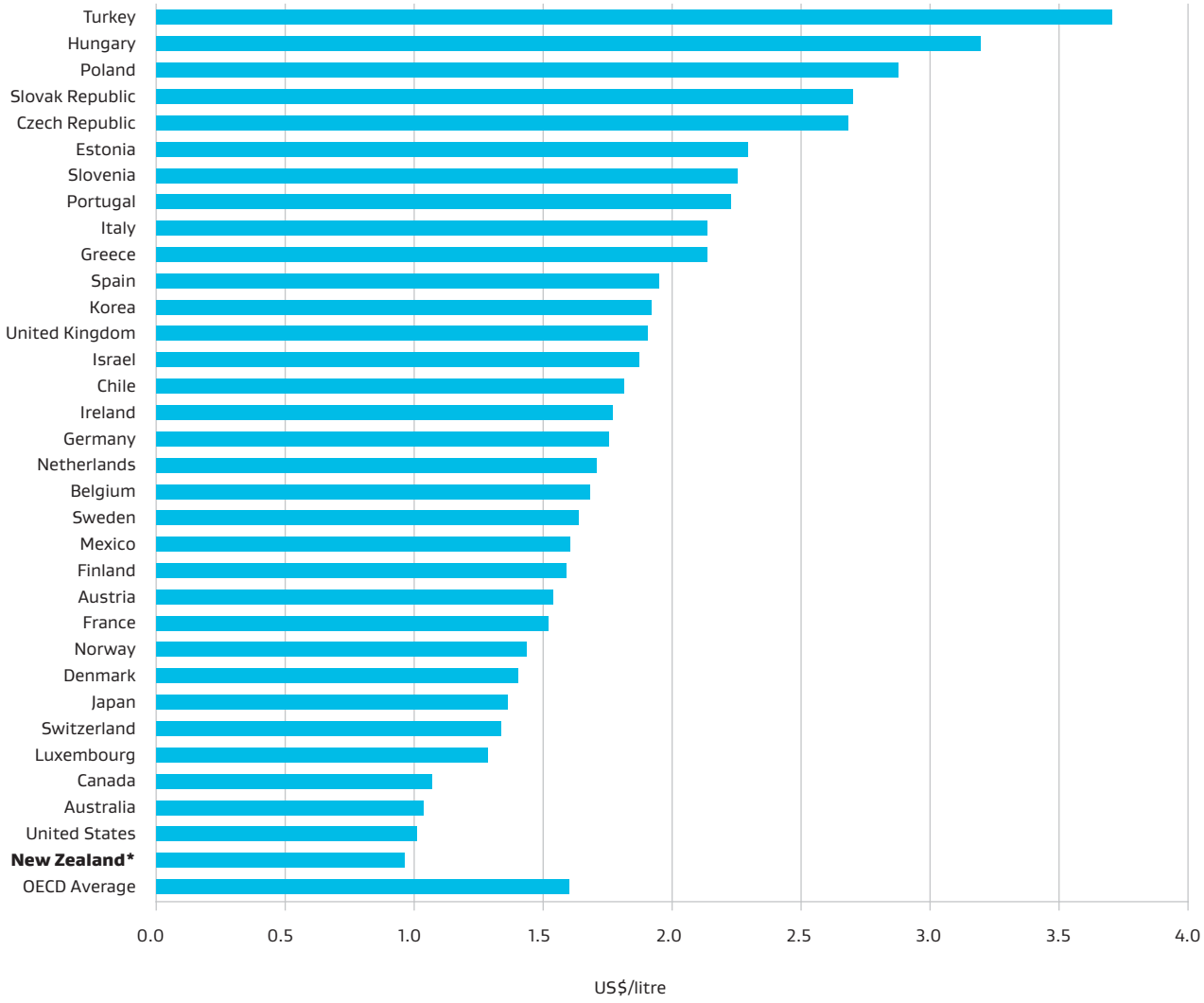


Figure D.13b: Automotive Diesel Prices (using PPP) in OECD Countries for 2014

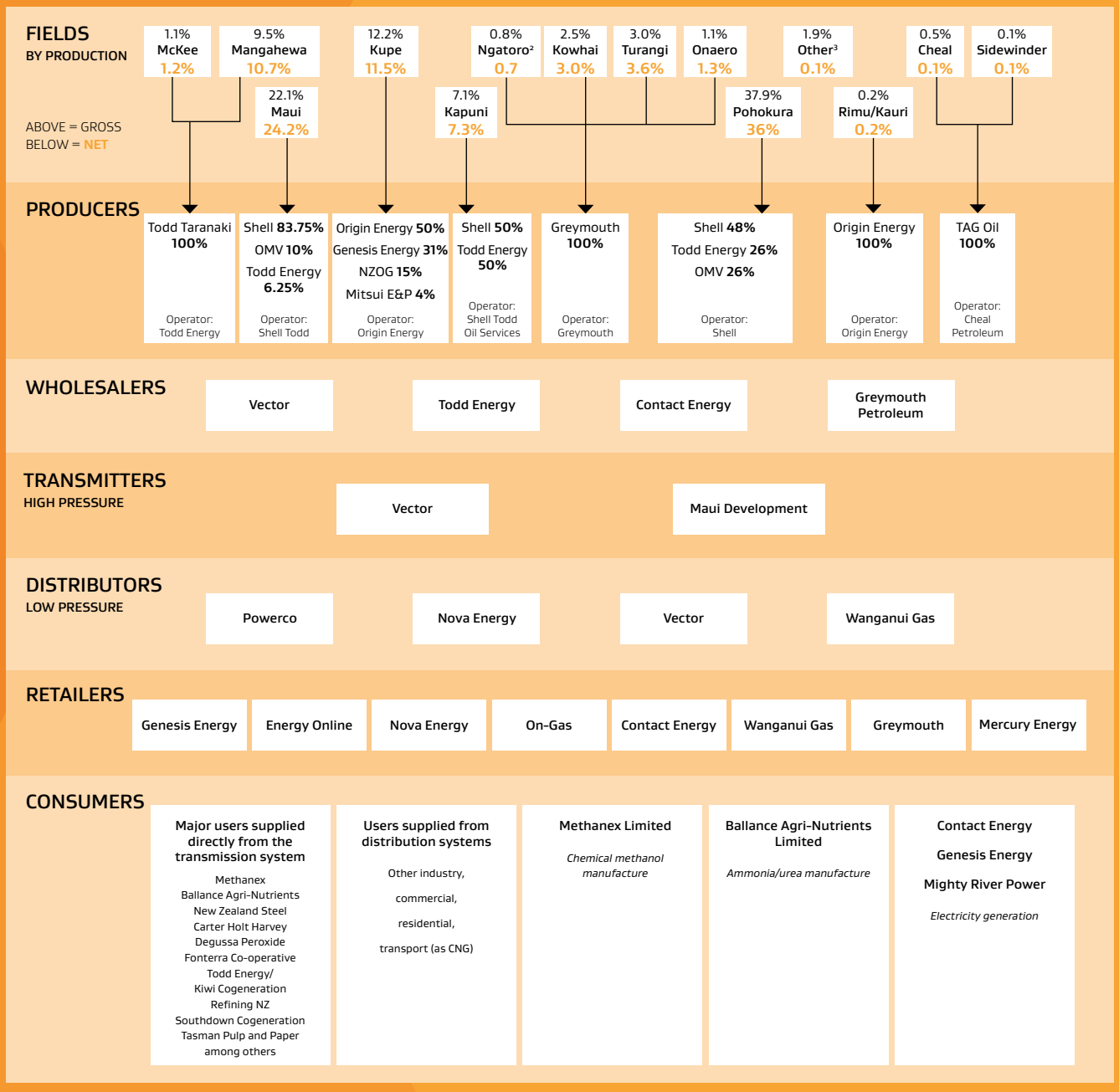


*Only taxes and levies paid at the pump are included; Road User Charges are not included. Most other OECD countries have all taxes and levies paid at the pump.

Oil and Gas

GAS

Figure D.14: Natural Gas Industry Summary for 2014[1]



Company names are listed without the suffi xes "Limited" and "New Zealand Limited" where applicable. AWE is Australian Worldwide Exploration Limited, Greymouth is Greymouth Petroleum Limited, Mitsui E&P is Mitsui E&P New Zealand Limited, NZOG is New Zealand Oil & Gas Limited, OMV is OMV New Zealand Limited, Contact Energy is Contact Energy Limited, Origin Energy is Origin Energy New Zealand Ltd and ContactEnergy (51% owned by Origin), Pan Pacific is Pan Pacific Petroleum, Shell is Shell NZ Limited (includes Shell Exploration NZ Limited, Shell (Petroleum Mining) Co Limited, Energy Petroleum Holdings Limited, Energy Petroleum Investments Ltd, Energy Petroleum Taranaki Ltd, Energy Finance New Zealand Limited and Taranaki Offshore Petroleum Company), TWN comprises the Tariki, Waihapa and Ngaere fields, Todd Energy is Todd Energy Limited and includes Nova Gas, Vector is Vector Limited and includes OnGas, Wanganui Gas is Wanganui Gas Company Limited. Nova Energy is Nova Energy Limited.

Notes:

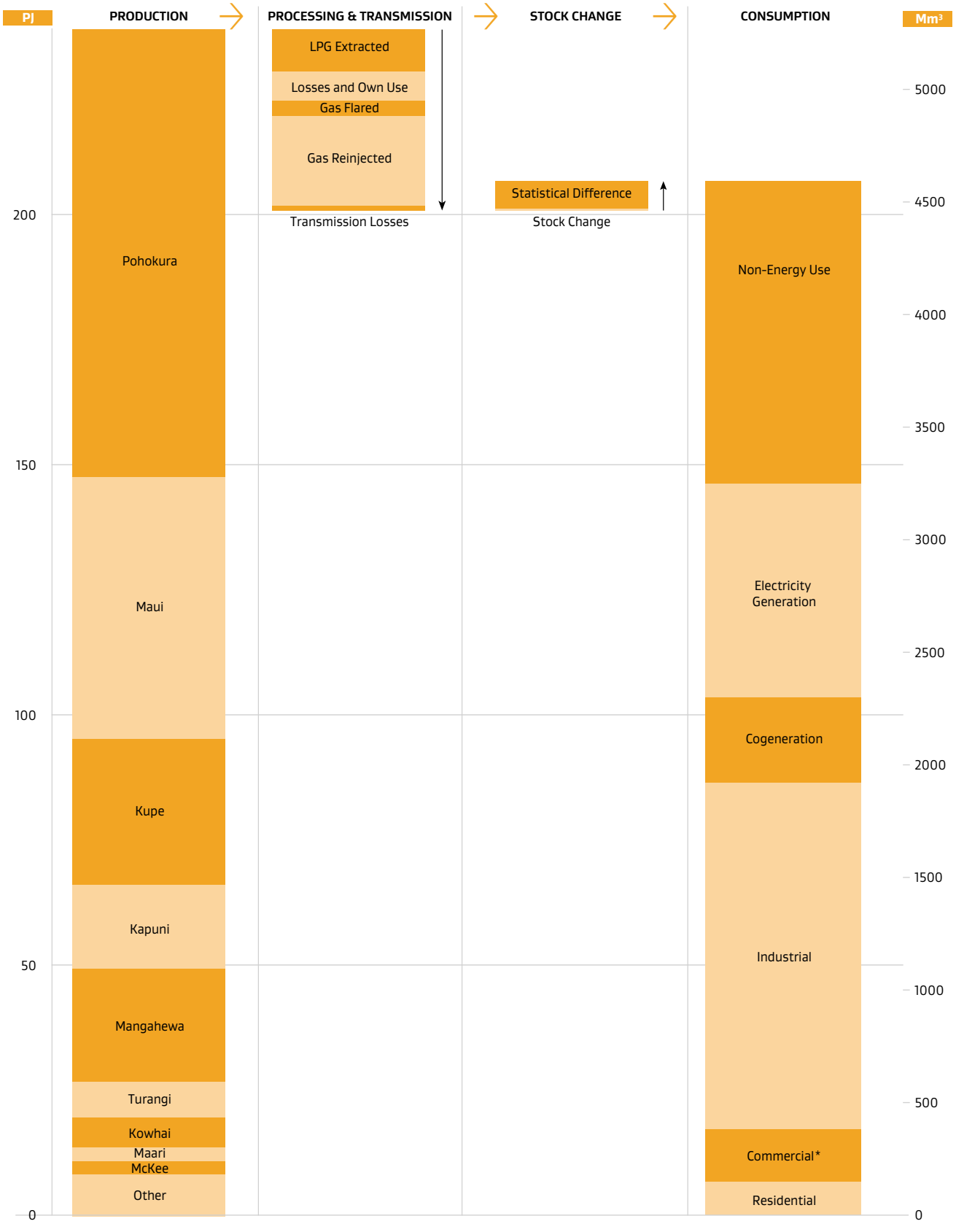
1 Gas ownership as at year end 2014; excludes LPG.

