MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

MARKETS – EVIDENCE AND INSIGHTS BRANCH

ENERGY IN NEW ZEALAND 18

2017 CALENDAR YEAR EDITION

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

New Zealand Government

Energy in New Zealand 2018 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 2018 edition includes information up to the end of the calendar year 2017.

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

Prepared by:

Markets

Evidence and Insights

Ministry of Business, Innovation & Employment

PO Box 1473, Wellington 6140
New Zealand

Email: energyinfo@mbie.govt.nz

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Authorship

This publication was prepared by the Markets team within the Evidence and Insight Branch of the Ministry of Business, Innovation and Employment. Principal contributors were Maria Botes, Michael Smith, Jeff Lean, Jan-Yves Ruzicka, Chris Barnett, and James Hogan. The authors would like to thank New Zealand Petroleum and Minerals and the MBIE Design team for their contribution to this report.

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* All statistics are year-ending annual measures. “Dec-on-Dec” refers to absolute changes between annual values.

Quick facts for 2017

1 petajoule (PJ) is equivalent

to the energy contained in enough regular petrol to drive **30,000** cars for a year

or

the electricity to power **40,000** homes with electricity

Dubai Crude Oil averaged **$53.13** in 2017 – a 30% increase from 2016

The Refinery to Auckland Pipeline (RAP) is capable of transmitting **325,000 litres per hour**

This is enough to fill an Olympic swimming pool in around 10 hours, or one 747 in just over half an hour

94% of all crude oil extracted in New Zealand in 2017 was exported

NEW ZEALAND'S POPULATION HAS INCREASED FROM **4.3 MILLION** IN 2010 TO **4.8 MILLION** IN 2017

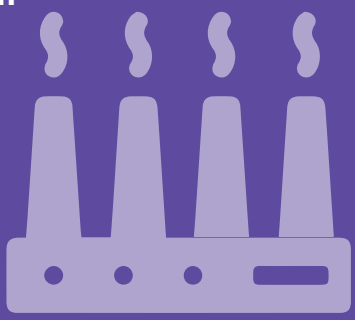
TOTAL ENERGY USE HAS DECLINED FROM **126GJ** PER PERSON TO **123GJ** PER PERSON IN THAT TIME

In 2017 **82%** of electricity was from renewable sources

In 2017 **68%** of all fuel consumed was produced at the Marsden Point refinery

NEW ZEALAND'S LARGEST SOLAR ARRAY IS RATED AT **0.41 MW**

Each of the four Rankine units at Huntly are rated at **250 MW**

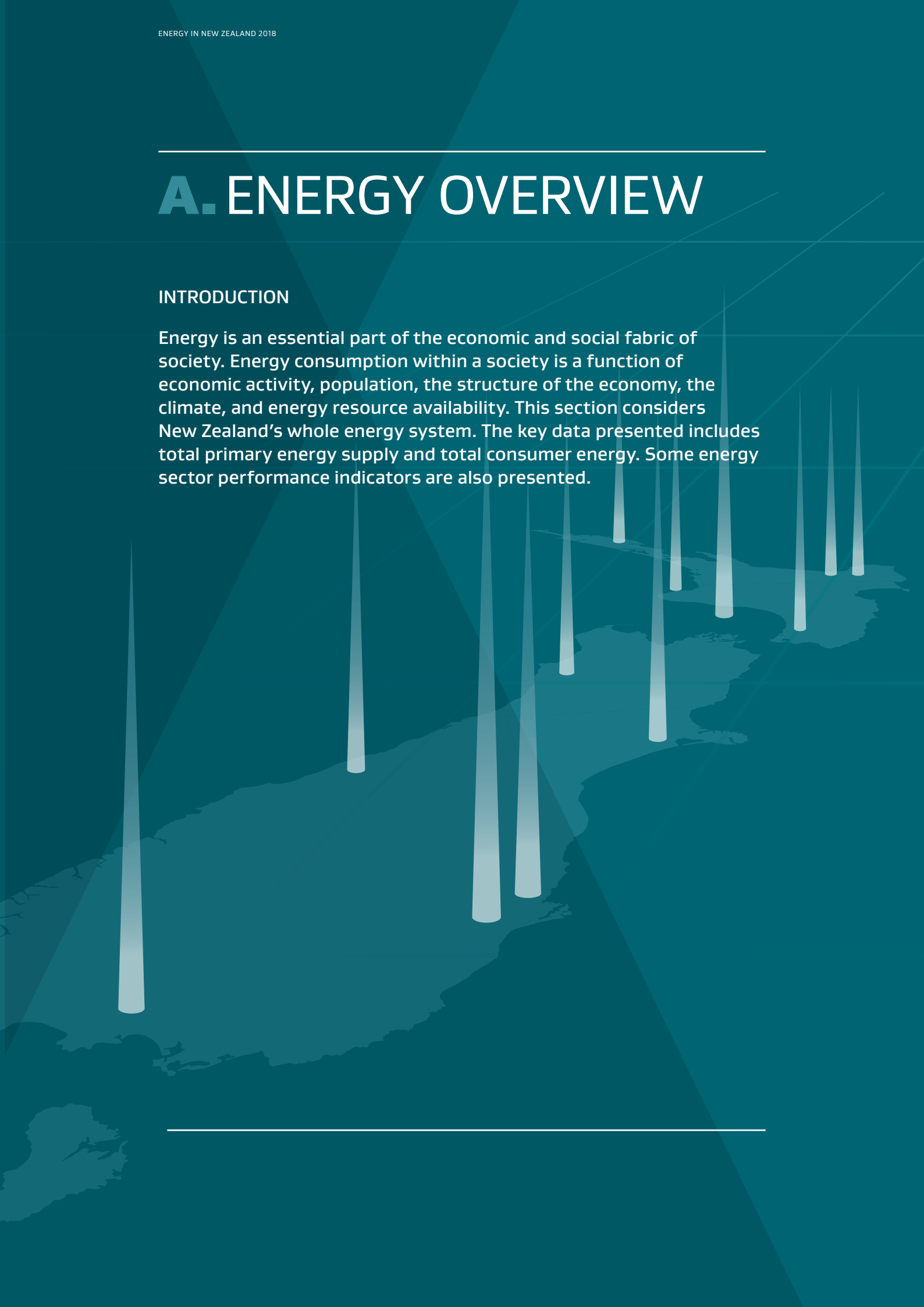


The Mahinerangi wind farm has 12 TURBINES each rated at 3 MW

A. ENERGY OVERVIEW

INTRODUCTION

Energy is an essential part of the economic and social fabric of society. Energy consumption within a society is a function of economic activity, population, the structure of the economy, the climate, and energy resource availability. This section considers New Zealand's whole energy system. The key data presented includes total primary energy supply and total consumer energy. Some energy sector performance indicators are also presented.



Snapshot of energy in 2017

Energy Supply

2.6%

from 2016 levels

Indigenous Production

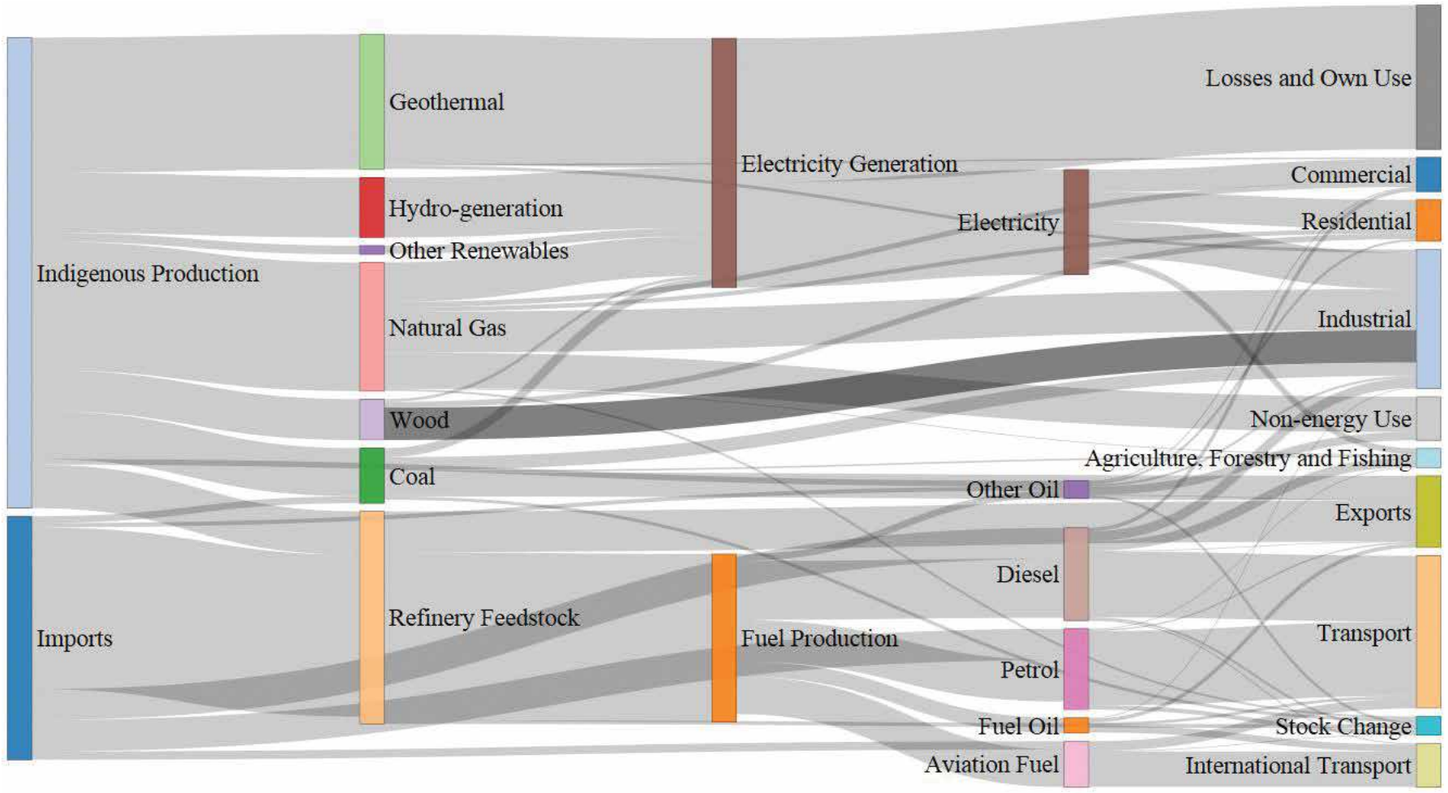
Coal ▲ **1.3%**

Oil ▼ **9.8%**

Imports

Coal ▲ **2.1%**

Oil ▲ **1.2%**



Energy Demand

2.8%

from 2016 levels

- **Transport** ▲ **6.2%**
- **Commercial** ▲ **2.8%**
- **Residential** ▲ **1.0%**
- **Industrial** ▲ **0.7%**
- **Agriculture** ▼ **2.0%**

Renewable energy was **39.6%** of energy supply in 2017

In 2017, New Zealand had the **4th highest** renewable primary energy supply in the OECD

Transformation

Coal ▲ **7.5%**

Oil ▲ **46.6%**

Gas ▲ **20.7%**

NZ Refinery intake was 254 PJ in 2017, up 0.7%
This produced 63 PJ of petrol, 89 PJ of diesel, 57 PJ of jet fuel, and 23 PJ of fuel oil

151 PJ of electricity was generated in 2017, up 1.3% on 2016
80% of the electricity generated in 2017 was from renewable sources, down from 85% in 2016. 13 PJ of coal and gas were used to generate electricity

The industrial sector consumed 54 PJ of renewable energy, up 6.7% on 2016

The Residential sector consumed 9 PJ of renewable energy, up 1.2% on 2017

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Snapshot of energy in 2017

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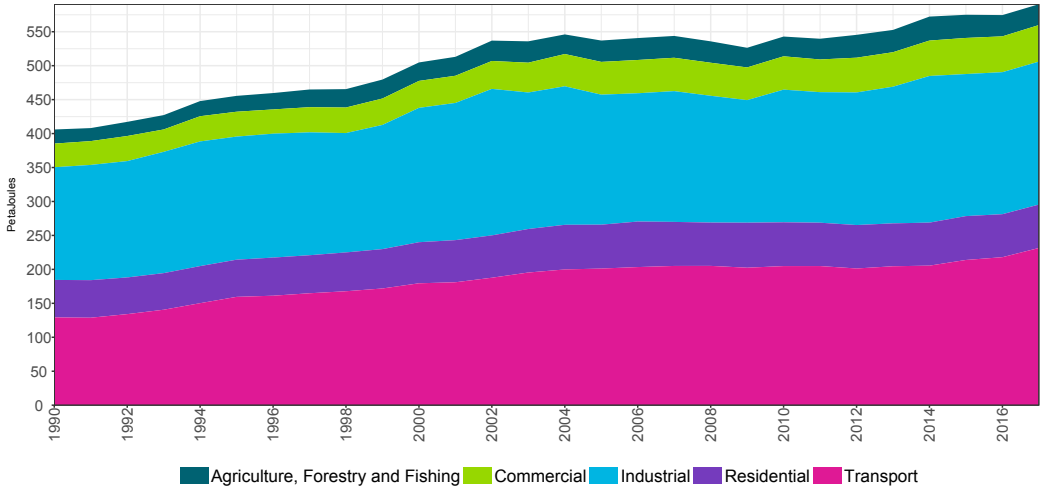
Energy Supply and Demand

Figure 1: Energy Demand



The energy sector, and its activity, is measured two separate ways:

- From the ''supply-side'', looking at the composition of total primary energy supply (TPES) over the year, and measuring the value of energy transformed and consumed in non-energy related processes. Energy transformation and non-energy uses are subtracted from TPES to derive the ''calculated consumer energy demand''.
- From the ''demand-side'': measuring the value of energy consumed across different sectors of the economy. The resulting derived measure is ''observed consumer energy demand''.

The difference between the two separate measures is reflected in a statistical difference.

Calculated consumer energy demand

Calculated consumer energy demand had a robust 11.5 PJ increase in the 2017 calendar year, up 2.0% on the 2016 calendar year predominantly from increased transport-related fuel supply.

Table 1: Calculated and Observed Consumer Energy (Petajoules)

Measure	Aggregate	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Supply	Total Primary Energy Supply	907.83	931.76	23.93	2.6%
Energy Transformation	Energy Transformation	-257.03	-272.02	-14.99	5.8%
Non-energy Use	Non-energy Use	-68.56	-66.04	2.52	-3.7%
Consumer Energy Calculated	Consumer Energy Calculated	582.24	593.7	11.46	2.0%
Demand	Agriculture, Forestry and Fishing	31.31	30.69	-0.62	-2.0%
	Commercial	52.75	53.86	1.11	2.1%
	Industrial	209.17	210.54	1.37	0.7%
	Transport	217.95	231.49	13.54	6.2%
	Residential	63.33	63.94	0.61	1.0%
Consumer Energy Observed	Consumer Energy Observed	574.51	590.52	16.01	2.8%
Statistical Differences	Statistical Differences	7.76	3.19	-4.57	-58.9%

Over the 2017 year, all fuel types increased their TPES: coal production increased in 2017, reversing a seven-year long decline. The bulk of the increase in TPES occurred within the oil fuel type. Oil TPES grew 19.2 PJ compared to the 2016 calendar year (Table 2), primarily through increases in oil fuel products held in stock (Table 3).

Table 2: Total Primary Energy Supply, by Fuel (Petajoules)

Fuel Type	2017-12-31	Dec-on-Dec	% Change	% Change
Renewable Energy	367.49	369.06	1.57	0.4%
Oil	293.26	312.50	19.24	6.6%
Natural Gas	194.90	197.61	2.71	1.4%
Coal	50.87	51.40	0.53	1.0%
Waste Heat	1.31	1.19	-0.12	-9.2%

Table 3: TPES Oil (Petajoules)

Oil TPES Component	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Indigenous Production	82.49	74.43	-8.06	-9.8%
Exports	-72.59	-71.95	0.64	-0.9%
Imports	353.80	358.12	4.32	1.2%
International Transport	-61.70	-66.14	-4.44	7.2%
Stock Change	-8.74	18.04	26.78	-306.4%

Energy Transformation

Energy Transformation represents how energy has been transformed into alternative fuel types which are in higher demand. For example, oil crude stocks are transformed into refined fuel products, like petrol and diesel, or wind and water energy potentials are transformed into electricity.

Over the 2017 calendar year, 11.3 PJ more natural gas and 2.0 PJ of coal was transformed into electricity compared to last year (Table 4). New Zealand experienced a relatively climatically dry winter over 2017, which left the hydro-generation lake levels low. 13.3 PJ of coal and gas TPES was transformed into electricity to maintain electricity demand.

Mirroring the increase in oil-product stocks affecting oil TPES, 5.6 PJ more crude stock oil was refined into final oil products compared to last year, an increase of 46.4% for the year (Table 4).

Table 4: Energy Transformation, by Fuel Type (Petajoules)

Fuel Type	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Renewable Energy	-304.43	-302.52	1.91	-0.6%
Oil	-11.97	-17.52	-5.55	46.4%
Electricity	141.93	143.78	1.85	1.3%
Natural Gas	-54.77	-66.09	-11.32	20.7%
Coal	-26.48	-28.48	-2.00	7.6%
Waste Heat	-1.31	-1.19	0.12	-9.2%

Non-Energy Use

Non-energy use represents the consumption of energy fuel types for non-energy related purposes; for example, as feed stock for chemical processes, or as inputs into manufacturing activity.

Over the 2017 calendar year, 2.5 PJ less energy was used in non-energy related activity (Table 1). Across the different fuel types, 4.8 PJ less natural gas was used for non-energy related purposes, while 2.3 PJ more oil was used in predominantly manufacturer processes (Table 5).

Table 5: Non Energy Use, by Fuel Type (Petajoules)

Fuel Type	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Oil	-10.41	-12.72	-2.30	22.2%
Natural Gas	-58.15	-53.32	4.80	-8.3%

Observed consumer energy demand

Observed consumer energy demand increased 16.0 PJ compared to the 2016 calendar year, mainly within the Transport sector, which accounted for 13.5 PJ of the growth (Table 6).