2 Includes Kaimiro, Windsor and Goldie wells.

3 Includes Maari, Tui, TWN, Copper Moki, Puka and Surrey fields. Maari is owned by OMV, Todd, Horizon, and Cue Taranaki and operated by OMV. Tui is owned by AWE, NZOG and Mitsui E & P and operated by AWE. TWN is owned by New Zealand Energy Corp and L & M Energy and operated by New Zealand Energy Corp. Copper Moki is owned by New Zealand Energy Corp. Surrey is owned and operated by Greymouth. Puka is owned by Kea Petroleum Holdings and MEO Australia and operated by Kea Petroleum Holdings.

Oil and Gas

Figure D.15: Natural Gas Flow Summary for 2014



* Includes transport, agriculture, forestry and fishing.

Oil and Gas

Overview

This section contains information about the production, transmission, distribution and sales (to end consumers) of natural gas.[11]

All statistics apply to the 2014 calendar year. Comparisons are made with the 2013 calendar year, unless otherwise specified. Percentage changes are calculated from energy units (PJ) rather than volume (Mm3, or million cubic metres), due to the different energy properties of gas from different fields.

Gas is produced entirely in the Taranaki region and reticulated gas is only available in the North Island. Figure D.14 summarises the New Zealand gas industry in 2014, showing current fields and their percentage of total gas produced. Consumption by major user/supplier categories is also shown in this figure.

Gas consumption for electricity generation falls

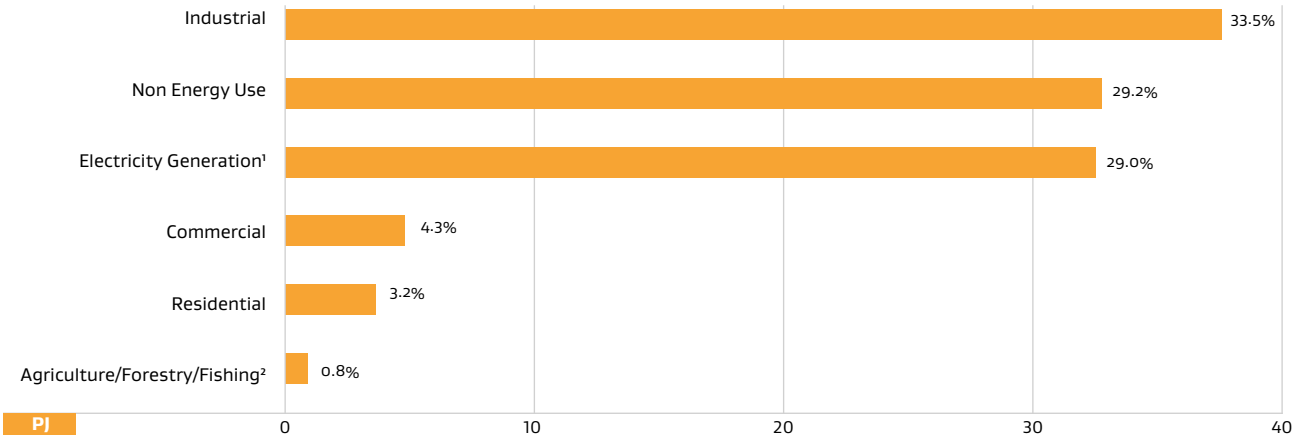
Total observed gas consumption (including for electricity generation, cogeneration and non-energy use) increased 13% in 2014 to 203 PJ. Gas used for electricity generation and cogeneration was down 17% to 59 PJ. Gas used for non-energy (feedstock) use was up 50% to 59 PJ. Gas for industrial energy use was up 26% to 68 PJ. For the first time since 1995, gas used for electricity generation and cogeneration did not account for the largest share of consumption, with industrial and non-energy use the largest and second-largest respectively.

The trend in recent years has seen non-energy use of gas (i.e. as a feedstock) rise and gas used for electricity generation and cogeneration fall. In 2011, the share for electricity generation was about triple that of non-energy use, while in 2013 it was less than double, and in 2014 they were about the same.

Much of the feedstock use is for methanol production by Methanex, which as a gas consumer is also represented in Industrial (gas-for-energy) use. Methanex in New Zealand was the single largest consumer of domestic gas in 2014. In 2013, Methanex upgraded the Motunui-1 train and restarted the Waitara Valley train. With its second train at Motunui, Methanex

11. LPG statistics are not presented here but are presented in the oil section.

Figure D.16: Natural Gas Consumption by Sector for 2014



1 Includes cogeneration
2 Includes Transport

Figure D.17: Non-Energy Use Gas Consumption

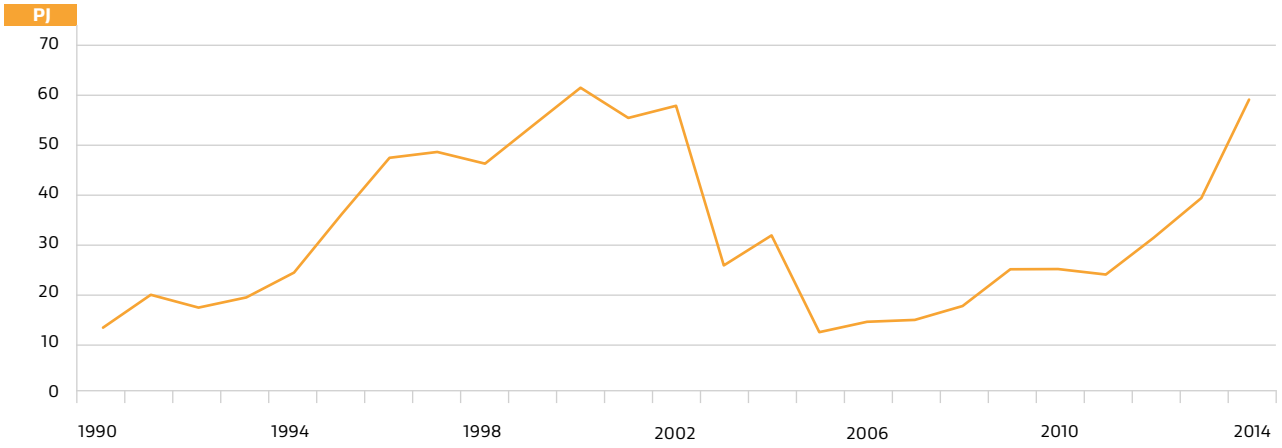
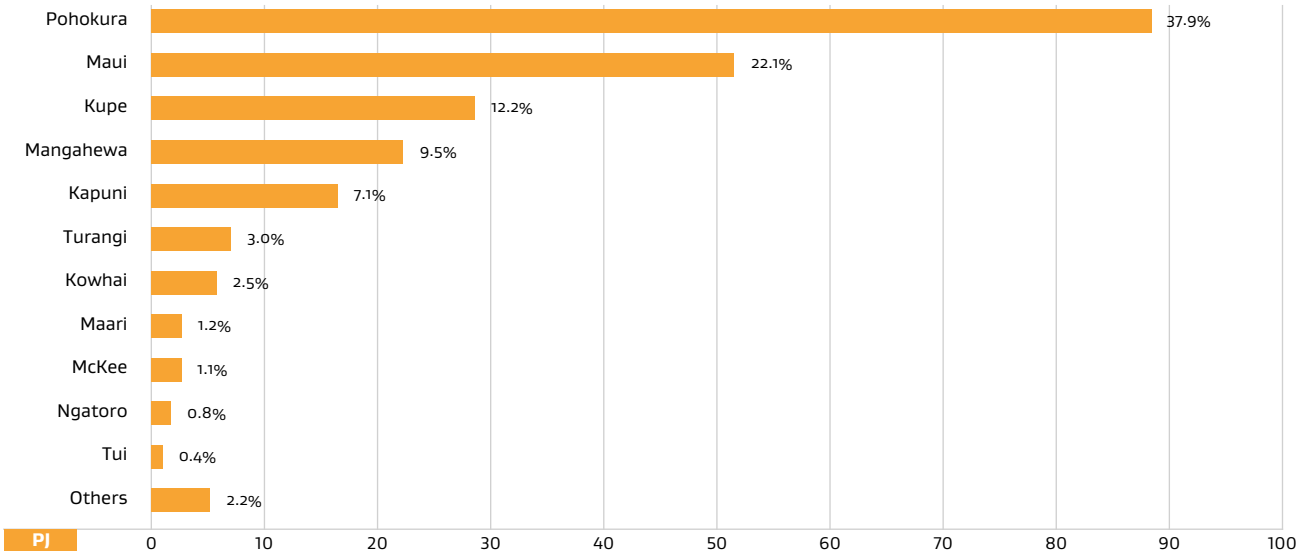


Figure D.18: Total Natural Gas Production by Field for 2014



operated all its three plants in New Zealand during 2014, producing 2,196 kilotonnes of methanol (meaning it produced at just over 90% capacity), up 55% from 1,419 kt in 2013 when it did not have all three plants running until October.[12]

The Motunui-1 train was shut in December 2004 due to gas supply constraints in New Zealand. Domestic gas supply had fallen 24% from 2002 (230 PJ) to 2003 (174 PJ). Production from Maui had fallen 32% over this time, from 175 PJ to 119 PJ. Pohokura, the largest gas-producing field in New Zealand from 2007 onwards has reduced domestic supply constraints. It began production in the latter half of 2006 with 14 PJ, and has annually produced around 70 PJ from then on.

In January 2012, it was announced that Methanex had a 10-year sales agreement with Todd Energy, which owns and operates the Mangahewa and McKee fields. As a result of the agreement, Todd Energy is undertaking an 800 million dollar expansion project over five years to increase its production and processing supply at its Mangahewa and McKee fields.

Gas used as a feedstock in the petrochemicals sector represented 29% (59 PJ) of New Zealand's natural gas consumption in 2014 (up from 23% or 40 PJ).

Ballance Agri-Nutrients (Kapuni) Limited manufactures ammonia/urea from natural gas. Gas consumption as a feedstock for ammonia/urea production was up on 2013.

The industrial sector accounted for 33% (68 PJ) of total gas consumption, up from 28% (53 PJ). This was mainly due to an increase in gas for energy consumption at the Methanex facilities. Methanex consumes some gas for energy in its facilities (categorised under Industrial consumption) and also transforms feedstock gas into methanol, which has a variety of uses such as for blending into transport fuels, adhesives or production of chemicals. If operating at full capacity, Methanex would consume about 90 PJ per year of New Zealand's natural gas for energy and feedstock use, which is around half of total consumption.[13]

The amount of gas used for electricity generation in 2014 dropped significantly from 2013. In 2014, gas consumption for electricity generation fell by 12 PJ to (42 PJ). Over the same period cogeneration remained steady at 17 PJ. The electricity section of this ENZ shows that electricity generated from renewable sources rose from 75% to almost 80% in 2014.

Genesis Energy Limited (Huntly – including the unit 5 combined cycle plant) and Contact Energy Limited (Otahuhu B, Taranaki Combined Cycle, Te Rapa and Stratford) are the main electricity generators in New Zealand using natural gas.

Around 4% of gas consumption came from the commercial sector in 2014, which had about 14,000 consumers. The residential sector, with about 249,000 consumers in 2014, accounted for around 3% of total gas consumption. Industrial consumers numbered around 1,800 and consumed 29% of natural gas.

Production Up

Gross production was up 12% to 233 PJ, while the calculated supply to consumers went up 9% to 198 PJ.

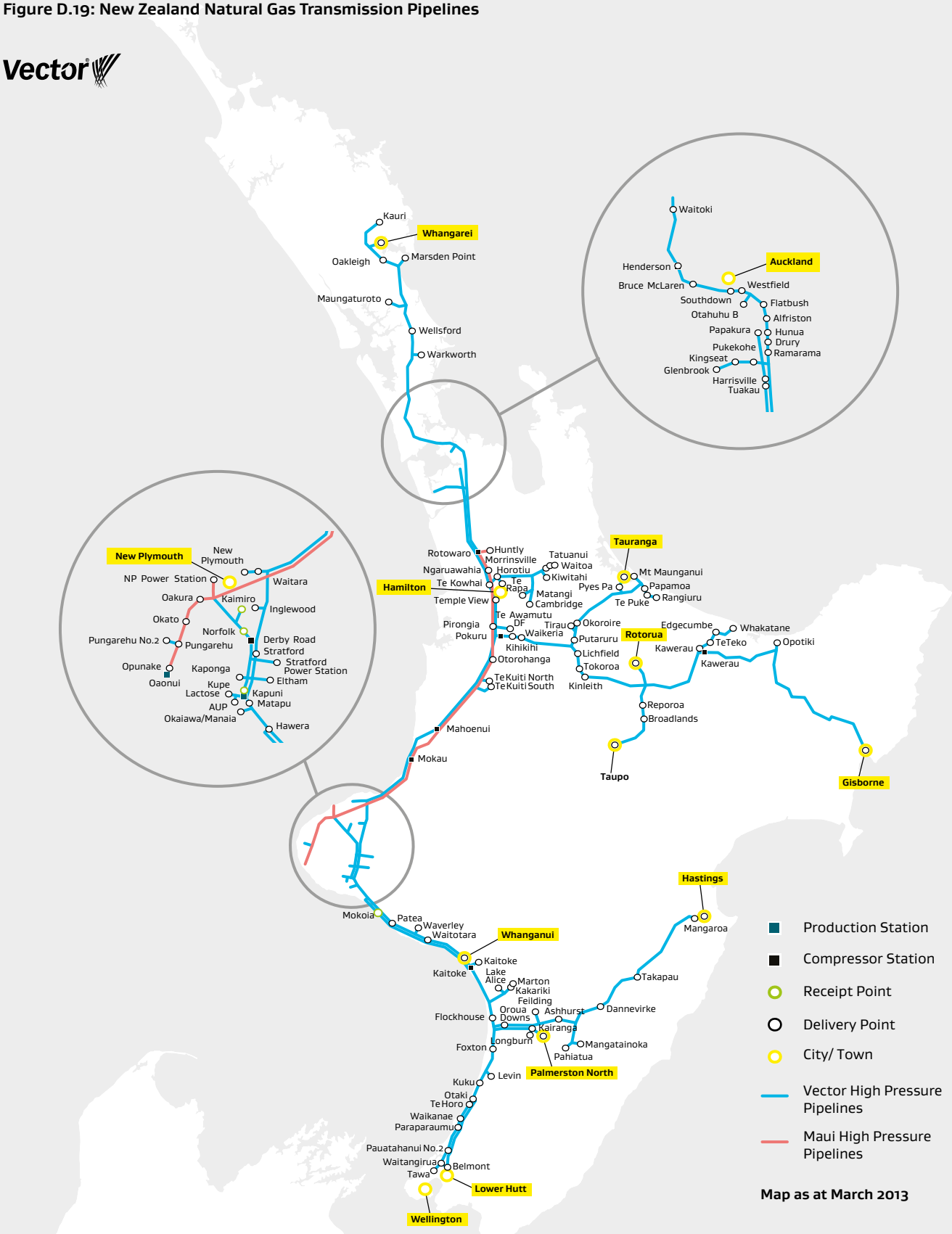
The largest contributors to the increase in gas supply were the Maui and Mangahewa fields. Maui increased 23% to 48 PJ and Mangahewa increased 39% to 21 PJ. Mangahewa is operated by Todd Energy and is a major supplier to Methanex's three methanol production trains. This is the highest annual production at Mangahewa on record and follows on from a major expansion project at the Todd Energy-owned Mangahewa and McKee fields. In May 2014, Todd Energy officially opened a new expansion train which will (nominally) increase annual natural gas processing capacity from 20 PJ to 45 PJ.

Total production continues to be dominated by Pohokura and Maui, responsible for over half of domestic gas production, as shown in Figure D18.

12. See 2014 annual report, available at: www.methanex.com/sites/default/files/investor/annual-reports/Methanex-Annual-Report-2014.pdf
13. See Methanex presentation overview available at www.petroleumsummit.co.nz/page/programme-2014

Oil and Gas

Figure D.19: New Zealand Natural Gas Transmission Pipelines



Total net gas production grew 9% to 198 PJ. This is the highest net gas production since 2002 (230 PJ), when the Maui field itself had a net production of 175 PJ, which subsequently fell below 100 PJ in 2005.

Total gross gas production grew 12% to 233 PJ. One reason why gross gas production grew more (in absolute terms) than net production is that reinjection grew from 11 PJ to 17 PJ. Pohokura is the main field reinjecting, which is done to maintain pressure underground which aids with the extraction of liquids. Gross gas production at Pohokura rose 7% to 88 PJ while its net production fell 3% to 71 PJ.

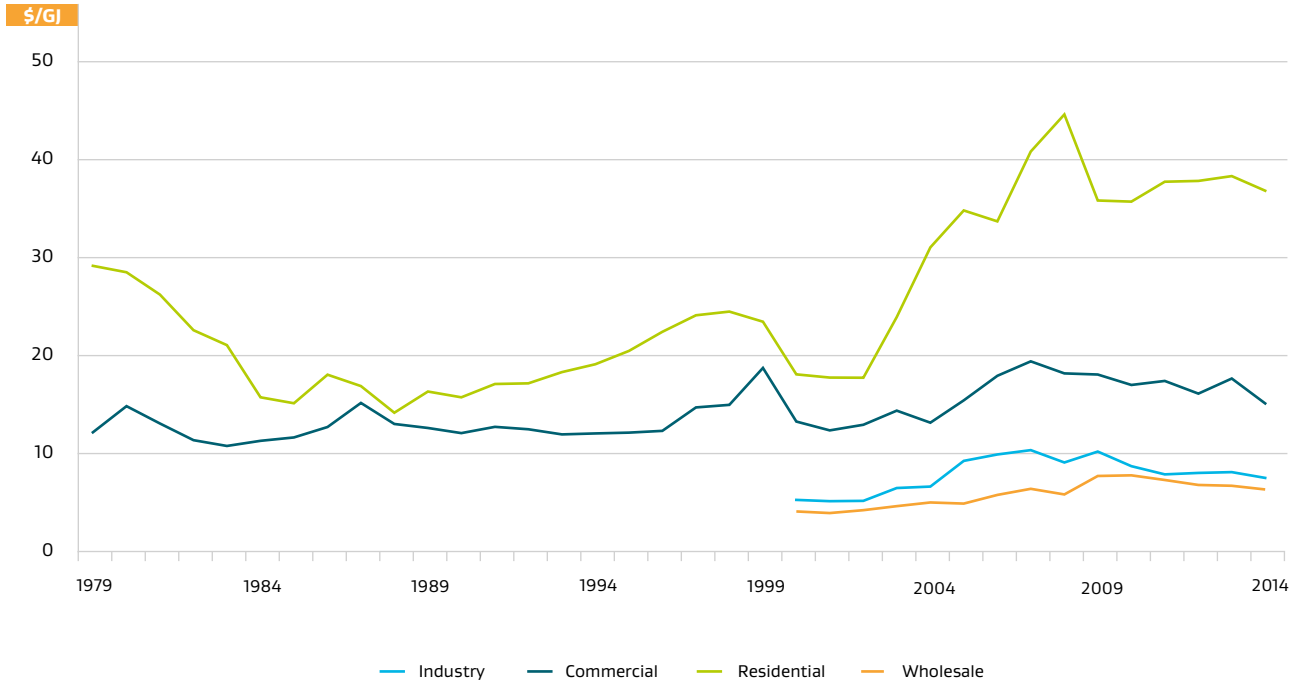
Natural Gas Prices

Natural gas prices are calculated by dividing income data by consumption data for each of the commercial, industrial and residential sectors. These data are collected quarterly from gas retailers. Gas sold for electricity generation has been excluded from the industrial sector, as the actual price paid by the generators is reflected in the wholesale price. Quarterly residential gas prices are calculated as a rolling average over the last year to smooth out seasonal variations as a result of fixed charges.

Overall, annual natural gas consumption grew in 2014 while prices (in real 2014 terms) fell for all sectors.

International comparisons of natural gas prices are currently unavailable. The Ministry has finished reviewing the quality of gas sales data. The data has not been published by the IEA as at time of publication.

Figure D.20: Natural Gas Prices (Real 2014 Prices)



E. RENEWABLES

INTRODUCTION

Renewable energy sources discussed in this section include hydro, wind, geothermal, solar, woody biomass, biogas and liquid biofuels. Information on renewable energy is presented for the 2014 calendar year.

Detailed information is available on the renewable energy sources utilised by large electricity generators. However, information on the direct use of renewable energy and use for distributed generation is more difficult to obtain, given that the input energy source (e.g. geothermal or the sun) is often used without being purchased and hence it is not well recorded. Where actual information on the direct use of renewable energy is not available, estimates have been made based on research and the knowledge of experts in this field.