Table 6: Consumer Energy Observed, by Fuel Type (Petajoules)

Measure	Fuel Type	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Agriculture, Forestry and Fishing	Coal	1.17	2.72	1.55	132.5%
	Electricity	9.23	9.09	-0.14	-1.5%
	Natural Gas	1.28	1.45	0.17	13.3%
	Oil	18.97	16.75	-2.22	-11.7%
	Renewable Energy	0.66	0.68	0.02	3.0%
Commercial	Coal	1.09	1.00	-0.09	-8.3%
	Electricity	34.11	34.29	0.18	0.5%
	Natural Gas	7.94	7.92	-0.02	-0.3%
	Oil	6.79	7.87	1.08	15.9%
	Renewable Energy	2.82	2.78	-0.04	-1.4%
Industrial	Coal	20.64	20.01	-0.63	-3.1%
	Electricity	55.00	55.28	0.28	0.5%
	Natural Gas	63.23	61.88	-1.35	-2.1%
	Oil	19.92	19.61	-0.31	-1.6%
	Renewable Energy	50.38	53.76	3.38	6.7%
Transport	Electricity	0.22	0.22	0.00	0.0%
	Natural Gas	0.01	0.01	0.00	0.0%
	Oil	217.72	231.26	13.54	6.2%
Residential	Coal	0.35	0.28	-0.07	-20.0%
	Electricity	44.03	43.91	-0.12	-0.3%
	Natural Gas	6.36	6.75	0.39	6.1%
	Oil	3.38	3.68	0.30	8.9%
	Renewable Energy	9.21	9.32	0.11	1.2%
Consumer Energy Observed	Consumer Energy Observed	574.51	590.52	16.01	2.8%

While not large increases in petajoule value , residential consumption of natural gas and oil measured strong percentage increases this year, up 6.1% and 8.9% respectively. Likewise, industrial consumption of renewable energy (wood), increased 3.4 PJ or 6.7% this year compared to 2017 (Table 6). Diesel consumption within the Fishing industry contributed to the majority of the 2.2 PJ oil decline within the Agriculture, Forestry and Fishing sector. However, offsetting oil was a 1.6 PJ increase in coal consumption within the Agriculture, Forestry and Fishing sector, an increase from a small 1.2 PJ base, within the agriculture industry.

The bulk of the growth in the Transport Sector was within the diesel fuel type, which increased 9.9 PJ, up 11% compared to the previous year; however, relatively moderate increases were also recorded in petrol and marine fuels (Table 7). Jet fuel consumption within the Transport sector also witnessed a strong increase, growing by an additional 1.1 PJ (8.2%) over the year (Table 7).

Fuel oil for Domestic Transport, used primarily for marine transport, increased 0.2 PJ, or 5.6%, off a low base of 4.1 PJ consumed in 2016. Premium and regular petrol fuels consumed in Domestic Transport increased 0.9 PJ (3.4%) and 1.7 PJ (2.0%) respectively.

Table 7: Oil Supply, Transformation and Demand, by Fuel Type (Petajoules)

Fuel Type	Measure	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Crude Oil, Condensate and Naphtha	Imports	237.3	237.6	0.30	0.1%
	Exports	-66.27	-61.74	4.53	-6.8%
	Stock Change	-2.00	1.49	3.49	-174.5%
	Stock in Transit	3.92	1.97	-1.95	-49.7%
	Refinery Intake	244.95	244.58	-0.37	-0.2%
	Total Supply for Consumption	-72.00	-65.26	6.74	-9.4%
Diesel	Imports	47.32	46.85	-0.47	-1.0%
	Exports	0	-1.16	-1.16	-Inf%
	Stock Change	-3.00	1.91	4.91	-163.7%
	Stock in Transit	0.78	1.29	0.51	65.4%
	International Transport	-1.87	-1.75	0.12	-6.4%
	Refinery Output	83.51	89.31	5.80	6.9%
	Total Supply for Consumption	126.74	136.45	9.71	7.7%
	Electricity Generation	0.03	0.04	0.01	33.3%
	Agriculture, Forestry and Fishing	15.97	14.56	-1.41	-8.8%
	Commercial and Public Services	4.82	5.54	0.72	14.9%
	Domestic Transport	89.76	99.65	9.89	11.0%
	Industrial	15.20	14.72	-0.48	-3.2%
	Residential	0.12	0.13	0.01	8.3%
	Total Consumption	125.9	134.64	8.74	6.9%
Fuel Oil	Exports	-5.10	-5.82	-0.72	14.1%
	Stock Change	-1.04	0.34	1.38	-132.7%
	Stock in Transit	-3.56	-0.34	3.22	-90.4%
	International Transport	-11.26	-10.66	0.60	-5.3%
	Refinery Output	26.81	23.14	-3.67	-13.7%
	Total Supply for Consumption	5.85	6.66	0.81	13.8%
	Agriculture, Forestry and Fishing	1.38	0.90	-0.48	-34.8%
	Commercial and Public Services	0.04	0.06	0.02	50.0%
	Domestic Transport	4.11	4.34	0.23	5.6%
	Industrial	1.07	1.36	0.29	27.1%
	Total Consumption	6.60	6.66	0.06	0.9%
Jet A	Imports	9.39	12.24	2.85	30.4%
	Exports	0	-0.03	-0.03	-Inf%
	Stock Change	-0.10	0.49	0.59	-590.0%
	Stock in Transit	0.57	-1.74	-2.31	-405.3%

Fuel Type	Measure	2016-12-31	2017-12-31	Dec-on-Dec	% Change
	International Transport	-48.56	-53.82	-5.26	10.8%
	Refinery Output	53.49	56.69	3.20	6.0%
	Total Supply for Consumption	14.79	13.83	-0.96	-6.5%
	Domestic Transport	12.96	14.02	1.06	8.2%
	Total Consumption	12.96	14.02	1.06	8.2%
Premium Petrol	Imports	11.30	13.30	2.00	17.7%
	Exports	0	-0.45	-0.45	-Inf%
	Stock Change	-1.30	0.08	1.38	-106.2%
	Stock in Transit	-0.11	-1.52	-1.41	1,281.8%
	Refinery Output	15.68	14.28	-1.40	-8.9%
	Total Supply for Consumption	25.57	25.69	0.12	0.5%
	Agriculture, Forestry and Fishing	0.10	0.06	-0.04	-40.0%
	Commercial and Public Services	0.05	0.08	0.03	60.0%
	Domestic Transport	25.21	26.06	0.85	3.4%
	Industrial	0.04	0.02	-0.02	-50.0%
	Residential	0.01	0.01	0.00	0.0%
	Total Consumption	25.41	26.23	0.82	3.2%
Regular Petrol	Imports	32.84	34.12	1.28	3.9%
	Exports	0	-1.70	-1.70	-Inf%
	Stock Change	-2.39	2.74	5.13	-214.6%
	Stock in Transit	1.78	5.21	3.43	192.7%
	Refinery Output	53.97	48.41	-5.56	-10.3%
	Total Supply for Consumption	86.2	88.78	2.58	3.0%
	Agriculture, Forestry and Fishing	1.43	1.14	-0.29	-20.3%
	Commercial and Public Services	0.40	0.54	0.14	35.0%
	Domestic Transport	84.81	86.49	1.68	2.0%
	Industrial	0.37	0.18	-0.19	-51.4%
	Residential	0.04	0.02	-0.02	-50.0%
	Total Consumption	87.05	88.37	1.32	1.5%

B. ENERGY BALANCES

INTRODUCTION

New Zealand's energy production derives from both renewable and non-renewable sources. New Zealand imports and exports fossil fuels, which generate export revenue, but also results in a dependency and vulnerability to energy commodity prices that vary according to international supply and demand factors outside of New Zealand's control.

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

Both the energy supply and demand dimensions of the energy balance tables are derived from surveys spanning different sources. An imbalance exists between the value of consumer energy calculated from supply, and the value of consumer energy observed from statistical measure.

Energy Supply and Demand Balance, Calendar Year 2017

	Converted into Petajolues using Gross Calorific Values	COAL			OIL							
		Bituminous & Sub-bitum.	Lignite	Total	Crudes/ Feed-stocks/ NGL	LPG	Petrol	Diesel	Fuel Oil	Av. Fuel/ Kero	Others	Total
SUPPLY	**Indigenous Production**	67.39	5.48	**72.88**	65.71	8.72						**74.43**
	+ Imports	10.34	0.00	**10.34**	244.88	0.71	47.41	46.85	-	12.65	5.62	**358.13**
	– Exports	36.70	-	**36.70**	61.74	0.64	2.15	1.16	5.82	0.03	0.41	**71.97**
	– Stock Change	-4.84	-0.03	**-4.87**	-5.80	0.04	-6.48	-3.19	0.00	1.12	-3.73	**-18.06**
	– International Transport						0.00	1.75	10.66	53.73	-	**66.14**
	TOTAL PRIMARY ENERGY	**45.87**	**5.52**	**51.39**	**254.66**	**8.75**	**51.74**	**47.14**	**-16.48**	**-42.22**	**8.94**	**312.52**
	ENERGY TRANSFORMATION	**-28.01**	**-0.46**	**-28.47**	**-254.20**	**-0.00**	**63.49**	**89.42**	**23.15**	**56.81**	**3.78**	**-17.54**
	• Electricity Generation	-5.71	-	**-5.71**				-0.04	-			**-0.04**
	• Cogeneration	-7.66	-0.26	**-7.92**								
	• Fuel Production				-254.20		62.74	89.33	23.14	56.69	10.39	**-11.92**
	• Other Transformation	-11.76	-	**-11.76**								
	• Losses and Own Use	-2.88	-0.20	**-3.09**	-	-0.00	0.75	0.14	0.02	0.12	-6.60	**-5.59**
Non-energy Use											**-12.72**	**-12.72**
CONSUMER ENERGY (calculated)		**17.86**	**5.06**	**22.92**	**0.46**	**8.74**	**115.23**	**136.56**	**6.67**	**14.59**	**-**	**282.25**
DEMAND	**Agriculture, Forestry and Fishing**	**2.71**	**0.01**	**2.73**		**0.09**	**1.20**	**14.56**	**0.90**	**-**		**16.75**
	• Agriculture	2.71	0.01	**2.73**		0.09	1.11	9.73	-	-		**10.94**
	• Forestry and Logging	0.00	-	**0.00**			0.01	3.87	-	-		**3.88**
	• Fishing	-	-	**-**			0.08	0.96	0.90	-		**1.94**
	Industrial	**15.65**	**4.33**	**19.98**		**3.40**	**0.20**	**14.71**	**1.31**	**-**		**19.62**
	• Mining	-	-	**-**			0.00	2.66	-	-		**2.66**
	• Food Processing	11.07	4.05	**15.12**			-	-	-	-		**-**
	• Textiles	0.02	-	**0.02**								
	• Wood, Pulp, Paper and Printing	0.56	0.02	**0.58**								
	• Chemicals	0.00	-	**0.00**								
	• Non-metallic Minerals	2.66	0.07	**2.73**								
	• Basic Metals	0.01	0.19	**0.20**			-	-	-	-		**-**
	• Mechanical/Electrical Equipment	0.01	0.01	**0.02**								
	• Building and Construction	-	-	**-**			0.04	5.70	0.01	-		**5.76**
	• Unallocated	1.33	-	**1.33**		3.40	0.15	6.35	1.30	-		**11.21**
	Commercial	**0.35**	**0.65**	**1.00**		**1.65**	**0.62**	**5.54**	**0.06**	**-**		**7.88**
	Transport	**-**	**-**	**-**		**0.24**	**112.55**	**99.65**	**4.34**	**14.48**		**231.26**
	Residential	**0.19**	**0.09**	**0.27**		**3.52**	**0.03**	**0.13**	**-**	**-**		**3.67**
CONSUMER ENERGY (observed)		**18.90**	**5.08**	**23.98**	**-**	**8.91**	**114.60**	**134.59**	**6.61**	**14.48**	**-**	**279.18**
Statistical Differences		**-1.04**	**-0.02**	**-1.06**	**0.46**	**-0.16**	**0.63**	**1.97**	**0.07**	**0.11**	**-**	**3.07**

	NATURAL GAS	RENEWABLES								ELECTRICITY	WASTE HEAT	TOTAL
	Total	Hydro	Geothermal	Solar	Wind	Liquid Biofuels	Biogas	Wood	Total	Total	Total	
	194.49	90.66	204.48	0.63	7.71	0.10	3.66	61.82	369.06		1.19	712.05
												368.47
												108.66
	-3.12											-26.05
												66.14
	197.61	90.66	204.48	0.63	7.71	0.10	3.66	61.82	369.06		1.19	931.77
	-66.09	-90.66	-196.29	-0.27	-7.71	-0.10	-3.33	-4.15	-302.51	143.79	-1.19	-272.02
	-46.23	-90.66	-194.30	-0.27	-7.71		-2.45		-295.38	150.76		-196.60
	-13.53		-2.00				-0.88	-4.15	-7.03	8.18	-1.19	-21.49
	-					-0.10			-0.10			-12.02
												-11.76
	-6.33									-15.16		-30.15
	-53.32											-66.04
	78.20		8.18	0.36	-	-	0.33	57.67	66.55	143.79	-	593.71
	1.45		0.68						0.68	9.08		30.69
	1.45		0.68						0.68	8.77		24.56
	0.00									0.23		4.11
	-									0.09		2.02
	61.87		4.73				0.05	48.98	53.76	55.30		210.53
	0.15									1.50		4.31
	17.19									9.56		41.87
	0.48									0.33		0.83
	5.68									9.71		15.96
	32.85									3.13		35.98
	2.17									0.99		5.88
	2.47									22.88		25.55
	0.26									0.53		0.81
	0.51									1.34		7.60
	0.12		4.73				0.05	48.98	53.76	5.31		71.73
	7.92		2.50				0.28		2.78	34.29		53.86
	0.01						-		-	0.22		231.49
	6.75		0.27	0.36				8.69	9.33	43.91		63.94
	78.00	-	8.18	0.36	-		0.33	57.67	66.55	142.80	-	590.51
	0.20		-	-	-		-	-	-	0.98	-	3.20

C. COAL

INTRODUCTION

This section contains information about coal production (supply) and sales to consumers (demand). Information on coal is presented for the 2017 calendar year. Background information on New Zealand's coal industry can be found on the New Zealand Petroleum and Minerals website: **www.nzpam.govt.nz/our-industry/nz-minerals/minerals-data/coal/.**

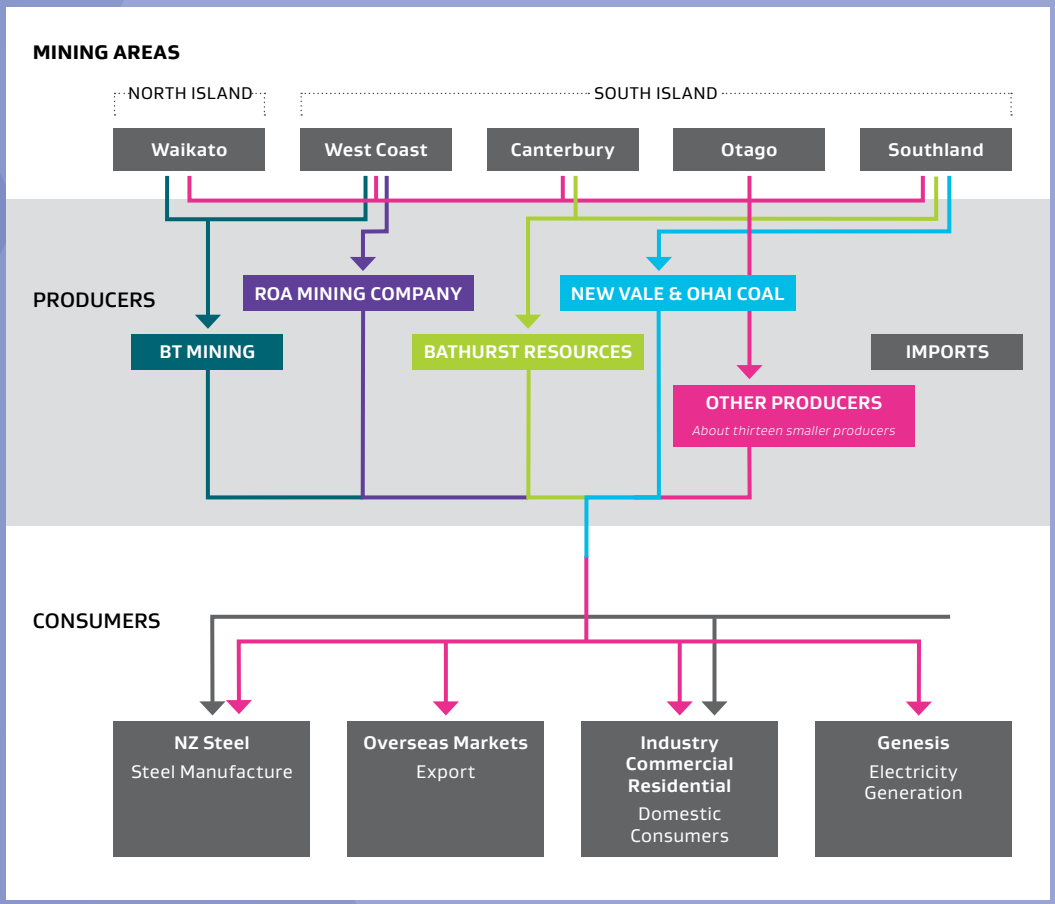


Table 8: Coal Supply, Transformation and Consumption (Petajoules)

Measure	Fuel Type	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Supply	Production	71.92	72.88	0.95	1.3%
	Imports	10.13	10.34	0.21	2.1%
	Exports	37.84	36.69	-1.14	-3.0%
	Stock Change	6.67	4.87	-1.80	-26.9%
	Production Losses and Own Use	2.55	3.09	0.54	21.2%
Transformation	Electricity Generation	4.84	5.71	0.87	17.9%
	Cogeneration	7.39	7.92	0.53	7.1%
	Other Transformation	11.70	11.76	0.05	0.4%
Consumption (Observed)	Agriculture, Forestry and Fishing	1.17	2.73	1.56	133.3%
	Commercial	1.08	1.00	-0.08	-7.7%
	Industrial	20.64	19.98	-0.66	-3.2%
	Residential	0.34	0.27	-0.07	-19.9%

Overview

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.

New Zealand's coal market can be divided into three distinct geological areas:

› North Island: In the North Island, coal production is centred on the Waikato region, where large coalfields like Awaroa and Rotowaro produce sub-bituminous coal. This coal is an excellent candidate for heating and energy generation, although it is generally not high enough quality to be used in metallurgical applications (that is, the production of iron and steel).