Renewables

Figure E.1: Renewable Energy Flow Summary for 2014

* Bioenergy in this instance refers to biogas, woody biomass and liquid biofuel.
† A very small amount of liquid biofuel is produced in New Zealand and sent to the transformation sector under oil production. This is included in bioenergy but is too small to distinguish on this figure.

OVERVIEW OF RENEWABLES IN NEW ZEALAND

Supply

The proportion of New Zealand's primary energy supply that came from renewable resources was 39.5% (358 PJ) in 2014. This is the highest proportion from renewable energy since records began. New Zealand had the third highest renewable primary energy supply in the OECD after Norway and Iceland in 2014, according to data from the IEA. This is due to the high levels of hydro and geothermal energy used for electricity generation. Figure E.2 gives a breakdown of renewable primary energy supply for 2014. Bioenergy includes energy from woody biomass and biogas.

The contribution of renewable sources to primary energy supply in 2014 increased from 38.4% in 2013, as shown in Figure E.3, with an additional 28.9 PJ of renewable energy supplied. This was mainly due to increased geothermal generation, with new plants increasing the geothermal contribution to 56% of total renewable primary energy (Figure E.2).

Electricity Generation

Most of New Zealand's renewable energy is used for electricity generation. In 2014, a total of 79.9% of electricity generation came from renewable resources, increasing from 75.1% in 2013. New Zealand's renewable percentage in 2014 was the fourth highest in the OECD. Figure E.4 shows how the percentage of electricity generation from renewables has changed over time.

Direct Use of Renewable Energy

In 2014, an estimated 65.6 PJ of renewable energy was used for direct-use heat applications around New Zealand. This is mostly in the form of woody biomass and geothermal for heating in commercial and industrial applications.

Geothermal energy is used directly as a heat source in small quantities in the central North Island in the timber and tourism industries. It is also used in small quantities for domestic heating.

Direct use of woody biomass occurs mainly in the timber industry, which burns residue wood to provide process heat. Wood is also burned to heat many private homes in New Zealand, with the 2013 Census reporting that over 36% of New Zealand households use wood to heat their homes.

Liquid Biofuels

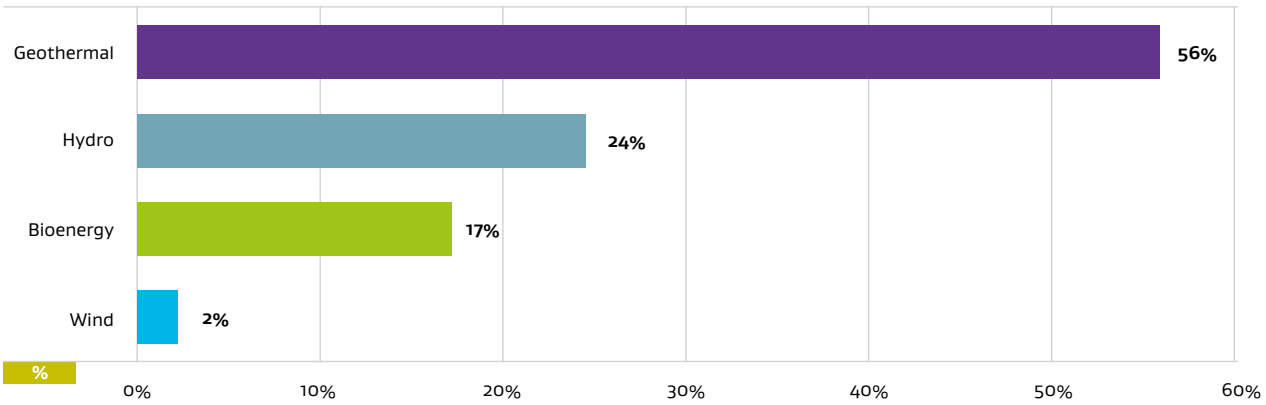
Estimated production of liquid biofuels was 4.2 million litres in 2014, a 21% decrease from 2013. Biodiesel production rebounded slightly from its record low in 2013, though remained well below the levels reached whilst the Bio-diesel grant scheme was in place. Bio-ethanol production continues to be the major biofuel produced, with 3.2 million litres or 78% of New Zealand's liquid biofuel production. The total consumption of biofuels was 5.7 million litres, with imports of 1.5 million litres, in 2014.[1]

In New Zealand, bio-ethanol is produced and imported from sustainable sources. Bio-ethanol is produced by fermenting whey, a cheese by-product, with some of the resulting ethanol purchased by fuel companies. This, along with imported ethanol, produced from sustainable sugarcane, is blended with regular petrol. A typical blend is 10% ethanol, which results in a 5-6.5% reduction in greenhouse gas emissions per litre compared with those from regular petrol.[2]

Solar Use

The use of solar photovoltaic (PV) panels to generate electricity is a small but growing proportion of total renewable primary energy. Installed capacity as of December 2014 was 18.8 MW. The total generation from small solar PV panels in 2014 was estimated at 16 GWh (58 TJ), more than double the 2013 figure.[3] This was calculated using total numbers of solar connections, and does not include unregistered solar or off the grid generation.[4] Total solar generation, including both PV and thermal, remains a small proportion of renewable energy at 0.1%.

Figure E.2: Renewable Primary Energy for 2014*

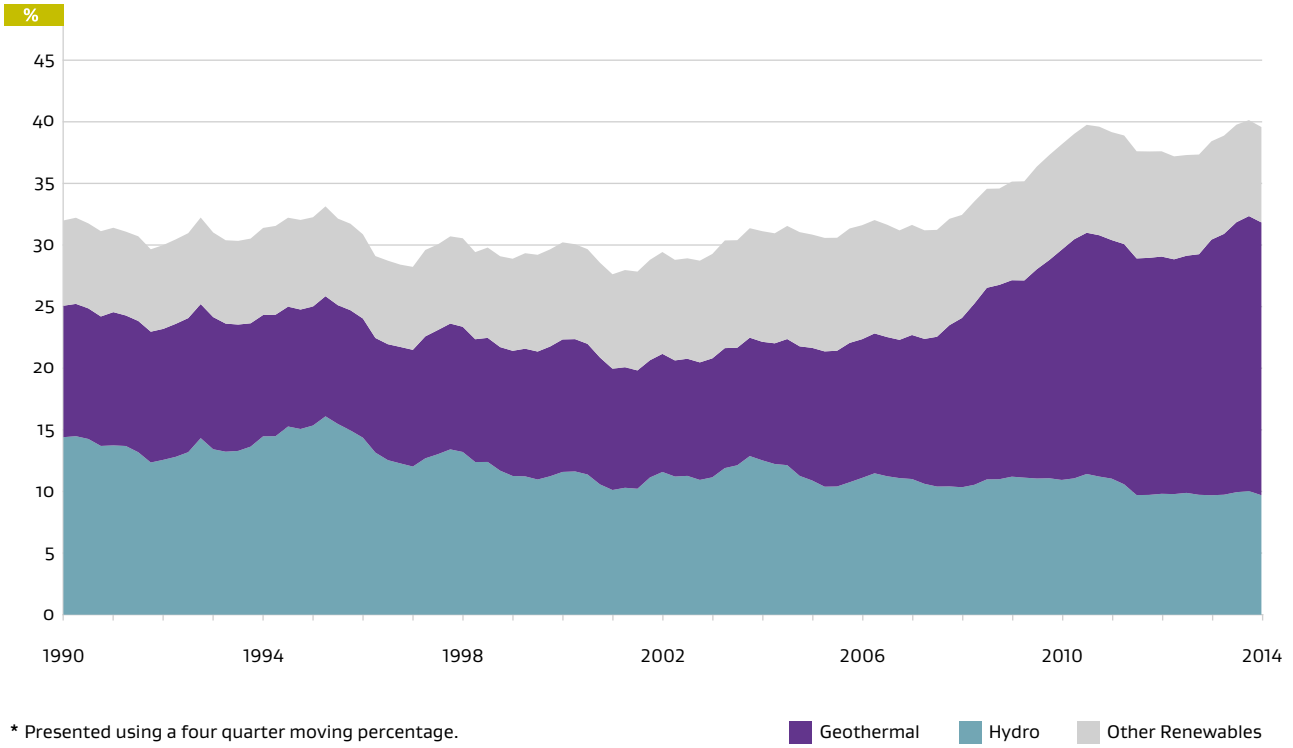


*Energy from liquid biofuels and solar is less than 0.2%.

1. Liquid biofuels are included under oil in the balance tables.
2. Energy Efficiency and Conservation Authority (EECA) biofuels information.
3. Electricity Authority data.
4. Solar generation is estimated using total installed capacity data (including both <10kW and >10kW systems) from the EA, and a capacity factor of 14%.

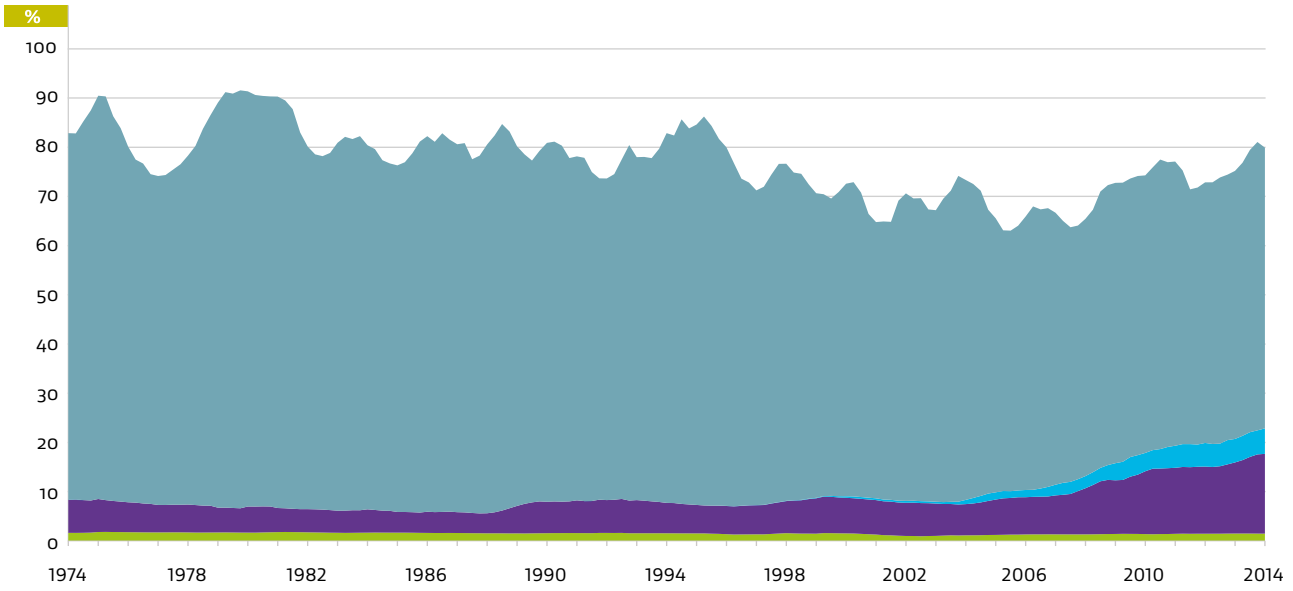
Renewables

Figure E.3: Renewable Percentage of New Zealand Total Primary Energy Supply by Fuel Type*



* Presented using a four quarter moving percentage.