  The main consumers of this "thermal coal" in New Zealand are Genesis' Huntly coal power plant, and the Glenbrook steel mill south-east of Auckland. Unlike the vast majority of steel mills, the Glenbrook mill can use thermal-grade coal in the production of iron and steel due to the unique processes employed at the facility.

› West Coast: Coal extracted on the West Coast of the South Island is generally classified as bituminous, with a higher energy content than the sub-bituminous coal mined in the North Island. The majority of this coal is exported for metallurgical applications.

› Rest of the South Island: The rest of the South Island tends to produce either sub-bituminous coal, or the even lower-energy lignite. This low-energy coal is generally sold to dairy and meat processing plants throughout the South Island, and to households and companies for heating.

It has been estimated that national in-ground resources of all coal are over 15 billion tonnes, although 80% of this is lignite in the South Island. Sub-bituminous and bituminous in-ground resources are around 4 billion tonnes, but economic reserves are much smaller.

The majority of coal used in New Zealand is consumed for energy use: the coal is burned to provide heat, whether that heat is used to dry milk powder, power a steam engine, run a boiler, or heat a house.

There are also two major **non-energy uses** for coal in New Zealand:

- At Huntly power plant, the energy in the combusted coal is used to drive turbines which generate electricity. As the energy contained within the coal is not used directly at Huntly, but merely transformed into a different form, we do not consider this to be "energy use".
- At Glenbrook steel mill, coal is used as a reducing agent, converting magnetite in ironsand to metallic iron. While it may provide energy, its primary purpose is as a reagent in a chemical reaction. As such, this is also not considered to be "energy use".

Year in Review

Figure 2: Timeline of Solid Energy's Asset Sales

New Zealand's coal market in 2017 was overshadowed by the dissolution of the state-owned Solid Energy, and the sale of its various mines to private companies throughout New Zealand. This process, which started in 2015, is planned to end in early 2018: by the end of 2017, all of Solid Energy's operating mines have either been sold or closed.

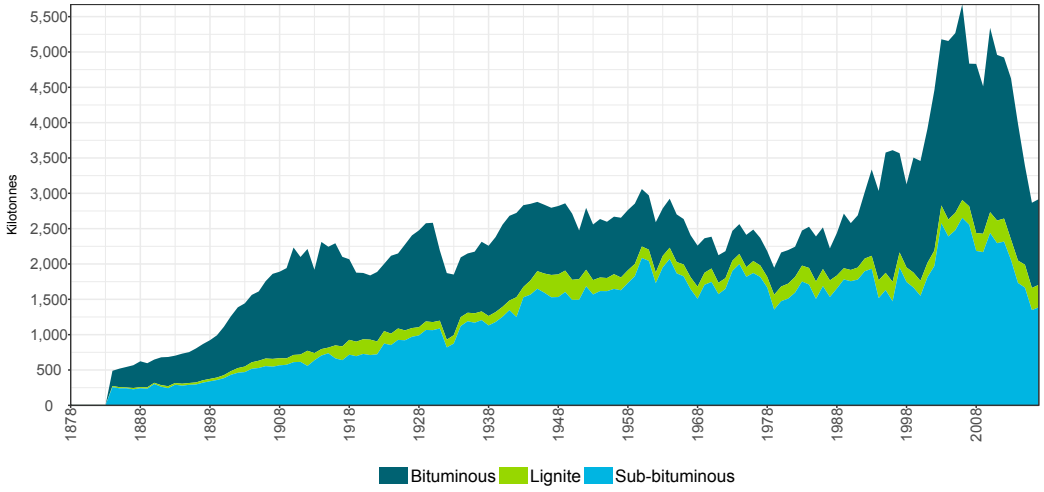
In the short term, Solid Energy's asset sales resulted in a drop in coal production as mines changed hands; in the future, however, this break-up is likely to stimulate the coal market in New Zealand as new operators bring fresh enthusiasm to the market.

Despite this disruption, a strong international coal market kept metallurgical coal production and exports steady. Thermal coal production rebounded from its six-year slump, buoyed by a dry summer which emptied hydro lakes and pushed coal use at Huntly power station to an eighteen-month high.

Coal Production

Coal production increased by 2% on 2016, finally reversing a seven-year slip.

Figure 3: New Zealand Annual Coal Production – Kilotonnes



Coal production in New Zealand for the year of 2017 was 2.9 million tonnes (72.9 PJ), an increase of approximately 2% from 2016. The purchase of Rotowaro and Awaroa mines by BT Mining, coupled with their renewed contract with Genesis, gave mining in the North Island a boost. While increasing this year, coal production is less than half its peak production volumes of 5.7 million tonnes recorded in 2006.

Other aspects of New Zealand's coal production in 2017 include:

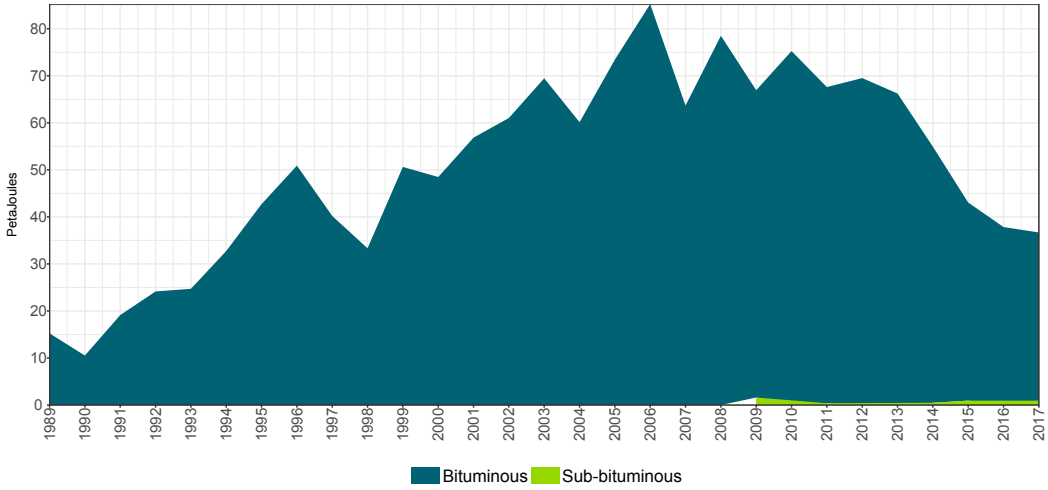
- Sub-bituminous coal production from North Island mines was up 8% (57 kt) on 2016 figures, driven by a dry year and increased demand for coal from Genesis' Huntly power plant. However, sub-bituminous coal production on the West Coast fell by 22% (44 kt) due to decreased local demand.
- Bituminous coal production stayed level, likely buoyed by strong metallurgical prices overseas. Across the rest of the South Island, sub-bituminous coal production rose 6% (26 kt) on 2016, as new blood in the mining industry boosted production for local markets.
- Lignite production was relatively unchanged, up 2% (6 kt) on last year.

2017 also saw the closure of the last underground coal mine, at Roa on the West Coast. All coal produced in 2017 came from opencast mines.

Currently, there are 16 Coal Mining Licences (of which two are for peat), 14 exploration for coal licenses and 44 mining permits for coal.

Trade

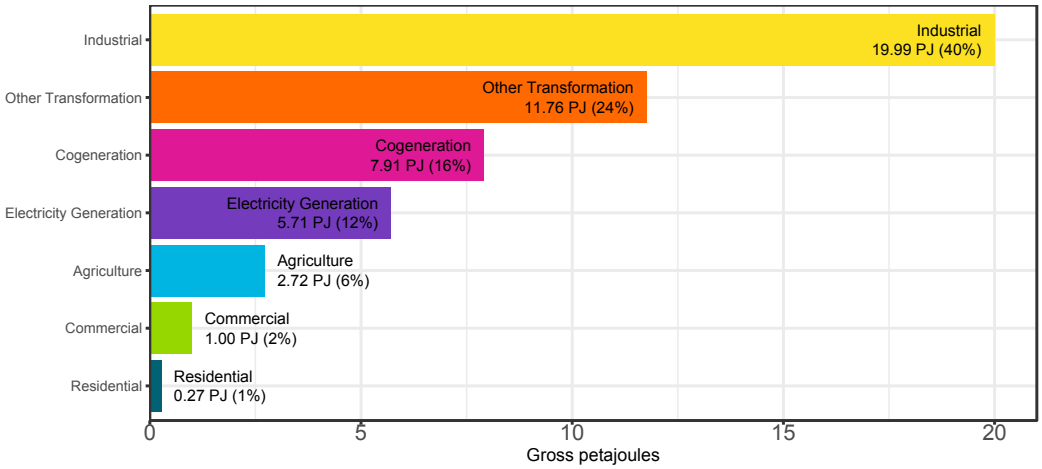
Figure 4: New Zealand Coal Exports – by Petajoules



Coal prices in the Asia-Pacific region spiked in early 2017 due to Tropical Cyclone Debbie, which closed ports in Queensland and severely disrupted Australian coal supplies for more than a month.[1] Despite a favourable export market, coal mining on the West Coast experienced its own problems: the main rail line linking the West Coast to Lyttelton port, the Midland Rail Line, was closed through February and March due to fire damage, limiting coal transport across the island.[2] Metallurgical coal production bounced back with the restoration of the line, but asset transfers from Solid Energy later in the year further suppressed export figures. Overall, New Zealand exported 37 PJ of coal during 2017, a slight decrease of 3% on 2016 export figures despite the lucrative overseas market. Coal imports were also around 2016 levels, only up 2% year-on-year.

Coal Use

Figure 5: Coal Consumption – by Sector



1 "The spectacular surge in coking coal prices caused by Cyclone Debbie", *Business Insider Australia*, 11 April 2017, www.businessinsider.com.au/chart-the-spectacular-surge-in-coking-coal-prices-caused-by-cyclone-debbie-2017-4

2 "Rail line to West Coast to close for at least six weeks following fire", *KiwiRail*, 7 February 2017, www.kiwirail.co.nz/news/461/78/Rail-line-to-West-Coast-to-close-for-at-least-six-weeks-following-fire

Coal use can be divided between consumption (which is further divided into Industrial, Agricultural, Commercial, and Residential consumption) and transformation (which is divided into Electricity Generation and Other Transformation).

The total primary energy supply of coal (calculated as production and imports less losses and exports) for 2017 was 51 PJ, an increase of 1% on the previous year. Coal accounted for approximately 5.5% of New Zealand's total primary energy supply.

Consumption

Coal consumption was relatively steady, with downturns in commercial, residential, and industrial use offset by an increase in agricultural use.

Coal use within New Zealand is dominated by industrial sector consumption, which includes meat and dairy processing, food product manufacturing, wood and pulp processing, metal and mineral processing, and chemical manufacture.

Almost half of all coal consumed in New Zealand is used in industrial sector activities. Agricultural, Commercial, and Residential consumption make up approximately 10% of coal use in aggregate.

Coal consumption in the Industrial sector fell by 3% (0.7 PJ) on 2016 levels, but was generally offset by consumption in other sectors, which rose by 54% (1.4 PJ) in aggregate. Total consumption for 2017 was 24 PJ, an increase of 3% (0.7 PJ) on the previous year.

Transformation

Coal use in the North Island is heavily influenced by Genesis' Huntly power plant. This power plant is the only coal-fired power plant in New Zealand, and is important for New Zealand's security of electricity supply requirements in dry years to meet winter energy and peak demand requirements.

Heavy rain in the first quarter of 2017 resulted in strong hydro lake inflows and zero coal use at Huntly, an unusual occurrence. However, the dry winter in the middle of the 2017 year pushed coal use back up to, and then beyond, 2016 levels.

In April 2017, Genesis started importing coal to keep up with demand, and later in the year it signed a contract with BT Mining to supply coal to the plant, securing supply. Even given the wet start to the 2017 year, coal use for electricity generation was up 18% on 2016 levels. Overall, 1.3 million tonnes (5.71 PJ) of coal were combusted for electricity generation in 2017.

Despite the interruptions caused by Solid Energy's sale of assets, coal use for other transformation processes (including iron and steel use) remained steady on 2016 figures.

D. OIL AND GAS

INTRODUCTION

This section contains information on New Zealand's oil and gas industry, presented for the 2017 calendar year. Oil and gas supply and demand are presented first, followed by oil and gas reserves.

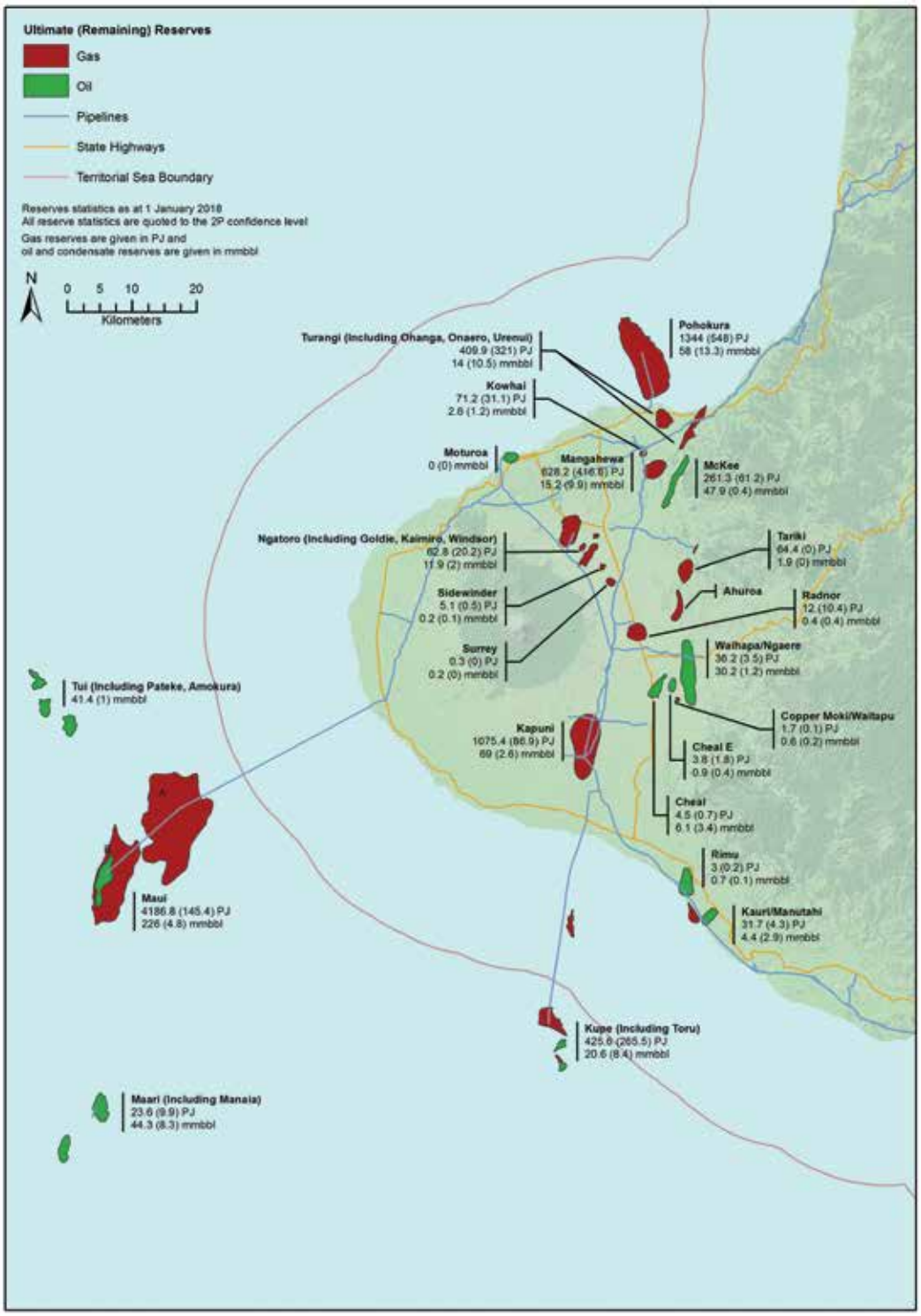
More information on oil and gas exploration in New Zealand can be found on the New Zealand Petroleum and Minerals website: **www.nzpam.govt.nz/cms/investors/our-resource-potential/petroleum**

Percentage changes in this section are calculated based on petajoules. This controls for differences in the energy content of different oil product types, and gas produced from different fields.

Liquified petroleum gas (LPG) data is presented in the Oil section.

Reserves

Figure 6: Overview of Taranaki Offshore and Onshore Oil and Gas Fields



Exploration and Development

› Total expenditure in 2017 was $996 million, down 16% from 2016.

› Production permit expenditure was $806 million, down 11% from $903 in 2016.

› Drilling activity remains low with a total of 12,633 metres made in 2017. This included 6,844 metres of exploratory drilling, 1,069m of appraisal wells, and 4,720 metres of development wells. By comparison, the average metres drilled annually over the last 10 years has been around 61,000 metres.

› The number of wells drilled has also remained relatively low, with 4 exploration wells, 1 appraisal well, and 2 development wells drilled. This is an increase on 2016, but still remains low when compared to historical figures.

Permits

› Permitting is also at an historical low, with only three permits granted in 2017. One prospecting, one exploration, and one mining permit.

Reserves

› Reserves are the estimated total amounts of oil and gas that are able to be recovered from a known petroleum reservoir. Ultimate recoverable reserves are the total economically recoverable reserves before any oil or gas is produced. Remaining reserves are ultimate recoverable reserves, less production to date. The most certain reserve figures are presented as 'proved' (1P), followed by 'proved plus probable' (2P), then 'proved plus probable plus possible' (3P).

› Field operators will regularly re-evaluate calculations based on new survey data for their fields to better understand the remaining reserves. For example, Pohokura had stated there was 20.2 million barrels of condensate (2P) remaining at the end of 2016, but during 2017 that figure was revised such that at the end of 2017 the remaining condensate (2P) reserves were only 13.26 million barrels. Pohokura produced around 2.8 million barrels of condensate in 2017, which means there has been a downward revision of Pohokura condensate 2P reserves of around 4 million barrels.

› Overall remaining oil and condensate 2P reserves at the end of 2017 stood at just over 71 million barrels.

› Overall remaining gas reserves at the end of 2017 were 1,726 billion cubic feet, down from 1,775 billion cubic feet the previous year.

Any discussion of reserves requires an understanding of the terms 'reserves' and 'contingent resources'.

Reserves are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions.[3]

Reserves must also meet the conditions of being discovered, recoverable, commercial and remaining. Contingent resources are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations, but the applied project(s) are not yet considered mature enough for commercial development due to one or more contingencies. This may include not having viable markets, not having the required technology to exploit the field, or where the expense involved in exploiting the field would exceed profitability.

3 www.spe.org/industry/docs/Petroleum_Resources_Management_System_2007.pdf

Figure 7: Estimated Remaining Oil 2P Reserves by Field – 2017

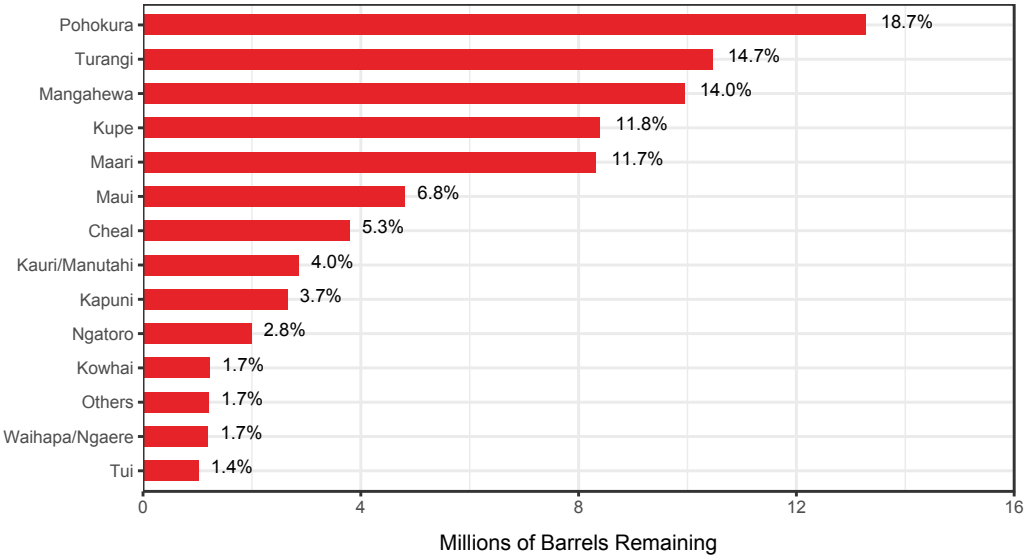


Figure 7 shows the estimated oil 2P reserves by field in New Zealand. Total oil reserves as of 1 January 2018 were approximately 71 million barrels. Contingent reserves at this time have been assessed at around 106 million barrels.

Figure 8: Forecast Oil Production Profile

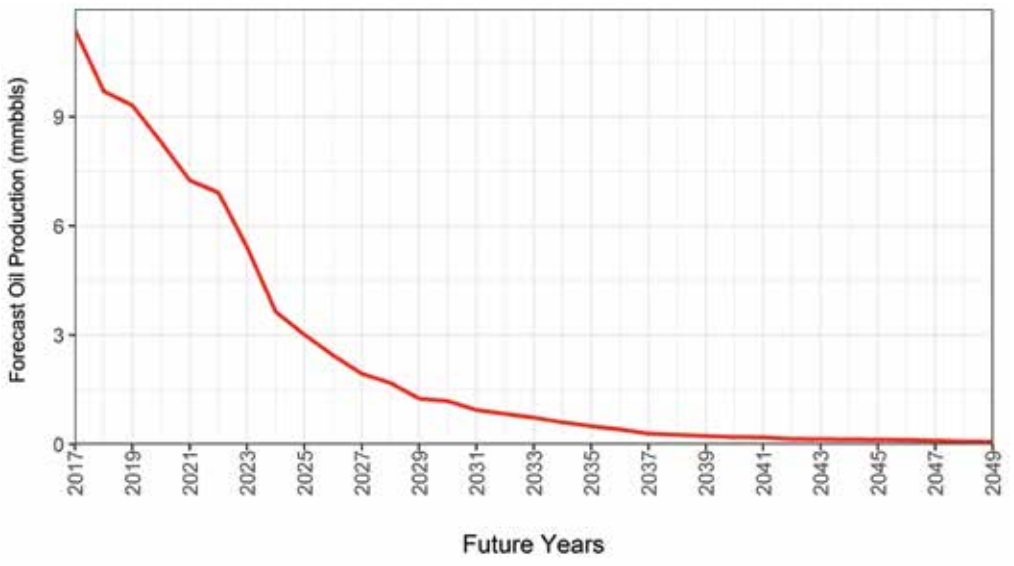


Figure 8 shows the estimated oil production profile as reported to MBIE by individual oil operators.

Gas Reserves

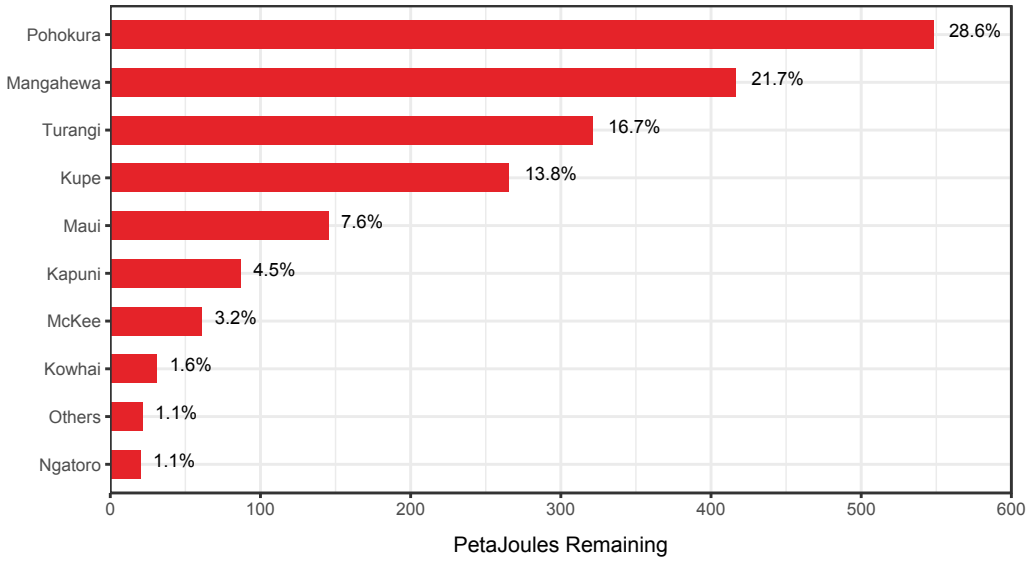
While oil reserves in New Zealand are relatively simple: most oil and condensate is exported with only a small amount sent to our domestic refinery, the picture for gas reserves is more complex.

Natural gas is extracted and processed for consumption domestically by industry and private consumers. The single biggest New Zealand consumer of natural gas for non-energy use is the petrochemical industry for the production of methanol. Changes in the estimated volume of New Zealand gas reserves affect the long-run average natural gas supply price. While Asia-Pacific methanol demand and prices have grown over recent years, so too has the Asia-Pacific methanol production capacity base, with implications for the continued high long-term Asia-Pacific methanol prices.[4]

Short term gas price dynamics are also closely linked to the hydro-electric generation pattern in New Zealand. Around one third of gas consumption in 2017 was by electricity generation. The changing landscape of electricity generation in New Zealand may also have a significant impact on long term gas availability in New Zealand.

New Zealand's Gas Reserves

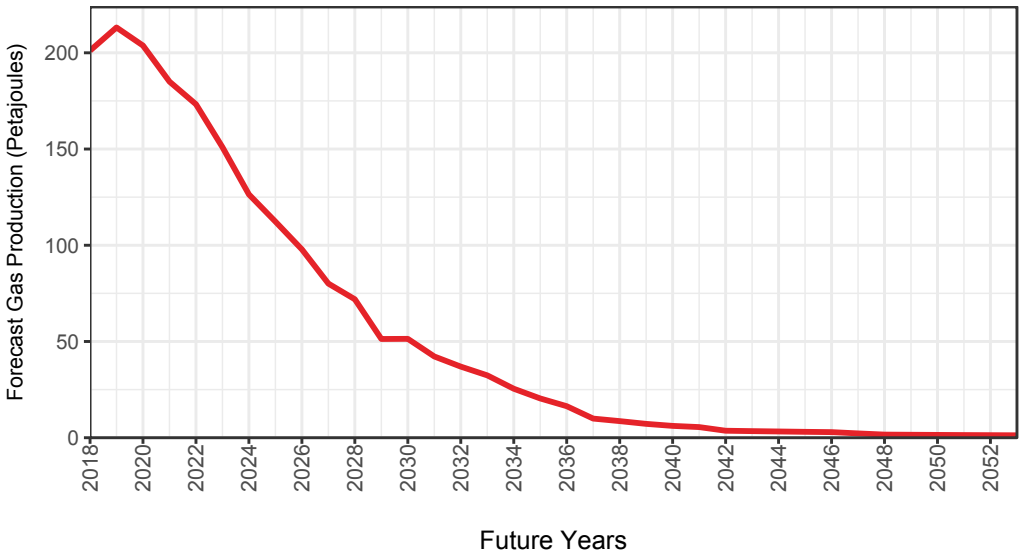
Figure 9: Estimated Remaining Gas Reserves by Field – 2017



As field operators review their reserves, it is not uncommon for reserve volumes to be updated. Figure 9 reflects the estimated remaining gas reserves, by field. This year, Mangahewa increased its estimates of 2P gas reserves from 289 PJ to 417 PJ. If other fields identify new areas in known fields with greater gas volumes, then the reserves figures may change again.

4 ccfgroup.com/newscenter/newsview.php?Class_ID=D00000&Info_ID=20180110012

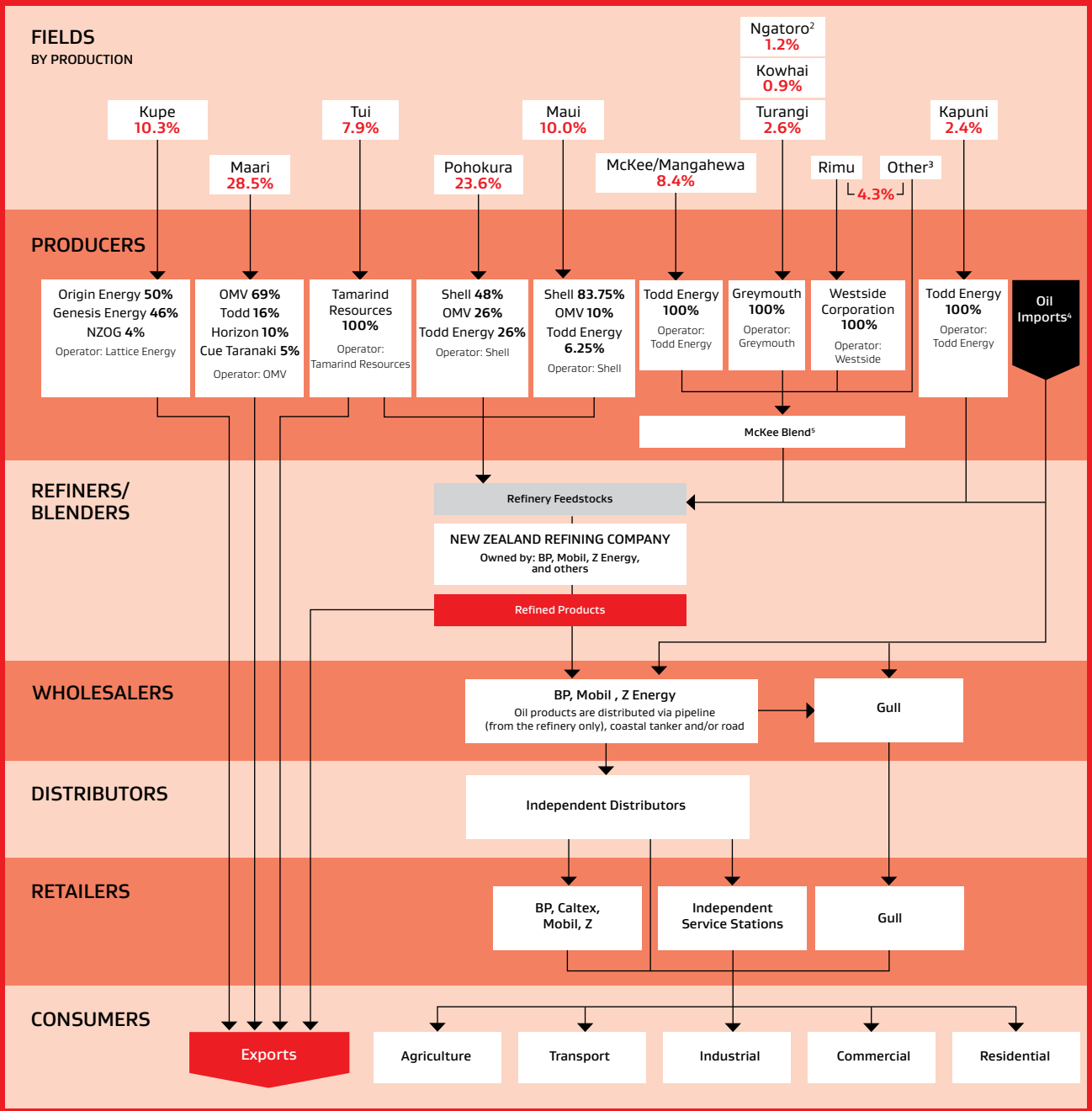
Figure 10: Forecast Gas Production Profile



Overall gas reserves as of 1 January 2018 were approximately 1917 PJ. Contingent resources of gas were around 1655 PJ. If natural gas consumption remains at current levels, then Figure 10 reflects the size and duration of New Zealand's natural gas reserves.

Oil and Gas

OIL



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: **Greymouth** is Greymouth Petroleum Holdings Limited, **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), **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.

Notes:

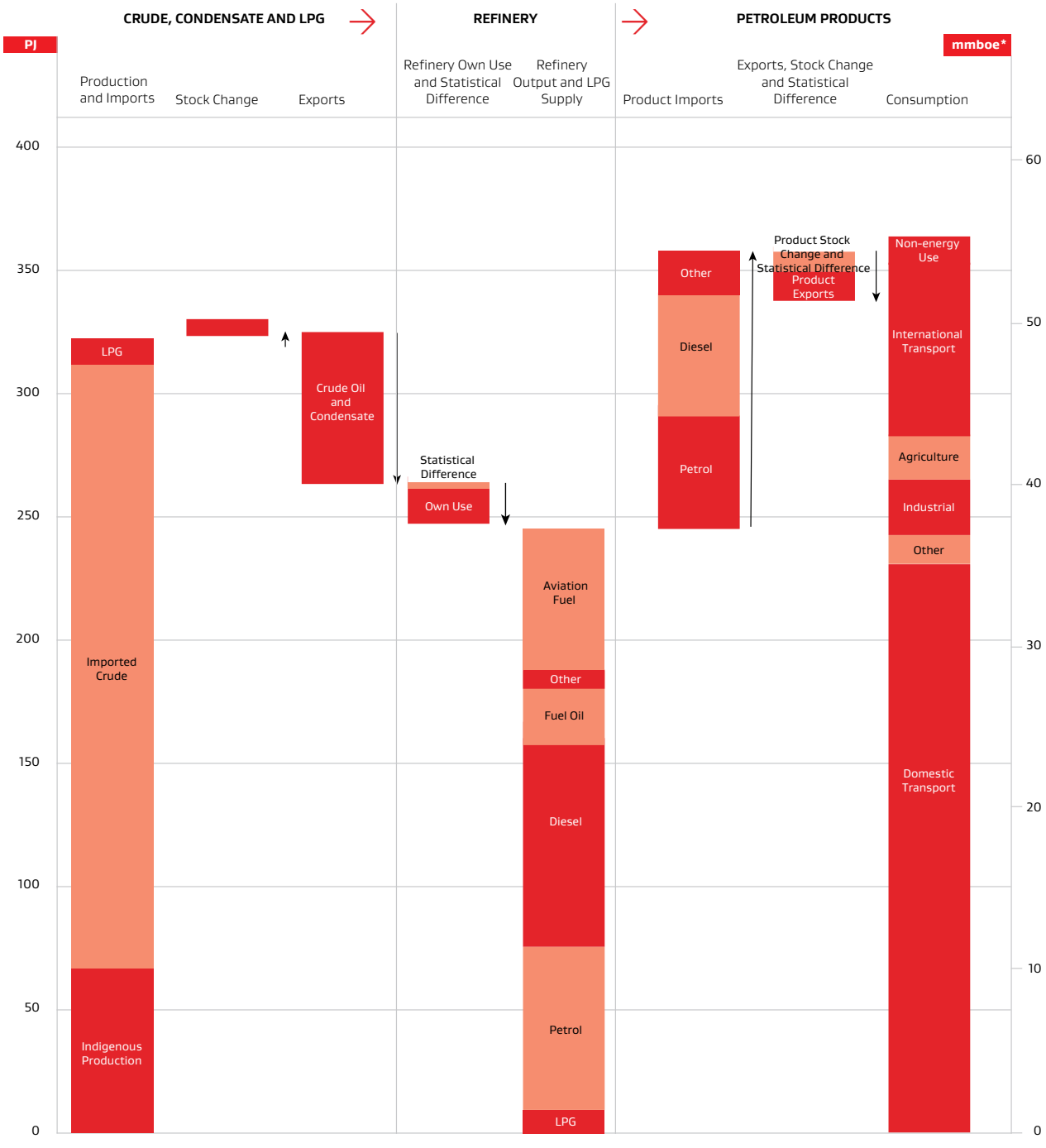
1 Ownership as at 31 December 2017.

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.