Figure E.4: Percentage of New Zealand Electricity Generation from Renewable Sources*



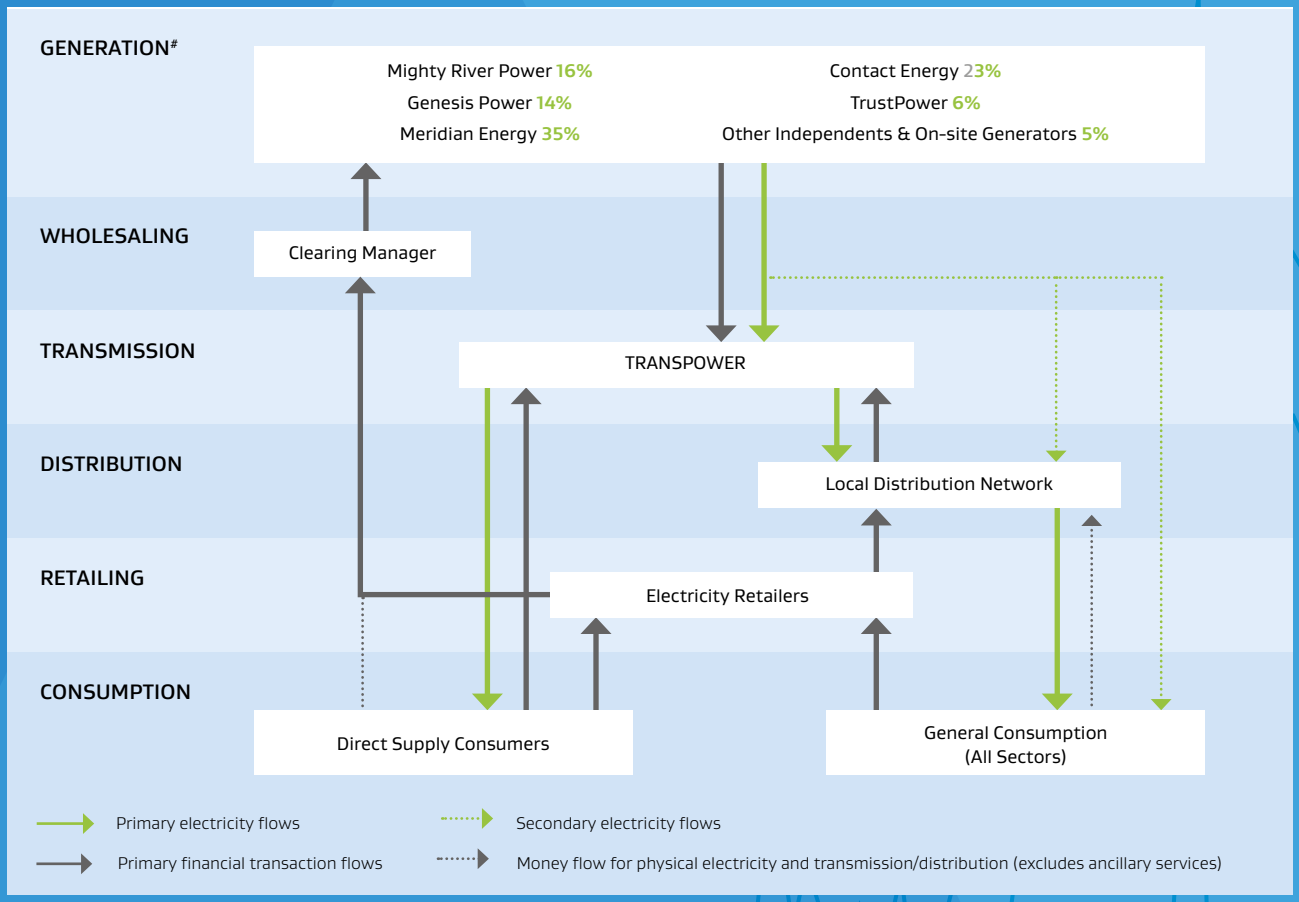
* Presented using a four quarter moving percentage.

F. ELECTRICITY

INTRODUCTION

This section contains information about electricity generation/ supply, transmission and distribution, and demand. Annual figures are for the calendar year, with the exception of electricity costs, which are presented on a March year basis.

Figure F.1: Electricity Industry Summary for 2014*



* Company names are listed without the suffixes "Limited" and "New Zealand Limited" where applicable.

"Primary" refers to the most common or typical way that electricity or money flows through the Electricity Industry

"Secondary" refers to flows of money or electricity which do occur, but are not typical of most participants in the industry.

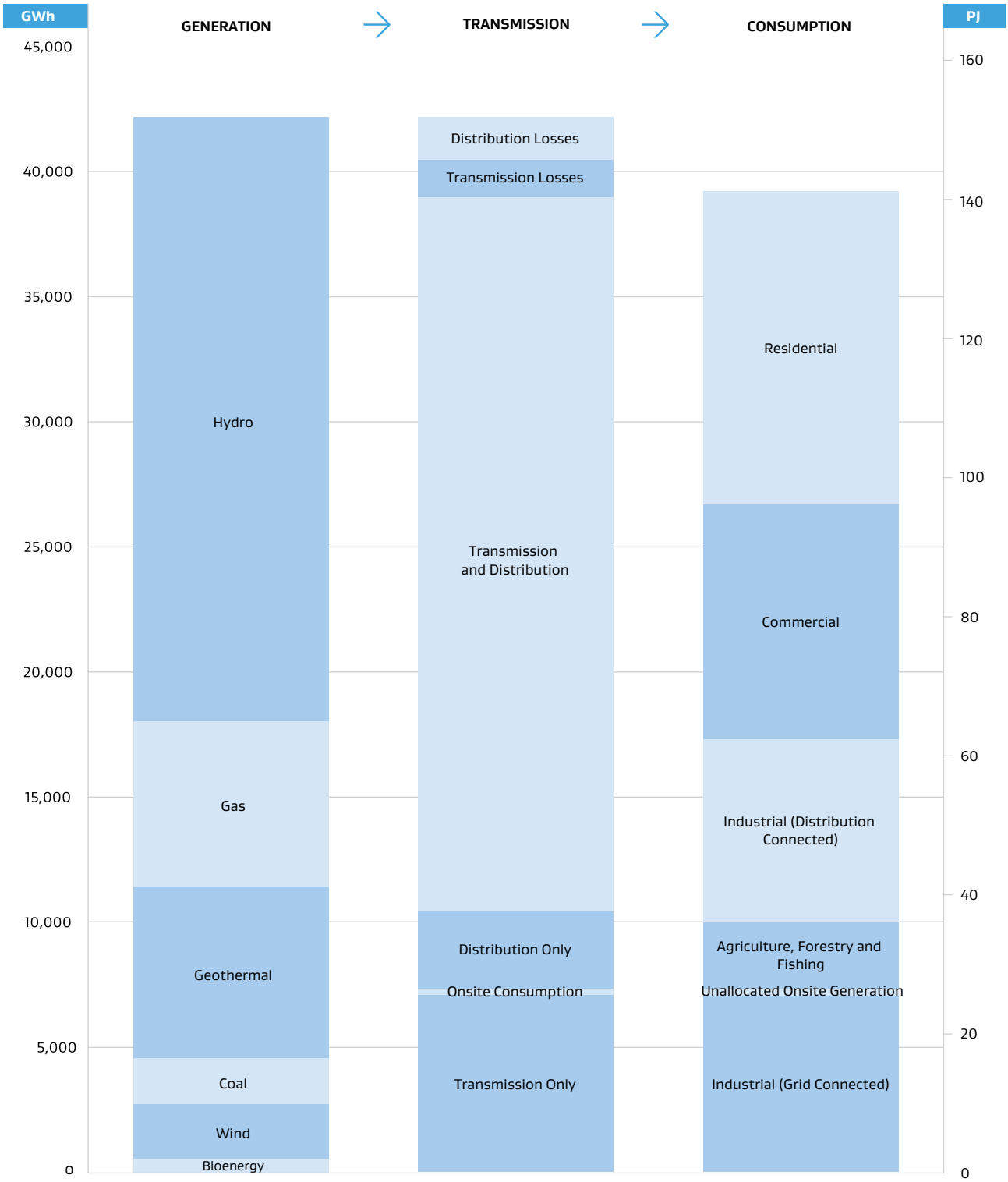
As an example, all customers in the "The Lines Company" distribution network area pay distribution charges directly to the local distribution network as shown by the black dotted line between the 'General Consumption' box and 'Local Distribution Network' box. This is not typical nationwide as most consumers pay their lines charges through their retailer as shown by the dense black line between 'General Consumption' and 'Electricity Retailers' which partly continues onto the 'Local Distribution Network'.

The thickness of the lines in Figure 1 in no way indicates the physical amount of money or electricity which passes through or is used by a particular participant or group of participants.

Both the Commerce Commission and Electricity Authority have key roles in the electricity market. The Commerce Commission has regulatory oversight of distribution and transmission pricing while the Electricity Authority has regulatory oversight of the retail and wholesale markets, and transmission contracts. The Electricity Authority also has contracts with service providers for market operation services such as that of the Clearing Manager.

Embedded (distributed) generators can choose to sell their electricity directly to retailers trading on the same grid exit point.

Figure 2: Electricity Flow Diagram for the 2014 year



Electricity

Generation

In 2014, net electricity generation (gross generation minus parasitic load) was 42,231 GWh (152 PJ). Net generation increased 0.9% from the previous year.

The share of electricity generated from renewable energy sources increased from 75.1% in 2013 to 79.9% in 2014. This is the highest annual share of electricity generation from renewables since 1996. Higher hydro and geothermal generation reduced the need for electricity generation from coal and gas.

Figure F.3 is a time series of generation by fuel type and shows continued growth in geothermal generation. Geothermal generation increased from 6,053 GWh in 2013 to 6,847 GWh, and in doing so, surpassed annual gas generation for the first time since 1975. The 2014 calendar year has seen a further increase in geothermal capacity with the Te Mihi power station adding 114 MW of generating capacity.[1] The increase in geothermal baseload generation reduces the extent to which fossil fuels are required.

Other renewable sources for electricity generation include bioenergy, solar energy and marine energy. Of these, bioenergy is the largest contributor to electricity generation in New Zealand. Bioenergy is predominantly from woody biomass consumed at a number of cogeneration plants located at wood processing factories and also from biogas produced from digesting waste at wastewater treatment plants and landfills.

Figure F.4 compares the electricity generation breakdown by fuel type for the 2013 and 2014 years.

Consistent hydro inflows for the year resulted in an increase in electricity generation from hydro compared with 2013. Along with an increase in geothermal capacity, this resulted in a noticeable decrease in generation from natural gas.

The five major generating companies provided 90.4% of New Zealand's electricity generation in the 2014 year. These companies are Meridian Energy (33.7%), Contact Energy (22.5%), Genesis Energy (13.2%), Mighty River Power (15.6%) and Trustpower (5.5%).