5 Source: Shell NZ Limited.



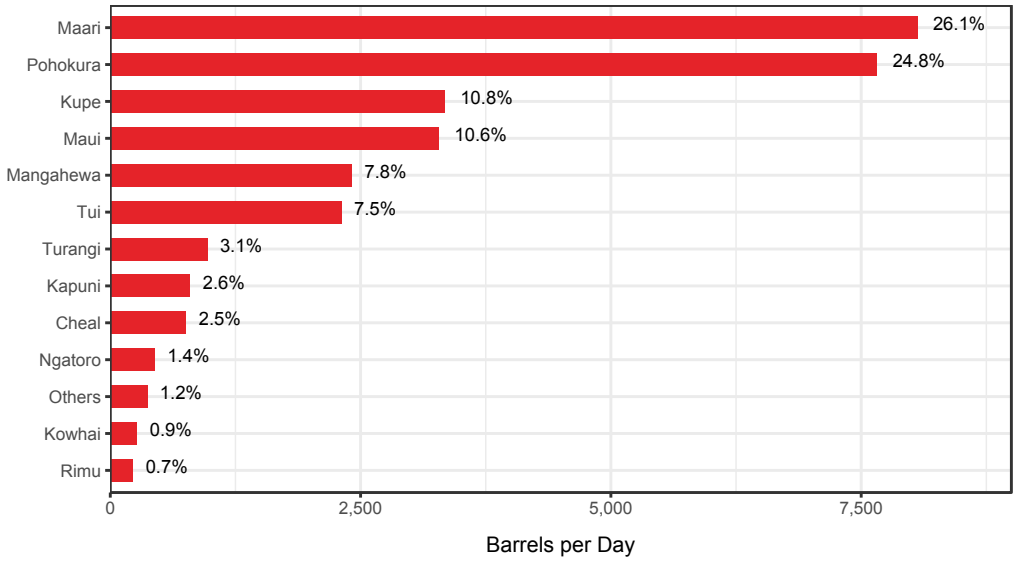
*Million barrels of oil equivalent.

Indigenous Oil Production

Oil volumes are measured in units of "barrels", which is abbreviated "bbls". The abbreviation "bbls" comes from "Blue Barrels". Historically, Standard Oil used to paint their barrels blue to assure everyone they were of a standard size. The industry standard abbreviation is now "bbl". There are 158.987 litres in a barrel. The abbreviation "mmbbls" refers to a million barrels, or 158,987,295 litres of oil.

Indigenous production of crude (including condensate, naphtha, and natural gas liquids) fell by 11% (1.4 mmbbls) to 11.3mmbbls in 2017. This was largely driven by reductions in output at Pohokura, Maari and Tui. This also partially led to a reduction in exports of crude oil products of 0.7mbbls to 10.3 mmbbls, a reduction of 6%.

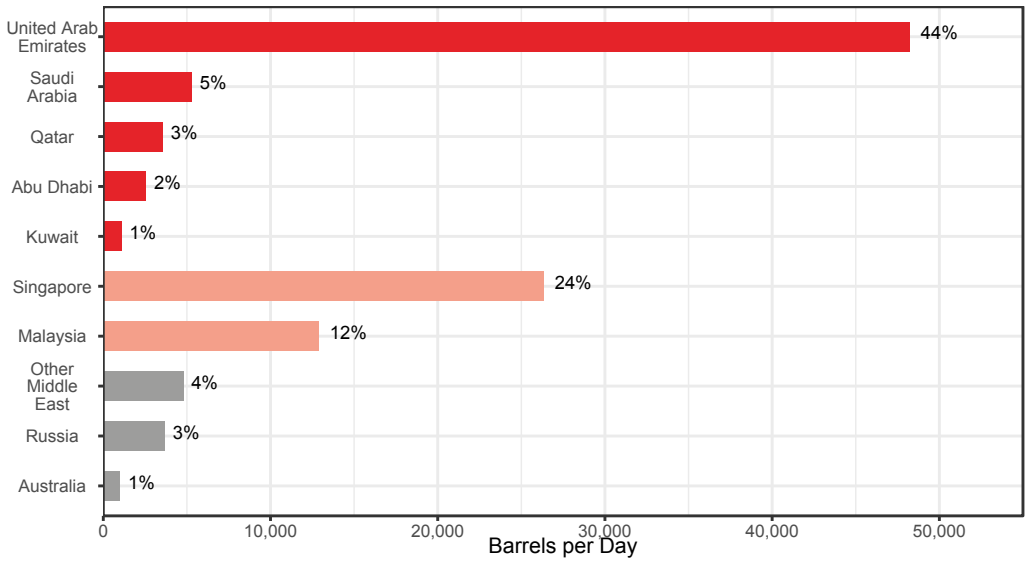
Figure 11: Oil Production by Field – 2017



Imports

In 2017, the Marsden Point refinery had a crude intake of 41.7 million barrels of crude oil.[5] Based on a daily capacity of 135,000 barrels of crude[6], this represents around 85% of the potential crude intake achievable.

Figure 12: Crude Imports by Origin



Petrol imports grew by 8% (0.66 mmbbls), with regular growing by 5% (0.31 mmbbls) and premium growing by 18% (0.35 mmbbls). Diesel imports declined by 2%.

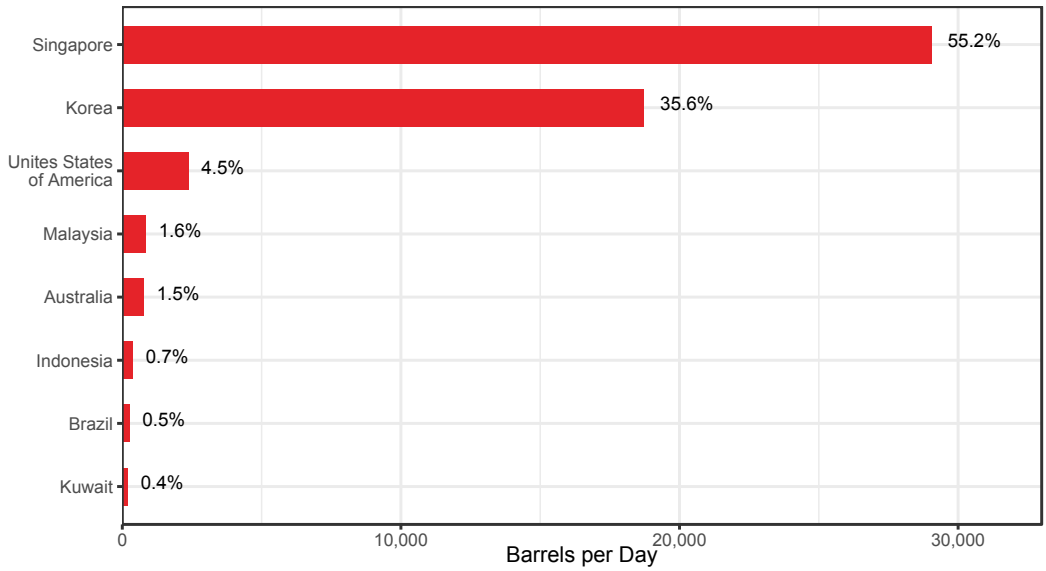
Aviation fuel imports increased by 28% (0.47 mmbbls). According to the International Visitor Survey[7], 2017 saw a 7% growth in visitor arrivals overall. This included a 14% growth in US visitors, and a 13% growth in UK visitors. This increase in long haul flights will be contributing to the increases in jet fuel consumption.

5 https://www.refiningnz.com/refininglogin/wp-content/uploads/2018/06/annual_report_2017.pdf

6 https://www.refiningnz.com/media/key-facts/

7 http://www.mbie.govt.nz/info-services/sectors-industries/tourism/tourism-research-data/ivs/documents-image-library/folder-infographic-files/ivs-infographic.pdf

Figure 13: Oil Product Imports by Country



Refinery Activity

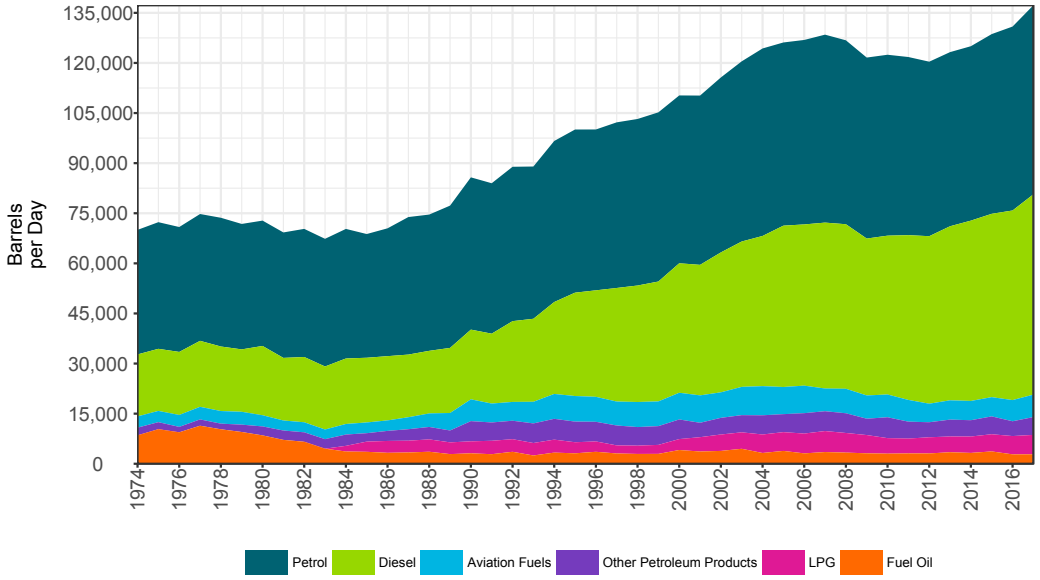
Overall refinery output was down 2% (0.84 mmbbls) in 2017, within normal refinery output fluctuations. The long run trend for refinery output is still growing.

Upgrades to the Refinery to Auckland Pipeline (RAP) have added capacity to provide fuel to the Wiri fuel station. After the successful completion of the third and final phase of the upgrades, the pipeline will be capable of 15% greater deliveries.[8]

8 https://www.refiningnz.com/refininglogin/wp-content/uploads/2018/06/annual_report_2017.pdf

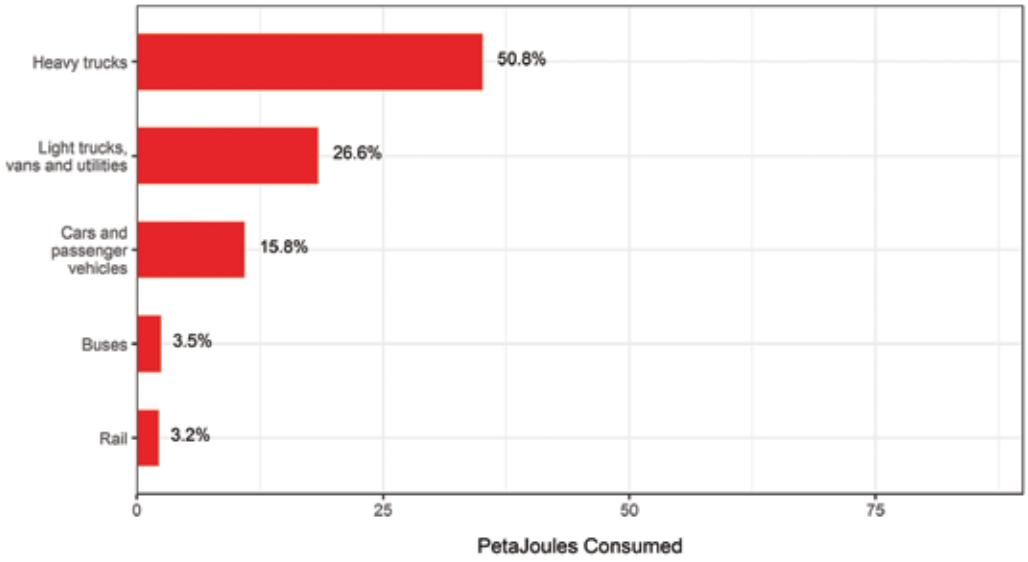
Consumption

Figure 14: Observed Oil Products Consumption



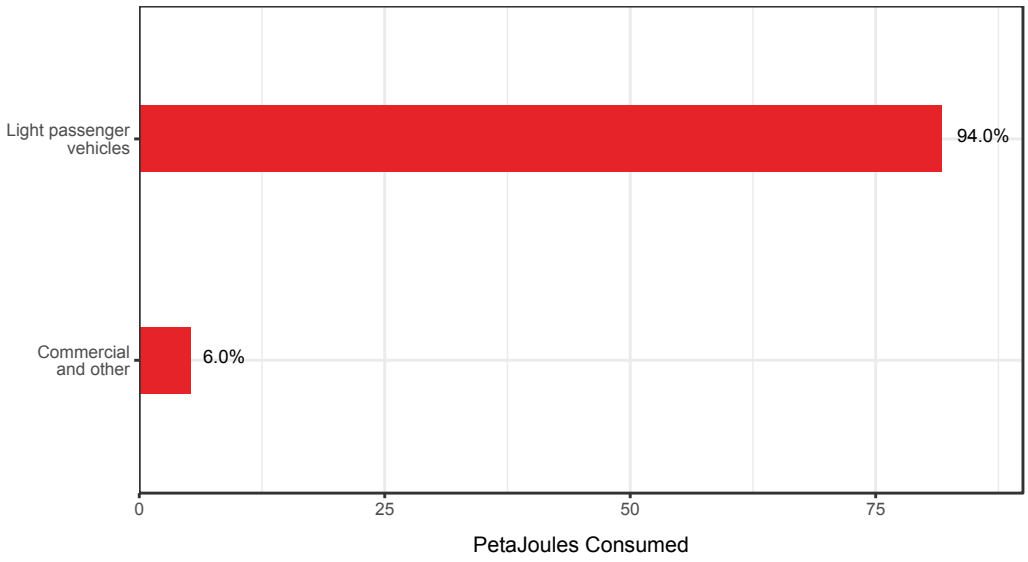
Overall fuel consumption was up 4% (2mmbbls). This was driven by increases in the Commercial and Domestic Transport sectors.

Figure 15: Transport Diesel by Mode



Growth in Commercial activity was again driven by increases in diesel consumption, which grew 14% (0.11 mmbbls). The remaining increases occurred in petrol and LPG consumption.

Figure 16: Transport Petrol by Mode



Domestic Transport grew by 6% (2.24 mmbbls). Much of this growth was in diesel consumption, which grew 10% (1.43 mmbbls). This aligns well with the growth in diesel vehicle registrations, which grew 14% from 61,835 in 2016 to 70,706 in 2017.[9] Petrol consumption grew by 3%. This is also reflected in growth in petrol vehicle registrations, which grew 7% from 240,111 to 256,602.

Stock levels

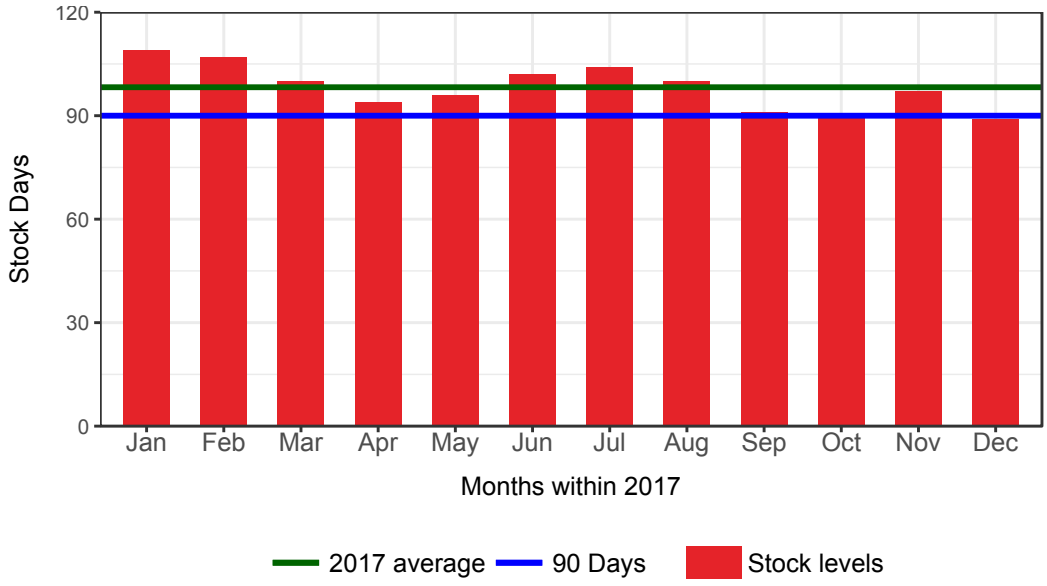
New Zealand has officially been a member of the International Energy Agency (IEA) since 1976. The IEA was set up in 1974 in response to major oil market disruptions in 1973/74. Member countries must demonstrate they have access to stocks of crude oil and/or oil products equivalent to not less than 90 days of their prior year's average net oil imports. The year is defined as the year ending March, so each April the Net Daily Import target is amended based on the calculations.

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 2017 was 98 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 that import and hold large stocks of oil products for their own use. Lower month-end stock levels can occur if an import shipment is delayed.

9 Table 1F: Light registrations by average CO2 and fuel – www.transport.govt.nz/resources/vehicle-fleet-statistics/quarterly-fleet-statistics-data-tables-january-to-march-2018-update/

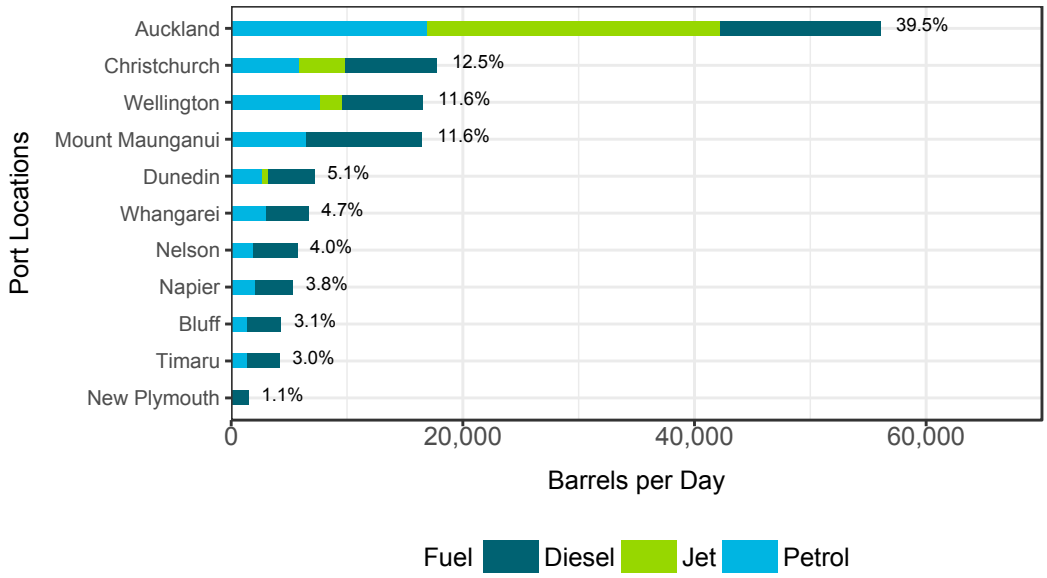
Figure 17: Oil Stocks for 2017



Port offtakes

Fig 18 shows offtakes by fuel for 2017.

Figure 18: Diesel, Petrol, Jet Offtakes in 2017



Port offtakes are a general indicator of regional fuel demand; however, fuel is transported between regions, decreasing the interpretation of offtakes as a regional measure. For example, New Plymouth is sometimes served by Wellington ports and Mount Maunganui often provides fuel throughout the North Island.

Some regions are serviced by multiple terminals. Auckland includes Wiri and Auckland terminal; and Wellington includes Seaview, Miramar and Kaiwharawhara. The bulk of Auckland's fuel flows through the Wiri terminal, which is serviced by the Refinery to Auckland Pipeline (RAP). This dependence was why the RAP interruption in 2017 drew so much attention.

Figure 18, nevertheless, provides an indicative measure – with unknown error – for how oil fuels might regionally be demanded.

Terminal fuel storage

Figure 19: Terminal Fuel Capacities 2017

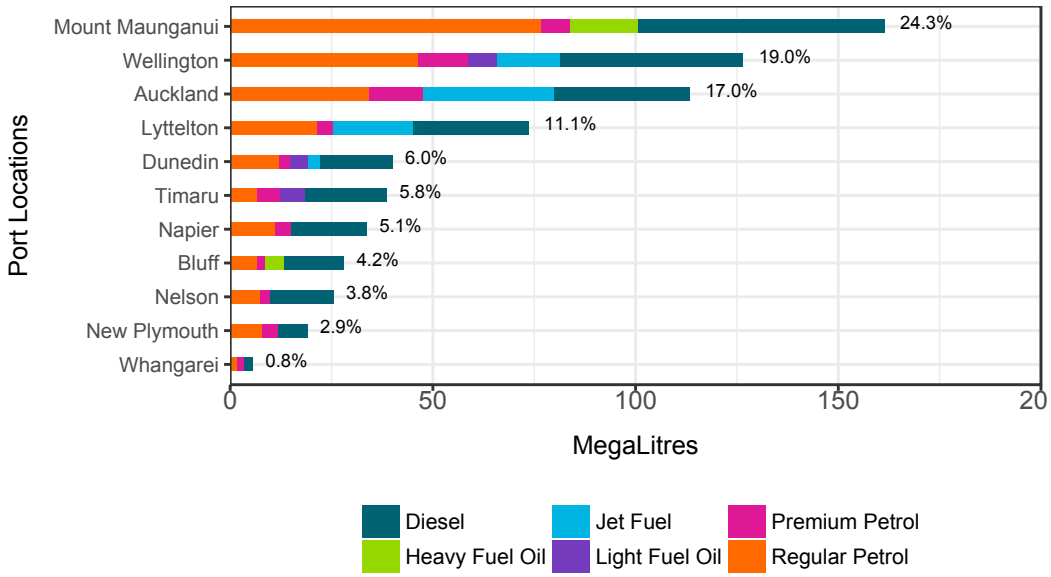


Fig 19 shows the net fuel capacities by type and terminal. Tank capacities include some volume of fuel at the bottom of a tank that is not generally accessible. Net fuel capacities subtract this volume from the overall volume of the tank.

Terminals generally have tanks offline for a small proportion of time to allow for cleaning and maintenance.

RAP incident

One of the most notable occurrences in the 2017 oil market was the disruption to the Refinery to Auckland Pipeline (RAP). On 14 September a leak was discovered on the RAP through monitoring at Refining NZ's control room. Subsequent aerial survey identified the source of the leak on a rural property in Ruakaka, approximately 8km south of the refinery.[10] The outage lasted 10 days from the time it was identified to when fuel began to flow through the pipeline again. During this time there was a concerted effort by Government and the major oil companies to ensure continuity of supply throughout the Auckland region.

Background

The RAP is a 170km long pipeline connecting the Marsden Point Refinery to the Wiri terminal in Auckland. Most of the fuel supplied to the Auckland region (including the Waikato) passes through the RAP, with a small amount entering through Auckland port directly. All of the jet fuel supplied to Auckland airport flows through the RAP. The RAP can transmit around 320,000L of fuel per hour.[11]

The pipeline carries jet fuel, petrol, and diesel. Each fuel is pumped through the pipeline one after the other. The boundary between the fuels results in some mixing and this is then reblended at the Wiri terminal.[12]

It takes around 24 hours for fuel to get from the refinery to the Wiri terminal. Volumes of petrol and diesel passing through the Wiri terminal have been relatively stable since around 2010, but jet fuel has been on the increase since late 2015. Wiri normally sees around 75 million litres per month of regular petrol, 15 million litres of premium petrol, and around 55 million litres of diesel. Jet fuel has increased from around 90 million litres per month in 2014, to around 145 million litres per month at the end of 2017.

Response to RAP incident

Fuel demand during the pipeline outage was largely managed by industry, with some assistance from the Government. Increased numbers of fuel trucks were employed to move fuel from the refinery to Auckland, and some fuel was transported by ship to Auckland port. Additional supplies of fuel were transported by fuel truck from Mount Maunganui. The pipeline was repaired in 10 days, with the first batch of fuel arriving at Wiri terminal around 10am on Sunday 24 September.[13] The pipeline was running at reduced capacity after the repair, and expected to return to full capacity approximately halfway through 2018.

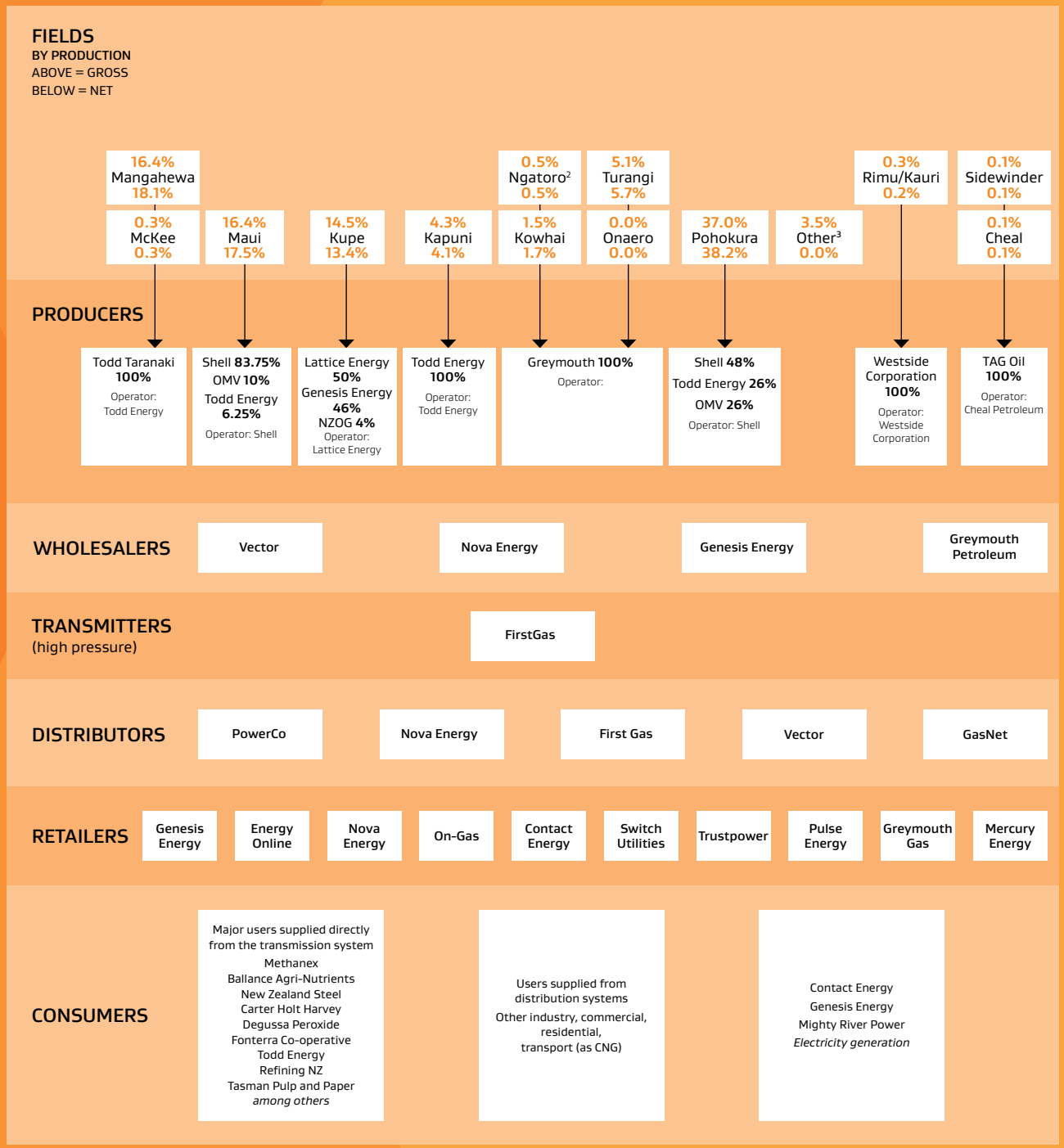
Observed effects

The Ministry of Business, Innovation and Employment (MBIE) collects data on the petroleum market from various organisations including Coastal Oil Logistics Limited (COLL), Refining NZ, and the major oil companies. This includes data on stock levels, imports, refinery output, and terminal throughput. When overall industry stock levels in 2017 were compared to stock levels in previous years at both annual and quarterly resolution, there was no apparent difference. Stock levels were within an expected range given historical volatility. While overall refinery output was 2% lower than 2016, both diesel and jet fuel output increased. Diesel output grew by 6% and jet by 5%. Although the pipeline outage would undoubtedly have had some impact, it is difficult to know just how much to attribute. Data for terminal throughput (the amount of fuel that passed through each terminal) shows reduced volume at Wiri for September, but when data is aggregated to quarterly level, this reduction is shown to be quite modest. Mount Maunganui, and the Truck Loading Facility at Marsden Point, show slight increases for the September period. This is to be expected since these two facilities were used during the RAP outage to bolster supplies to the region.

10 https://www.refiningnz.com/refininglogin/wp-content/uploads/2018/06/annual_report_2017.pdf
11 https://www.refiningnz.com/media/key-facts/
12 https://www.refiningnz.com/media/rap-line/
13 https://www.refiningnz.com/refininglogin/wp-content/uploads/2018/06/annual_report_2017.pdf

Oil and Gas

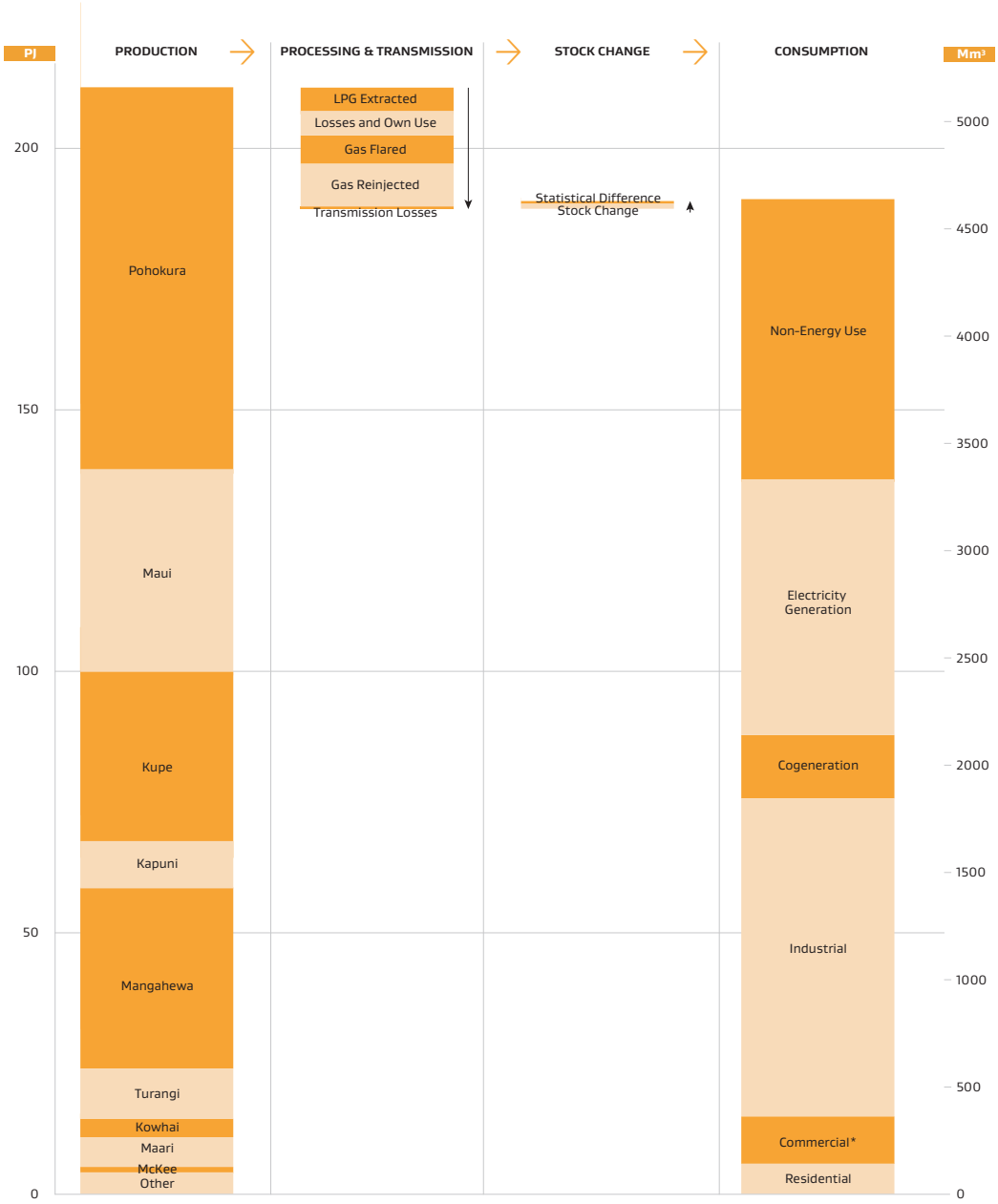
GAS



Company names are listed without the suffi xes "Limited" and "New Zealand Limited" where applicable. Greymouth is Greymouth Petroleum 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 Contact Energy (51% owned by Origin), 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, Nova Energy is Nova Energy Limited.

Notes:

1 Gas ownership as at year end 2017; excludes LPG. Does not show changes in ownership that occurred after 31 Dec 2017.
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 and operated by Tamarind Resources. 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.



* Includes transport, agriculture, forestry and fishing.

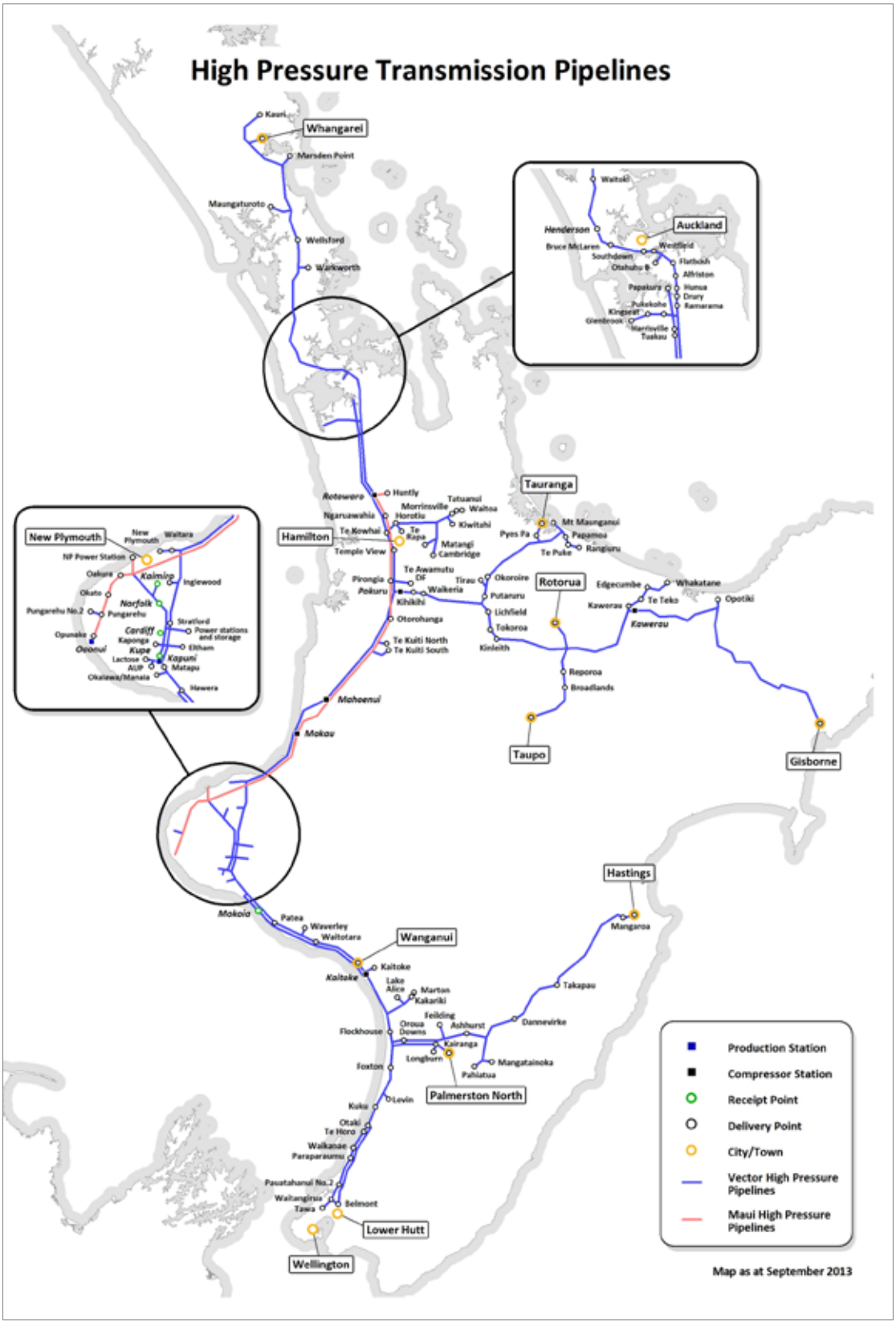

High Pressure Transmission Pipelines
Whangarei
Kauri
Marsden Point
Maungaturoto
Wellsford
Warkworth
Auckland
Waitoki
Henderson
Bruce McLaren
Westfield
Southdown
Otahuhu B
Flatbush
Albriston
Papakura
Hunua
Drury
Ramarama
Pukekohe
Kingseat
Glenbrook
Harrisville
Tuakau
Tauranga
Mt Maunganui
Papamoa
Pyes Pa
Te Puke
Rangiuru
Hamilton
Te Kowhai
Te Kapa
Matangi
Cambridge
Temple View
Rotorua
Edgecumbe
Whakatane
Te Teko
Opotiki
Kawerau
Okoroire
Tirau
Putaruru
Lichfield
Tokoroa
Kinleith
Reporoa
Broadlands
Taupo
Gisborne
Huntly
Tatuanui
Waitoa
Morrinsville
Horotiu
Ngaruawahia
Kiwitahi
Te Awamutu
Pirongia
Pokuru
Kihikihi
Walkeria
Otorohanga
Te Kuiti North
Te Kuiti South
Mahoenui
Mokau
New Plymouth
New Plymouth
Waitara
NP Power Station
Oakura
Kaimiro
Ingiewood
Okato
Norfolk
Pungarehu No.2
Pungarehu
Stratford
Cardiff
Power stations and storage
Opunake
Kaponga
Eltham
Ohaanui
Kupe
Kapuni
Lactose
AUP
Matapu
Okaiawa/Manaia
Hewera
Mokoia
Patea
Waverley
Waitotara
Wanganui
Kaitoke
Kaitoke
Lake Alice
Marton
Kakariki
Feilding
Flockhouse
Oroua Downs
Ashhurst
Kairanga
Longburn
Foxton
Palmerston North
Pahiatua
Mangatainoka
Dannevirke
Takapau
Hastings
Mangaroa
Kuku
Levin
Otaki
Te Horo
Waikanae
Paraparaumu
Pauatahanul No.2
Waitangirua
Tawa
Belmont
Lower Hutt
Wellington
Production Station
Compressor Station
Receipt Point
Delivery Point
City/Town
Vector High Pressure Pipelines
Maui High Pressure Pipelines
Map as at September 2013