1. Source: Energy News (www.energynews.co.nz)

Figure F.3: Annual Electricity Generation by Fuel Type

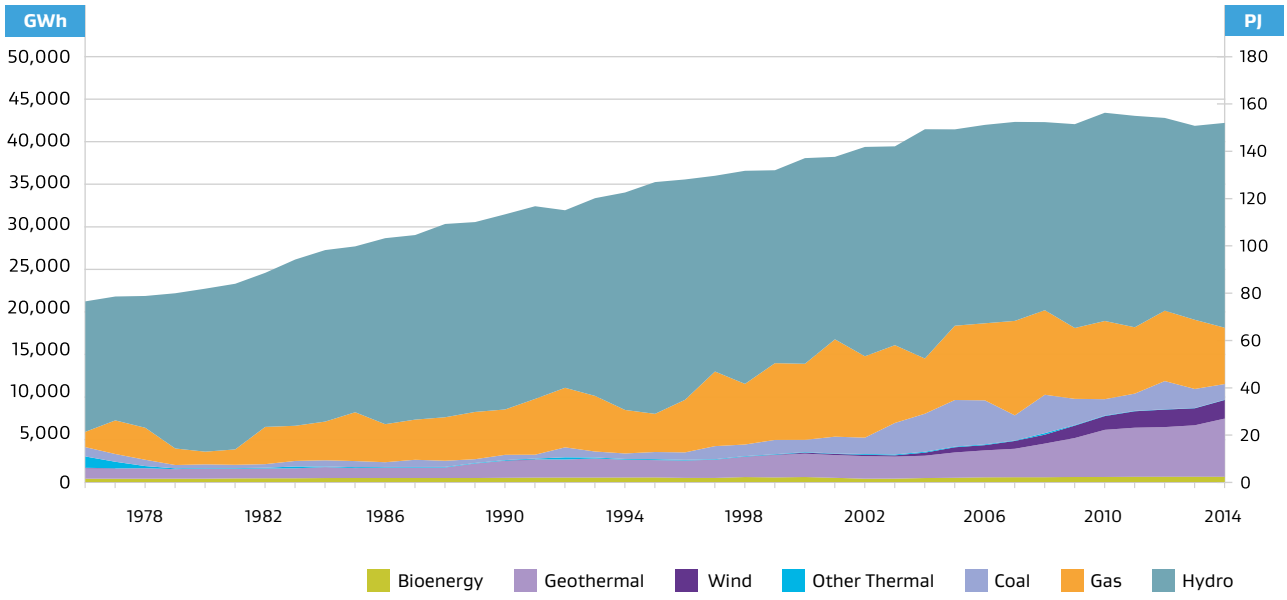
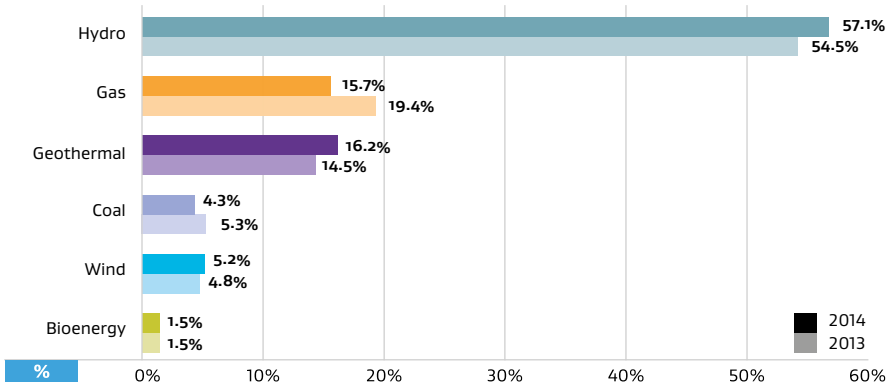


Figure F.4: Electricity Generation by Fuel Type, 2013 and 2014 Years



Electricity

Consumption

The Ministry has improved its method for calculating annual electricity consumption. Previously, weightings were calculated using grid export demand data from the Electricity Authority and applied to March year consumption data collected by the Ministry to calculate both quarterly and calendar year figures. Following a review of the collection of electricity retail sales data, these data are now directly collected on a quarterly basis. This means that actual calendar year data is available for 2014 onwards. The Ministry is reviewing the impact of this change in methodology to the continuity of the consumption time series, but this is only possible with more data points. For consistency in discussing trends over time, Figure F.5 refers to data using the historical methodology.

Figures F.2 and F.6 are based on data collected under the new method.

Electricity consumption increased for the first time since 2010, rising by 1.2% from 38,729 GWh in 2013 to 39,210 GWh in 2014. The main driver of the increase in 2014 was consumption in the agricultural, forestry and fishing sector rising 14.5% as dry soil conditions, especially in the South Island, increased demand for irrigation.

Residential consumption grew 0.4% to 12,374 GWh. Figure F.5 shows annual electricity consumption by sector since 1975, with residential consumption accounting for around a third of total consumption in 2014.

Consumption by the industrial sector grew 0.3% in 2014 to 14,410 GWh. The mining sector saw the largest decrease in demand, with decreased coal production resulting in a 3.6% fall. Demand by the wood, pulp, paper and printing sector continued to fall in 2014 to its lowest level in 25 years. However these reductions were not sufficient to lower total industrial demand. Electricity demand from the food processing sector increased 5.6%, driven mainly by the meat processing subsector.

Figure F.6 shows electricity consumption by sector for 2014. The industrial sector makes up the largest share of total consumption (37.0%), followed closely by the residential (32.1%), and commercial (24.1%) sectors.

Demand by region is shown in Figure F.7. The Central and South Auckland region has the highest share of national demand due its large population. The New Zealand Aluminium Smelter at Tiwai Point is excluded from the Otago/Southland region and is shown separately.

Figure F.5: Electricity Consumption by Sector*

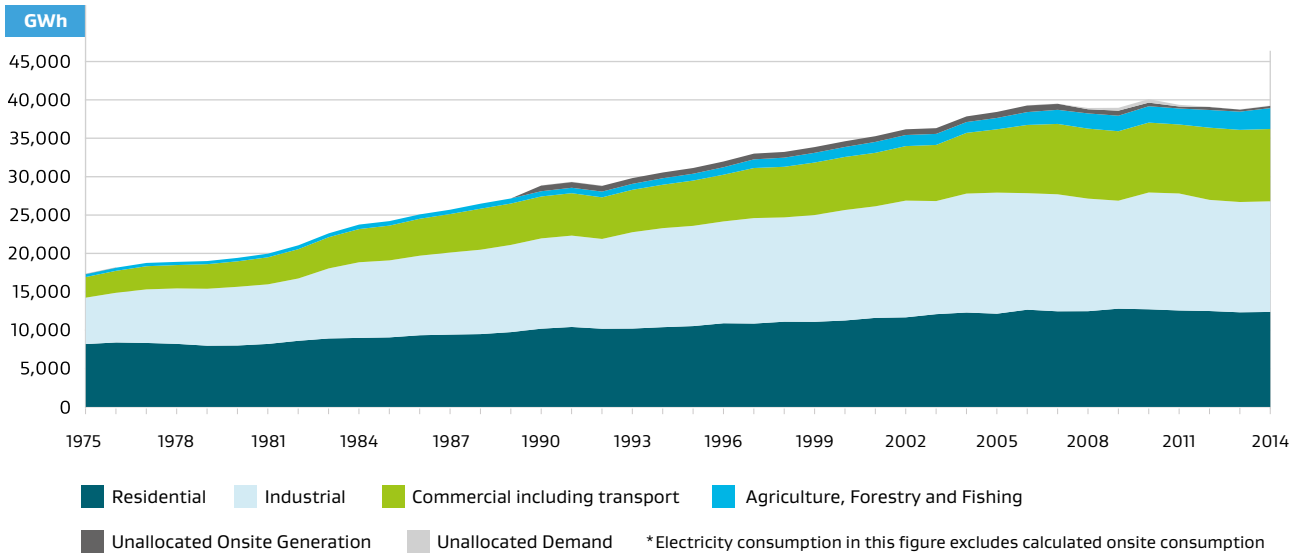
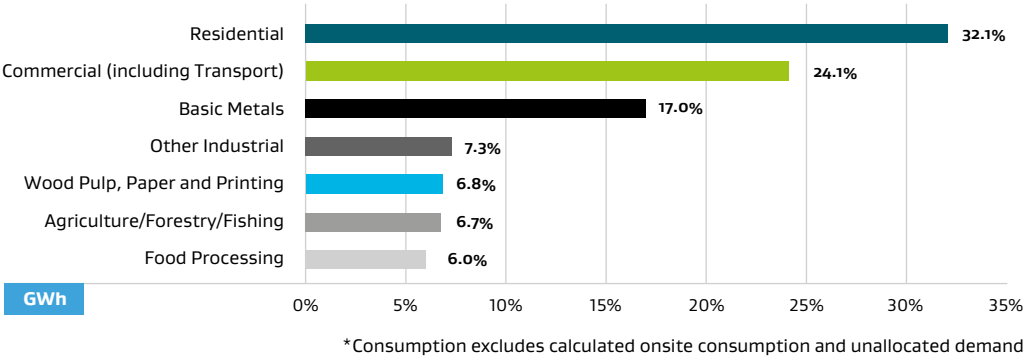


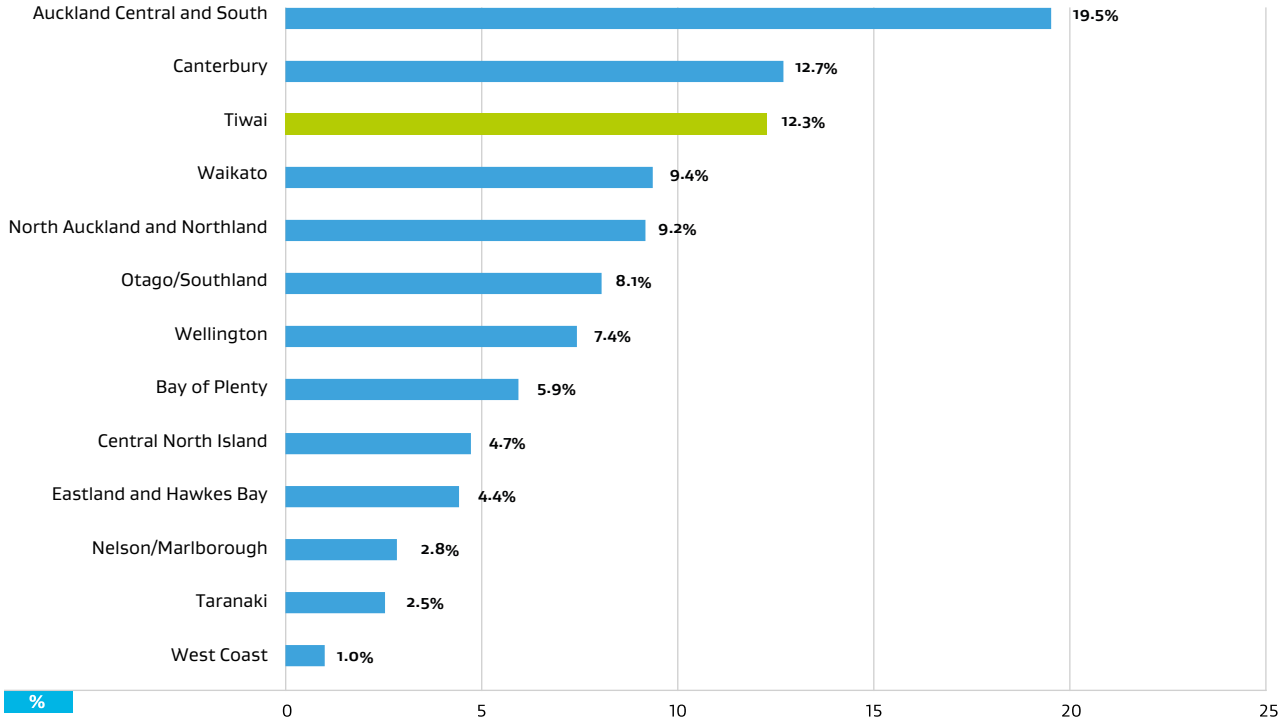
Figure F.6: Electricity Consumption by Sector for the 2014 Year*



*Consumption excludes calculated onsite consumption and unallocated demand

Electricity

Figure F.7: Approximate Share of National Demand by Region for the 2014 Year*



*Source: Electricity Authority, http://www.emi.ea.govt.nz/

Retail Electricity market

Figure F.8 shows the market share of retailers (parent companies) based on monthly numbers of customers since the end of 2003.

A number of new retailers have entered the market in the past few years. In 2014 alone, 6 new retailers were established, twice the number of new entrants in 2012 and 2013.[1]

Comparing December 2014 with the same month five years previously, December 2009, combined market share of the five largest companies decreased from 97.2% to 92.5%. Across the last year, Genesis Energy had the largest fall in customer connections, losing around 15,000 over the period. Mighty River Power rebounded slightly from the previous year, gaining around 2,700 connections. Smaller companies, Todd Energy and Pulse, increased their market share over the same period.

Figure F.9 shows switches in a year as a percentage of total consumers (all types) on a rolling annual basis. Retail switching as a percentage of total customer numbers decreased in 2014, from 19.8% in December 2013 to 19.0% in December 2014. Over the year, switching decreased in the North Island and marginally increased in the South Island. Switching in the South Island has not yet fully recovered from a large decrease in 2012, when switching in Christchurch slowed. Though switches decreased across the 2014 year, much of the year showed switching levels higher than during 2013.

Transmission & Distribution

Transpower operates the national transmission grid, which conveys electricity from most of the major power stations around the country to local distribution lines. It also conveys electricity directly to major users such as the New Zealand Aluminium Smelter.

There are 29 local distribution network companies in New Zealand, with a variety of ownership models from publicly listed companies to local community-owned trusts. Lines companies convey electricity to users within their network areas.

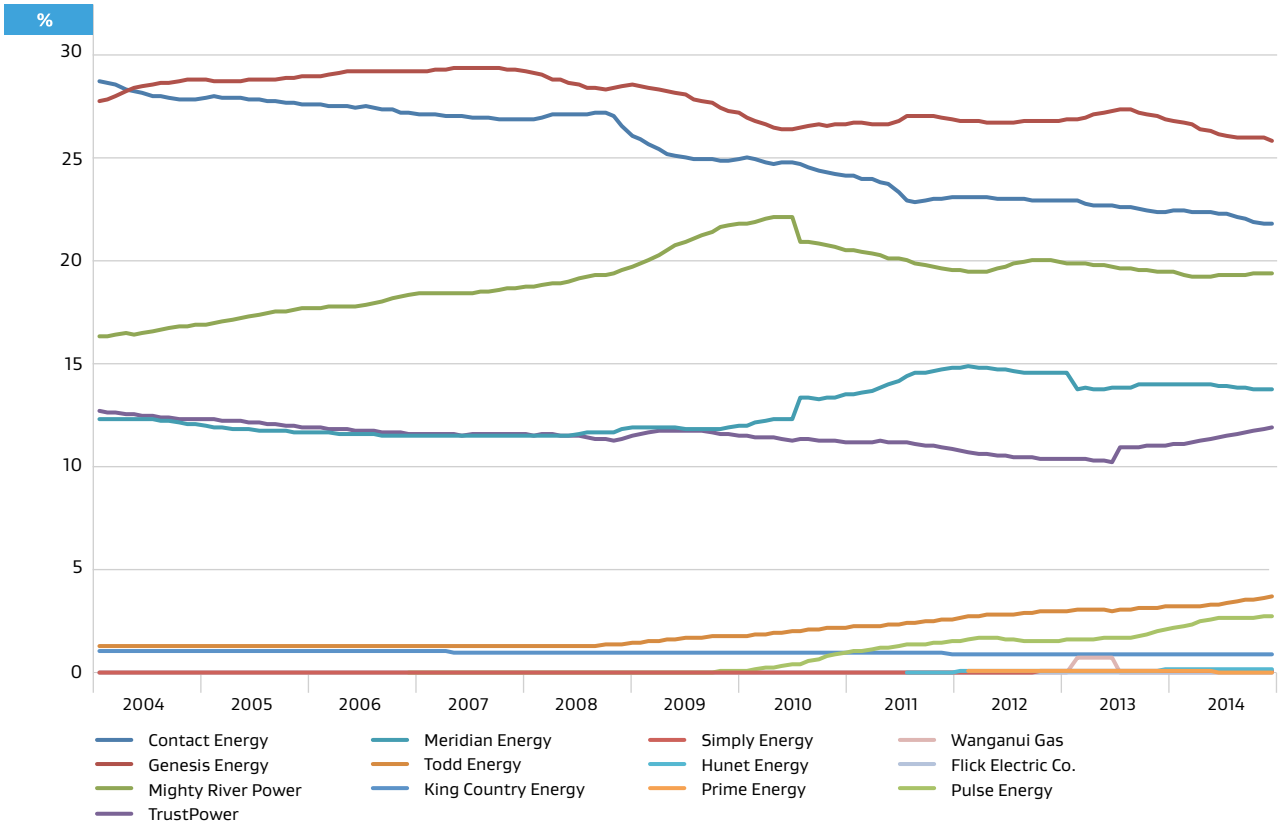
Electricity Costs

Sales-based data are used to calculate average residential, commercial and industrial electricity costs. This data is collected from electricity retailers and calculated by dividing total net income from electricity sales by total volume of electricity sold for each sector.[2] This is referred to as the cost per unit as it is what was actually paid relative to the quantity of electricity consumed. Residential electricity costs include GST while commercial and industrial electricity costs exclude GST. Figure F.10 presents electricity costs on a March year basis, with real costs expressed in March 2015 terms.

1. Source: Energy News (www.energynews.co.nz)

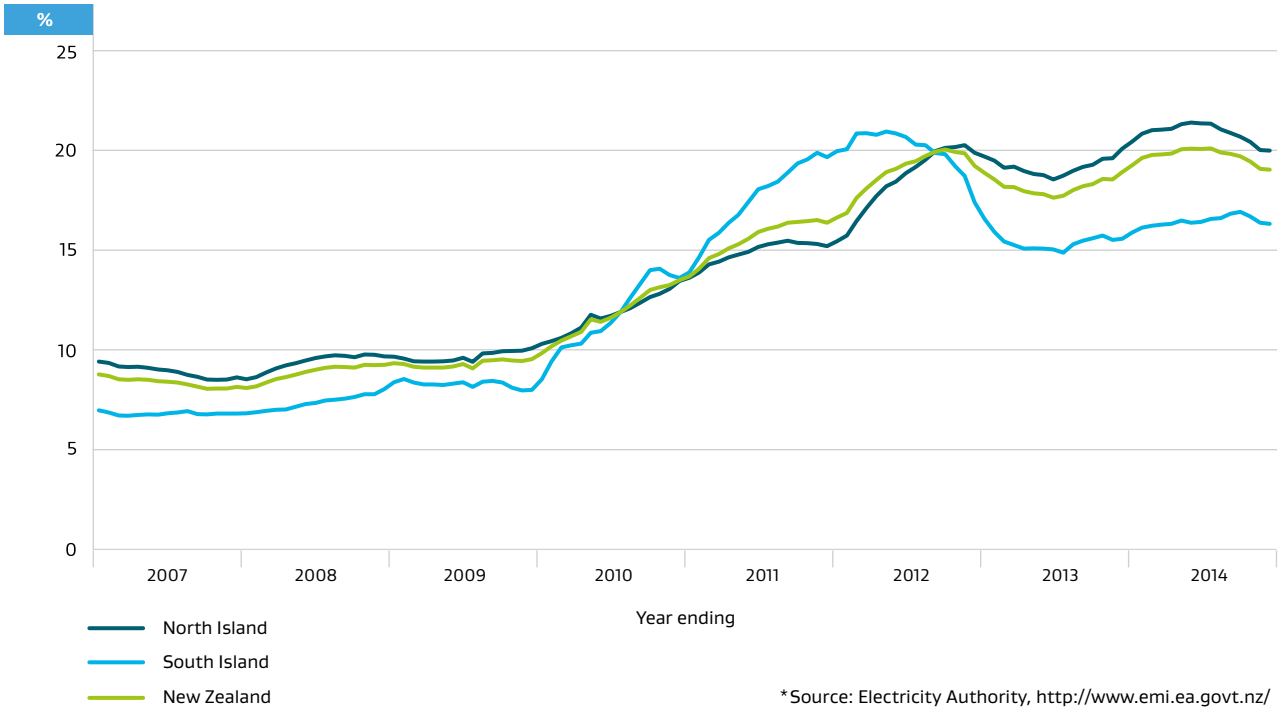
Electricity

Figure F.8: Monthly Retail Market Share by Parent Company*



*Source: Electricity Authority, http://www.emi.ea.govt.nz/

Figure F.9: Percentage of Customers Switching for Year to Date*



*Source: Electricity Authority, http://www.emi.ea.govt.nz/

Electricity

Residential Electricity Costs

The sales-based residential electricity cost for the March year 2015 rose 3.8% in nominal terms on the March year 2014. The combination of increased transmission and distribution charges from the 1st of April 2014 and falling residential consumption per ICP were the main reasons for this increase.

International Comparison

New Zealand's electricity costs can be compared to those of its major OECD trading partners, for whom data is available.[3] Figures F.12a and F.12b are based on data using US dollars per unit using purchasing power parity for the residential and industrial sectors.

The most recent year for residential data is 2014, while 2013 is the most recent year for industrial data. New Zealand's residential electricity cost is within the middle of the OECD range. In contrast, industrial electricity costs are amongst the lowest across the OECD range. New Zealand's geographical size, population, taxes and levies as well as industry size may contribute to its electricity costs in both the residential and industrial sectors. Residential costs are higher than industrial ones.

2. For more information visit: www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/statistics/prices/electricity-prices
3. Care is needed in interpreting this data, as product specifications, statistical methodology and information available can differ considerably among countries. Taxation forms a large component of the electricity costs in some countries.