Table 9: Gas Supply, Transformation and Consumption (Petajoules)

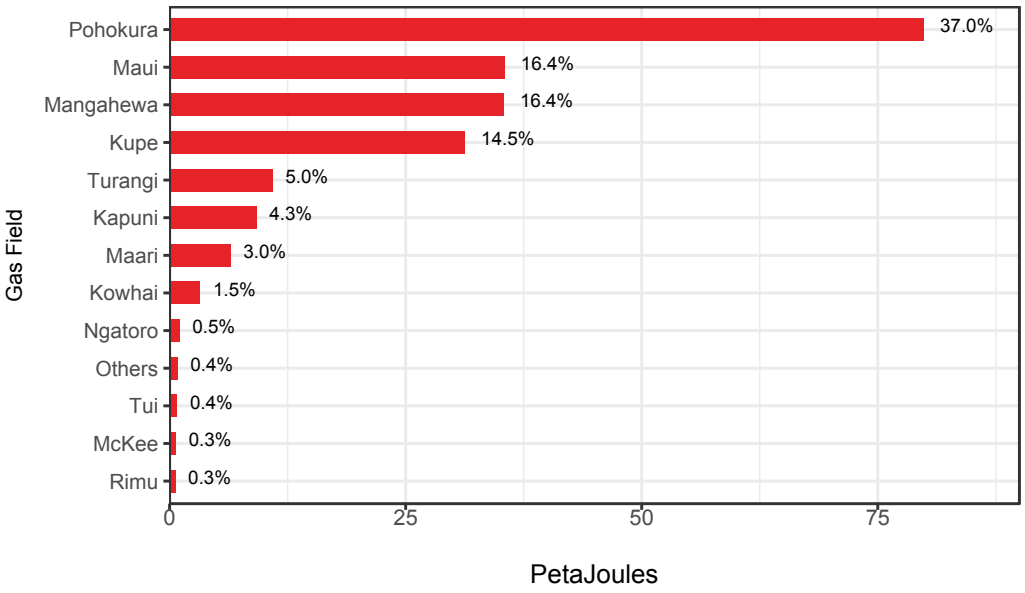
Measure	Fuel Type	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Supply	Supply	190.79	188.83	-1.97	-1.0%
Energy Transformation	Electricity Generation	36.81	46.23	9.42	25.6%
	Cogeneration	12.24	13.53	1.29	10.5%
	Transmission and distribution losses	0.64	0.69	0.05	7.8%
Non-Energy Use	Non-Energy Use	58.15	53.32	-4.83	-8.3%
Consumption	Agriculture, Forestry and Fishing	1.28	1.45	0.17	13.3%
	Basic Metals	2.41	2.47	0.06	2.5%
	Chemicals	39.16	32.85	-6.31	-16.1%
	Commercial	7.94	7.92	-0.02	-0.3%
	Food Processing	14.12	17.19	3.07	21.7%
	Other	3.01	3.68	0.67	22.3%
	Residential	6.36	6.75	0.39	6.1%
	Transport	0.01	0.01	0.00	0.0%
	Wood, Pulp, Paper and Printing	4.52	5.68	1.16	25.7%

Table 10: Gas Net Production – by Field (Petajoules)

Field	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Pohokura	74.55	71.97	-2.58	-3.5%
Maui	34.12	33.07	-1.05	-3.1%
Kowhai	3.94	3.19	-0.75	-19.0%
Kapuni	8.39	7.78	-0.61	-7.3%
McKee	1.11	0.65	-0.46	-41.4%
Rimu	0.58	0.32	-0.26	-44.8%
Others	0.23	0.06	-0.17	-73.9%
Coppermoki	0.12	0.01	-0.11	-91.7%
Ngatoro	1.07	1.02	-0.05	-4.7%
Cheal	0.40	0.38	-0.02	-5.0%
Waihapa	0.03	0.07	0.04	133.3%
Sidewinder	0.08	0.14	0.06	75.0%
Kupe	25.16	25.28	0.12	0.5%
Turangi	10.12	10.71	0.59	5.8%
Mangahewa	30.90	34.18	3.28	10.6%

Supply

Figure 20: Gross Gas Production by Field



Overall, gas supply fell 1% (1.9 PJ) compared to 2016. There were some significant changes at field level in 2017 with Mangahewa recording 11% (3.3 PJ) higher net production from 2016 (Table 10). Offsetting Mangahewa's increase were reductions at Pohokura (down 3%, 2.6 PJ), Kowhai (down 19%, 0.8 PJ), Kapuni (down 7%, 0.6 PJ), and McKee (down 41%, 0.5 PJ).

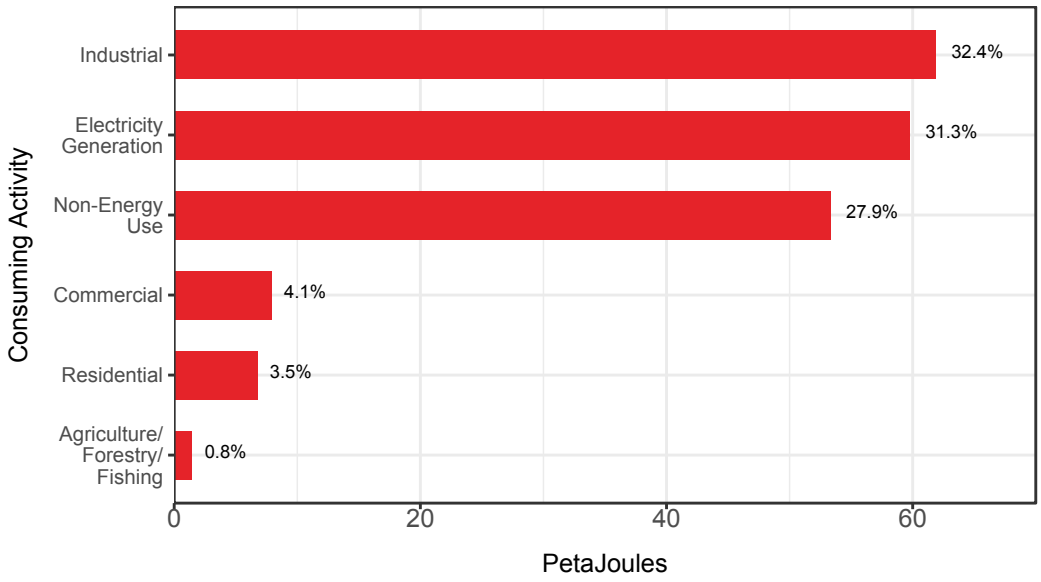
Mangahewa gas production has been steadily increasing over the last few years with the Mangahewa Expansion Train 2 (MET2) project, which was expected to increase production from 20 PJ to 45 PJ per year.

The reductions at Kowhai, Kapuni, and McKee appear to be a result of simple field decline, whereas the reduction in output at Pohokura appears to be within expected volatility given historical performance.

Consumption

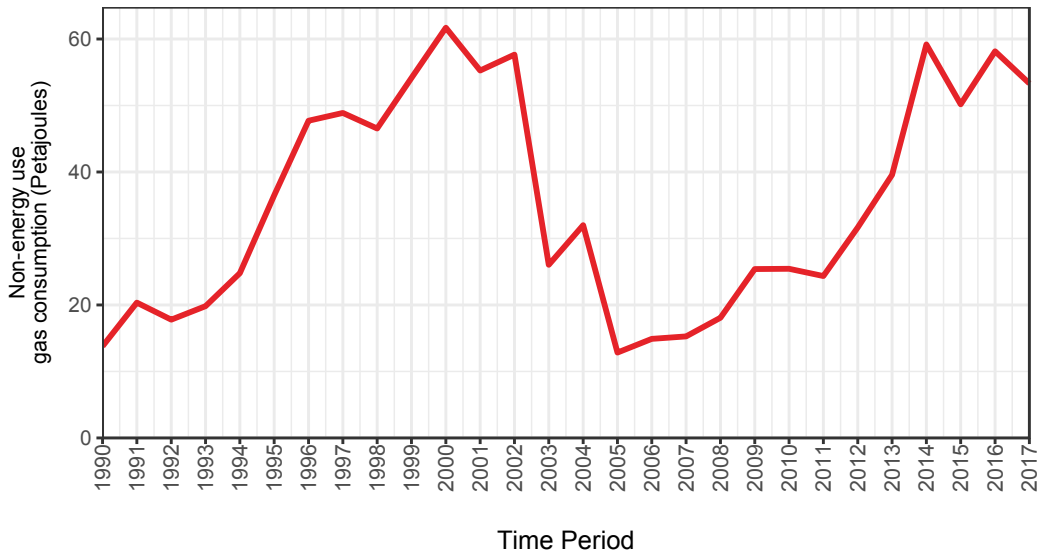
Overall consumption was reduced by 1% from 2016. This was a combination of increases in the Food Processing (22%, 3.1 PJ), and Wood, Pulp, Paper, and Printing (26%, 1.2 PJ) sectors, along with a 16% decrease (6.3 PJ) in the Chemical manufacturing sector.

Figure 21: Gas Consumption by Sector



Methanex experienced planned maintenance and repairs at its Motonui facilities in 2017. This resulted in production decreasing from 2.2 million tonnes in 2016, to 1.9 million tonnes in 2017. This led to a reduction of 8% in non-energy use for the year and much of the consumption decrease in the chemical manufacturing sector.

Figure 22: Non-Energy Use Gas Consumption



Electricity generation from gas grew by 26% (9.4 PJ). Cogeneration grew by 11% (1.3 PJ).

E. RENEWABLES

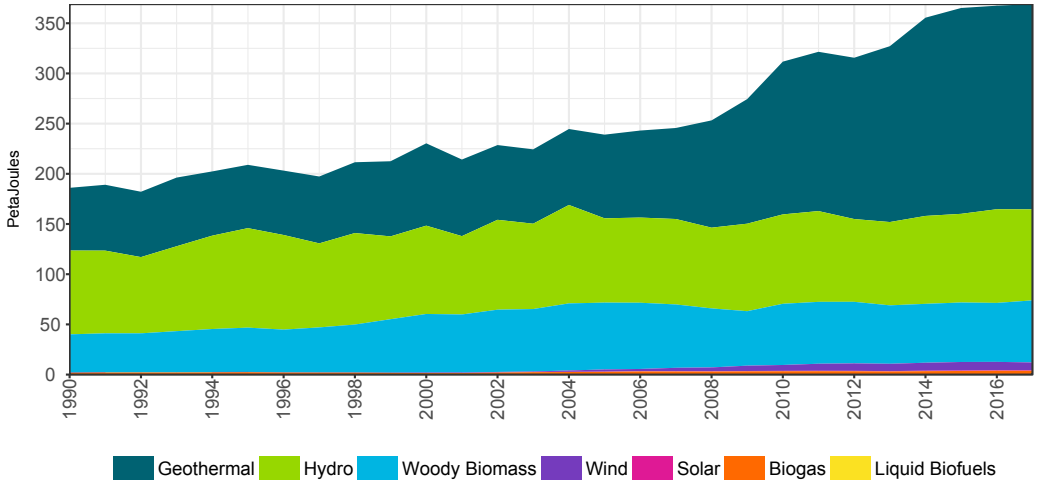
INTRODUCTION

Renewable energy is an important and significant part of New Zealand's energy supply. New Zealand is also a World leader in terms of harnessing our renewable resource, with a very high proportion of our primary energy supply sourced from renewables compared to other countries.

Reliable data is available on the quantity of renewable energy utilised by large industrial users. 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 solar) 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.

Supply overview

Figure 23: Total Renewable Primary Energy Supply



In 2017 New Zealand had the fourth highest renewable primary energy supply in the OECD after Iceland, Norway and Sweden based on the latest data available from the International Energy Agency. The contribution of renewable sources to primary energy supply rose to 369 PJ in 2017, up 2 PJ from the previous year. This represented 39.6% of primary energy supply. Hydro and geothermal energy were the largest contributors to renewable energy supply. Hydro was down slightly to 91 PJ from the high of 93 PJ seen in 2016 which was a particularly good year for hydro.

Renewable electricity generation

Most of New Zealand's renewable energy is used to generate electricity. In 2017, 81.9% of electricity came from renewable sources, down from the 84.8% in 2016. New Zealand's renewable electricity percentage in 2017 was the third highest in the OECD (IEA, 2018) behind Iceland and Norway.

Sources of renewable energy

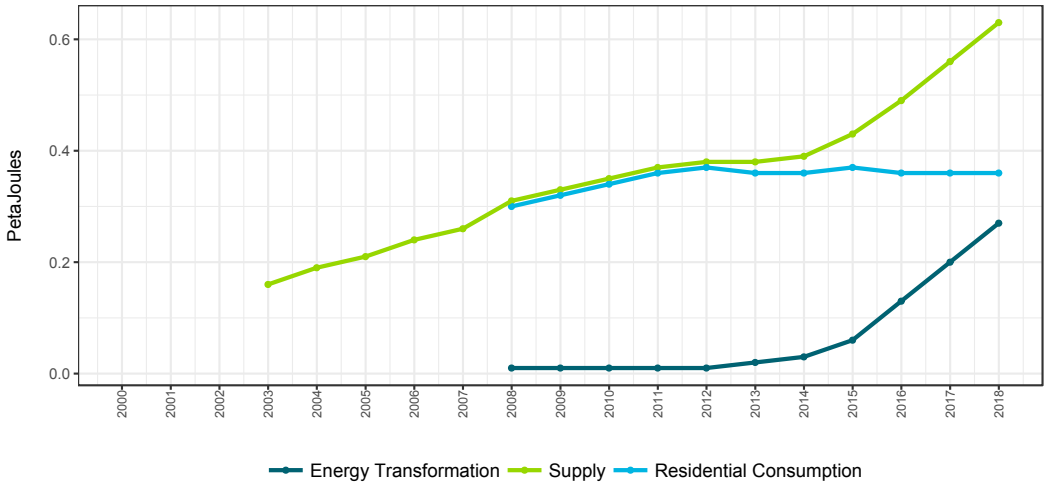
Solar

Solar energy sources include solar thermal and solar PV systems, both of which are predominately used by households on their rooftops (distributed generation). Solar thermal systems collect heat and directly store it in water for later use as space heating or hot water supply. Data on the quantity of energy utilised is not collected, and so the number of systems is estimated.

Solar PV systems use photovoltaic panels to convert sunlight directly into DC electricity and then convert this to AC using an inverter. As these systems have become cheaper their uptake has increased, and 2017 saw an additional 4,330 units (17MW) installed bringing the total to 17,672 (69 MW) by the end of the year (and up to 19,870 (78MW) in July 2018).

Despite this recent growth, solar PV still provides less than 0.2% of total electricity generation. The single largest solar array, rated at 412 kW capacity, is installed at Yealands Estate winery in Marlborough. In contrast, the average residential PV system is around 3 kW.

Figure 24: Solar Power Supply, Transformation and Consumption



Passive solar heating is utilised, to some extent, by most homes and buildings in New Zealand. By combining good design with effective insulation, buildings can collect and store solar energy to provide warmth both day and night. Conversely, overheating is a common problem in many buildings during summer, and passive cooling is often employed to achieve a comfortable temperature. The scale of energy involved is such passive heating and cooling applications will be sizeable, but it is not included in energy statistics which only consider active energy systems.