Figure F.10a: Real and Nominal Sales-based Residential Electricity Costs for March Years 1974-2015 (includes GST)

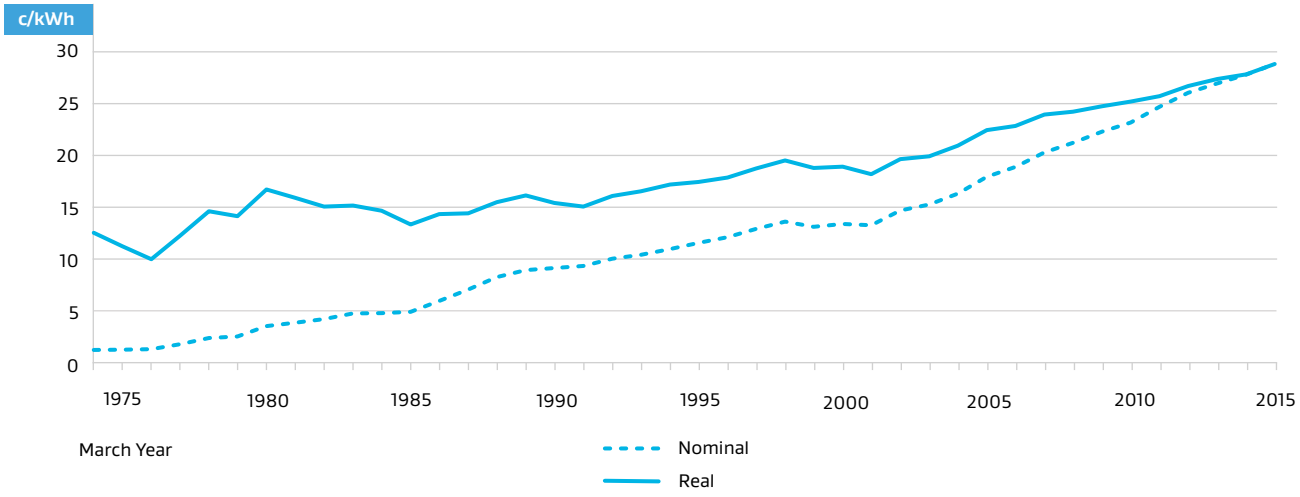


Figure F.10b: Real and Nominal Sales-based Commercial and Industrial Electricity Costs for March Years 1974-2015 (excludes GST)

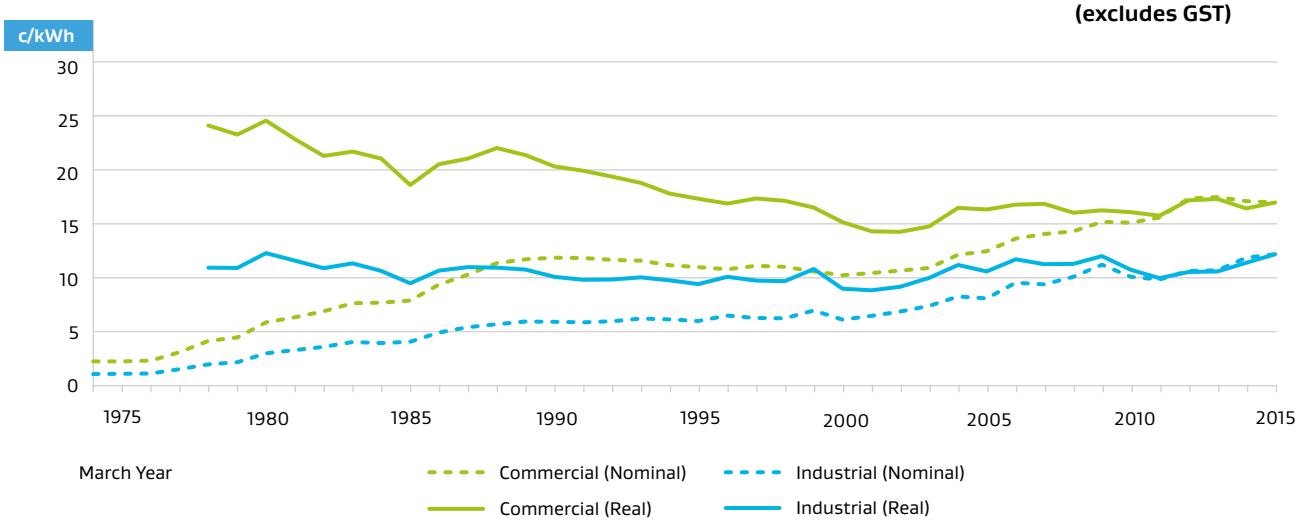


Figure F.11a: Residential Electricity Costs (Using Purchasing Power Parity) in OECD Countries for 2014

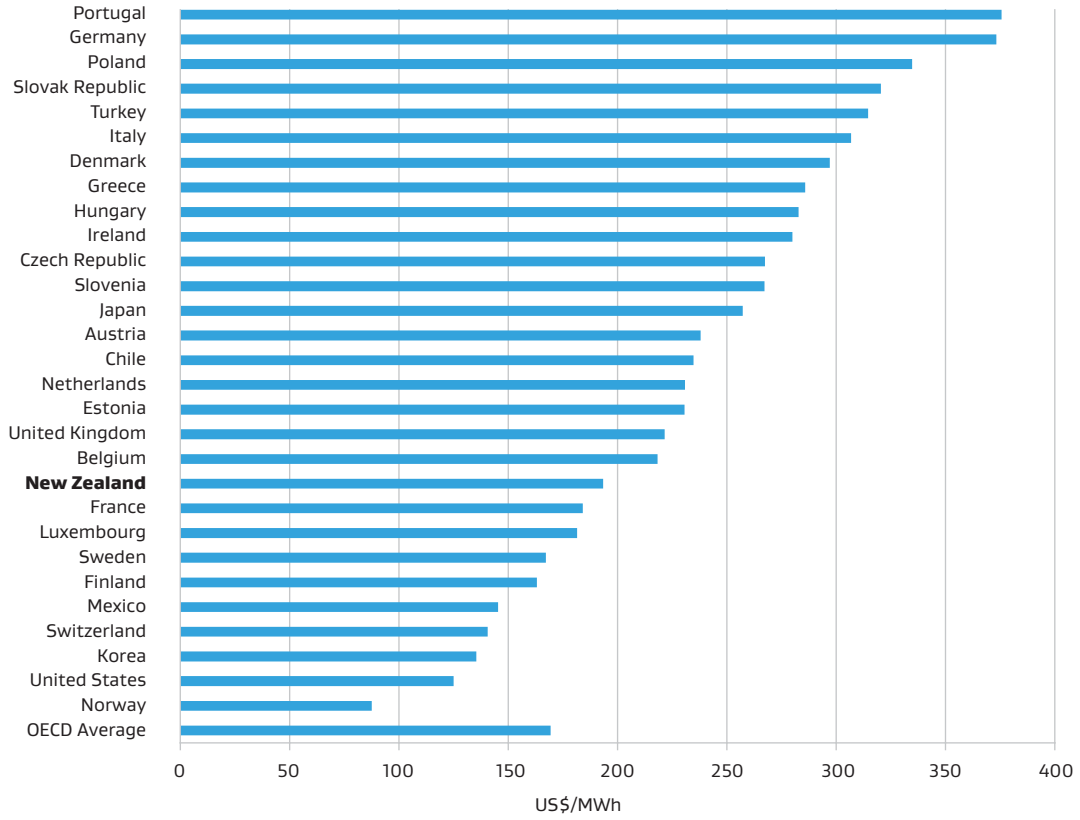
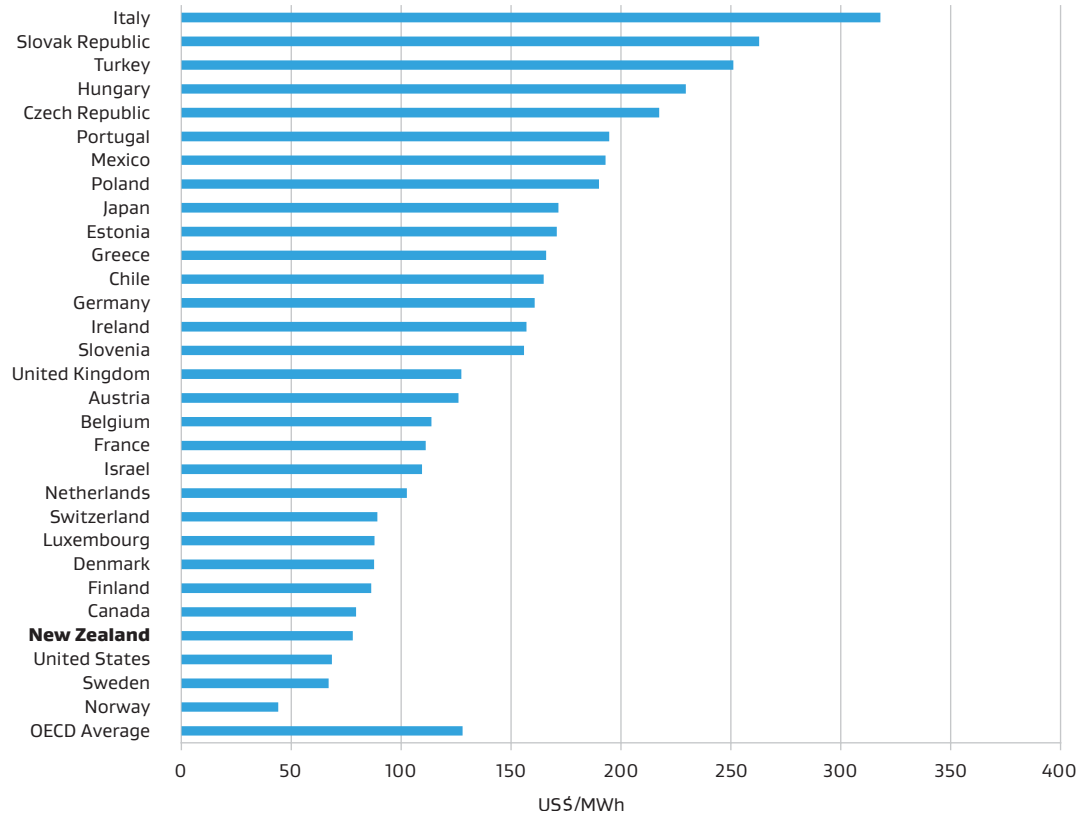


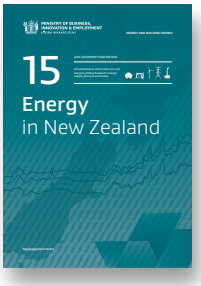
Figure F.11b: Industrial Electricity Costs (Using Purchasing Power Parity) in OECD Countries for 2013



FURTHER READING

www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/publications/

Energy and building Trends Energy Publications



Energy in New Zealand provides comprehensive information and analysis on New Zealand's energy supply, demand, reserves and prices, mostly as national aggregates.

New Zealand Energy Greenhouse Gas Emissions provides detailed inventory information on carbon dioxide equivalent emissions from New Zealand's energy sector and industrial processes for the calendar years 1990–2013.

New Zealand's Energy Outlook explores the long-term future for energy supply, demand, prices and energy sector greenhouse gas emissions in New Zealand.

New Zealand Energy Snapshot provides a handy pocket-sized overview and insight into New Zealand's energy sector.

New Zealand Energy Quarterly provides quarterly energy statistics and trend data on the supply of major fuel types, electricity generation and the associated greenhouse gas emissions, and fuel prices.

Changes in Energy Use provides annual trend data and analysis of changes in the way energy is used.

newzealand.govt.nz