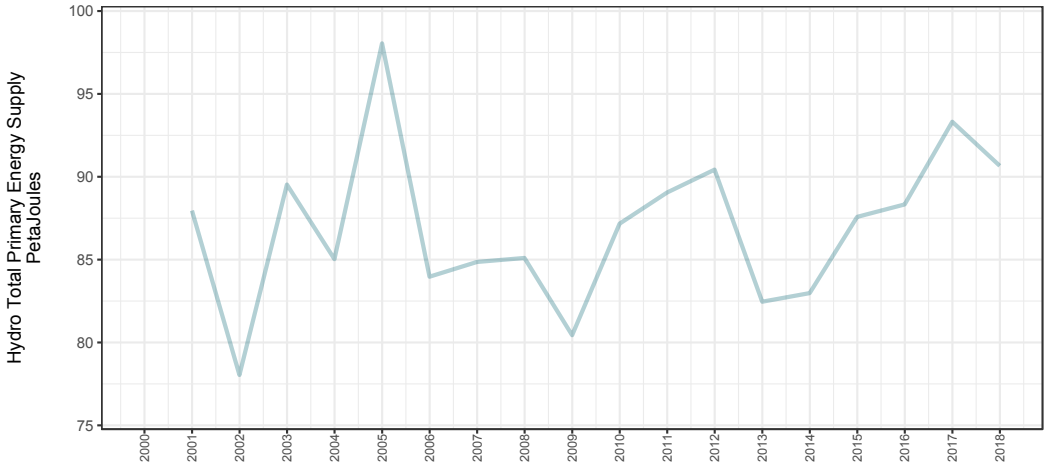
Hydro

New Zealand was a world leader in the deployment of hydro-electric generation.

The first hydro power station in the southern hemisphere has built near Skippers Canyon, north of Queenstown, in 1885 to power a rock crusher at a gold mine several kilometres away. Before this, hydro energy was harnessed using direct-drive water wheels.

Today, there is over 5,000 MW of installed hydro capacity spread over a hundred or so sites, but dominated by the major power stations such as Manapouri (730 MW), Benmore (540 MW), the Upper Waitaki Scheme (848 MW) and Clyde (400 MW).

Figure 25: Hydro Power, Total Primary Energy Supply



Hydro generation typically provides 55% to 60% of New Zealand's electricity supply, or around 24,000 GWh each year out of more than 40,000 GWh of total demand.

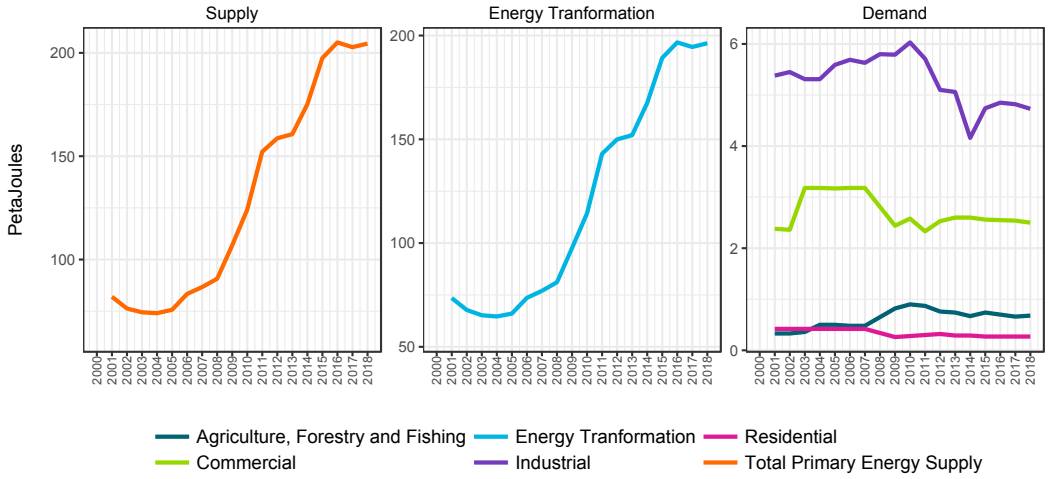
Unfortunately, our hydro storage lakes are relatively shallow, only storing around 4,000 GWh when full, and require regular inflows to maintain lake levels. Without significant amounts of hydro storage, careful management of hydro resources and alternative back-up is required in New Zealand to ensure security of supply during dry period when hydro-generation is constrained.

Geothermal

Geothermal energy is extracted from heat deep beneath the earth's surface. New Zealand is particularly rich in geothermal energy, especially in the Taupo and Kawerau regions.

Geothermal energy has been used for hundreds of years – first by Maori and then by European settlers and tourists. Since the 1950s geothermal energy has increasingly been used as direct energy, such as heating homes, and to generate electricity.

Figure 26: Geothermal Total Primary Energy Supply and Use



Geothermal energy for electricity generation

The main use of geothermal energy in New Zealand is for electricity generation. New Zealand's first geothermal plant, and the world's second, was opened at Wairakei in 1958. In 2017, electricity generation from geothermal accounted for over 17% of New Zealand's total electricity supply.

Geothermal is currently one of New Zealand's cheapest sources of new electricity generation. However, we are unlikely to see additional new geothermal power stations in the next five years or so, due to slow growth in electricity demand and the recent completion of geothermal generating capacity.

We may see additional new capacity in the medium term. Most of New Zealand's installed geothermal generation (about 1010 MW) is situated in the Taupo Volcanic Zone, and another 25 MW is installed at Ngawha in Northland. The temperature and conditions of particular geothermal reservoirs determine which type of generation technology is used: dry steam, flash steam, binary cycle, or a combination.

Geothermal energy for direct use

There is a wide range of direct uses of geothermal energy in New Zealand, which involves using geothermal heat directly, without a heat pump or power plant. In 2017, an estimated 8.2 PJ of geothermal energy was used directly, with 58% of this used in industrial applications, 30% in commercial, and the remainder in residential and agricultural applications.

Kawerau, where geothermal steam is a significant source of energy for pulp and paper mills, was until recently, the world's largest direct geothermal heat use at one location.

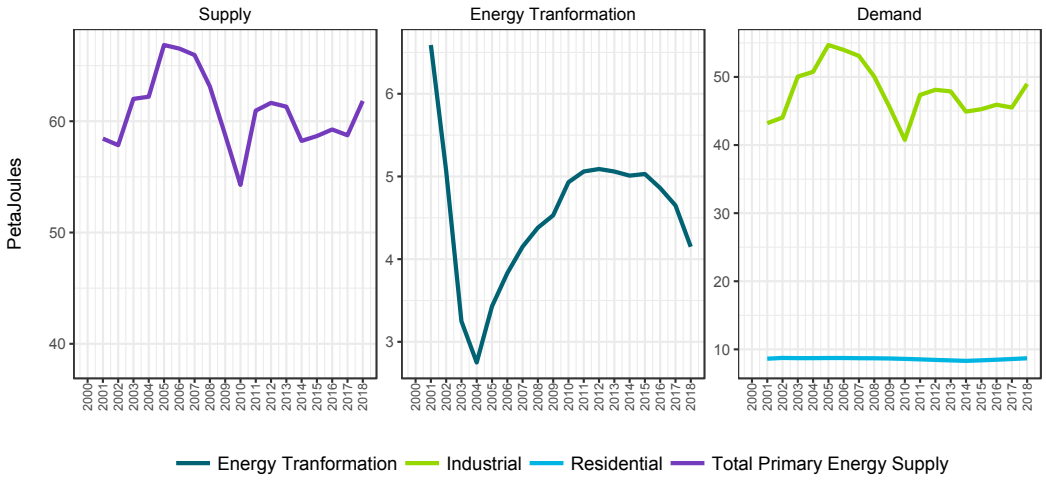
Other existing applications include:

- Timber drying – Tenon's wood processing plant near Taupo uses geothermal energy to heat its timber-drying kilns.
- Aquaculture/tourism – The Huka Prawn Park, near Taupo, is the only geothermally-heated prawn farm in the world. Heated discharge water from the Wairakei geothermal power station helps heat the ponds.
- Horticulture – The use of geothermal energy to heat the glasshouses of Rotorua-based PlentyFlora and Taupo-based Gourmet Mokai has reduced production costs for flowers (PlentyFlora) and tomatoes/capsicums (Gourmet Mokai).
- Milk drying – The Maori-owned dairy company Miraka, based near Taupo, is the first milk drying facility in the world to use geothermal energy.
- Space heating – Rotorua Hospital uses geothermal energy – via a heat exchanger – for space heating and hot water heating. The system, commissioned in 1977, has proven to be a very reliable source of energy.

Wood

The majority of woody biomass is used at just a few industrial pulp and paper mills to provide heat energy and to generate electricity (cogeneration). A smaller quantity is used by households for space heating. Reasonable quality data exists for the former (49 PJ), while the latter (8.7 PJ) is estimated using census data on the proportion of households with wood burners and other basic assumptions.

Figure 27: Wood, Total Primary Energy Supply and Use Production and Use



Black liquor

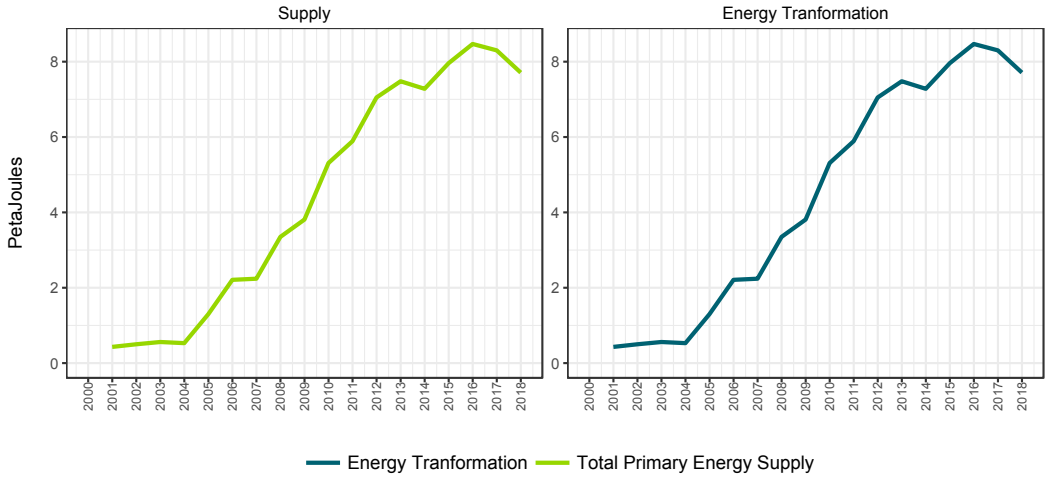
Also called sulphite lyes, black liquor is a by-product derived from wood and is utilised for energy at several industrial sites in New Zealand. Black liquor is an alkaline spent liquor from the digesters in the production of sulphate or soda pulp during the manufacture of paper where the energy content derives from the lignin removed from the wood pulp. It is burnt through recovery boilers to produce process heat and recover chemicals that can be reused in chemical pulp production.

Wind

New Zealand has a world class wind resource.

There are currently 17 wind farms operating in New Zealand, comprised of 490 turbines with a total capacity of 690 MW. 2017 was not a great year for wind generation. While wind provided 5% (2,120 GWh) of electricity supply in 2017, this was down 7% on the 2016 level and down 9% on the 2015 level. During 2017 the average capacity factor was around 35% (i.e. a lot of the time the wind was not blowing), which was the lowest since 2011.

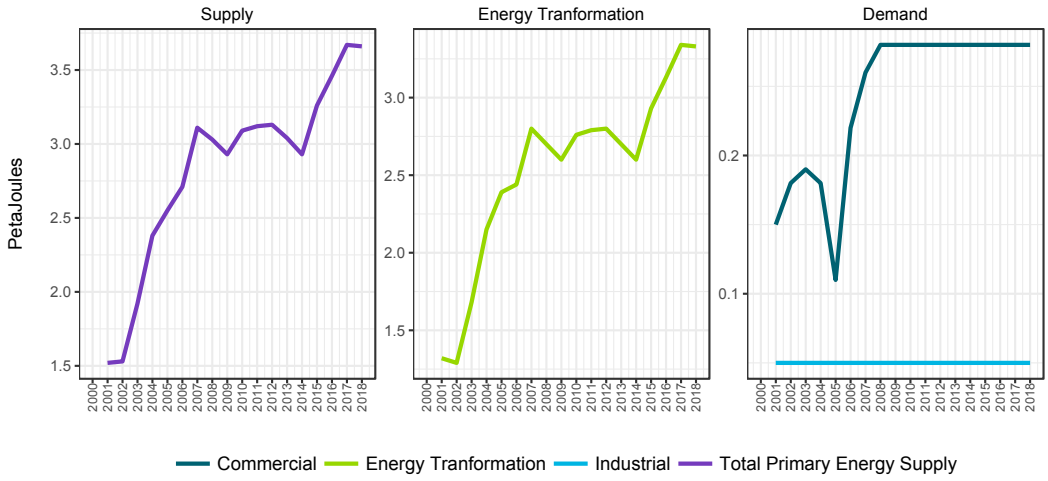
Figure 28: Wind, Total Primary Energy Supply and Use



Biogas

Coming from a variety of non-fossil sources, biogas is primarily a mixture of methane and carbon dioxide, and is combusted to produce heat and/or electricity.

Figure 29: Biogas, Total Primary Energy Supply and Use



Sludge gas

Sludge gas is derived from the anaerobic fermentation of biomass and solid wastes from sewage. Sludge gas is produced at the Tirau dairy processing facility. Cattle effluent is utilised to produce sludge gas that is used to raise heat for the milk processing facility, which is open from September through to December each year. Sludge gas is also produced at a number of municipal wastewater treatment plants around the country, where it is used to generate electricity.

Landfill gas

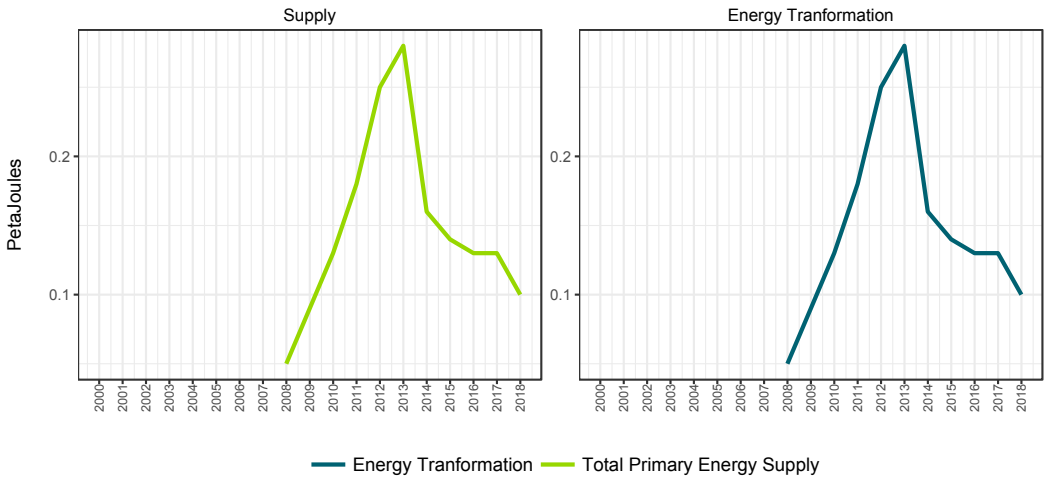
Landfill gas is derived from the anaerobic fermentation of biomass and other organic solid wastes in landfills. There are around a dozen or so sites around the country which collect landfill gas and use internal combustion engines to produce electricity.

Liquid Biofuels

Bioethanol

In New Zealand, bioethanol is produced and imported from sustainable sources. Bioethanol is produced by fermenting whey, a cheese by-product, and also from the waste of beer fermentation, 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.

Figure 30: Liquid Biofuels, Total Primary Energy Supply and Use



Biodiesel

In New Zealand, biodiesel is currently produced from tallow, oilseed rape and used cooking oil, resulting in life-cycle greenhouse gas emissions 40% to 50% lower than those from fossil diesel. Since used cooking oil is a waste product and oilseed rape is grown as a break crop on grain fields to increase soil quality, they don't compete with food production or compromise biodiversity or soil quality.

Tallow can be used in food such as shortening and pemmican, so it's conversion to biodiesel raises the controversial food versus fuel dilemma. While pure biodiesel (B100) can be used in some equipment, it is commonly blended at 5% with petrodiesel (B5) for use in vehicles.

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.

Overview

Table 11: Electricity Generation, Distribution and Consumption (Petajoules)

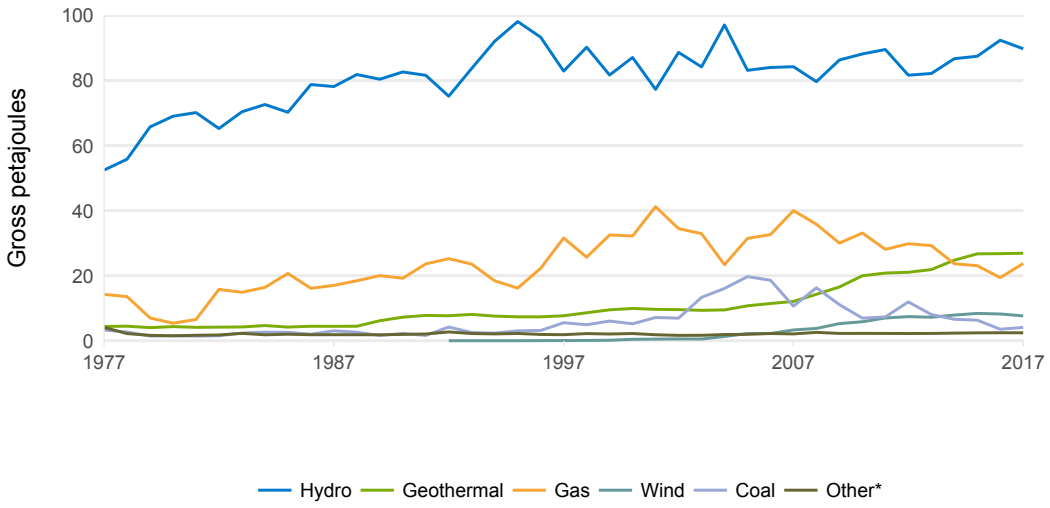
Measure	Fuel Type	2016-12-31	2017-12-31	Dec-on-Dec	% Change
Net Generation (PJ)	Hydro	92.39	89.76	-2.63	-2.9%
	Geothermal	26.77	26.89	0.12	0.5%
	Gas	19.39	23.73	4.33	22.3%
	Wind	8.22	7.63	-0.59	-7.2%
	Coal	3.53	4.08	0.55	15.7%
	Wood	1.19	1.09	-0.10	-8.4%
	Biogas	0.87	0.88	0.01	1.6%
	Waste Heat	0.18	0.17	-0.01	-8.8%
	Solar	0.20	0.27	0.07	35.0%
	Oil	0.01	0.02	0.01	76.9%
Total Line Losses	Losses – Distribution	5.61	5.52	-0.09	-1.6%
	Losses – Transmission	5.03	4.95	-0.08	-1.5%
Consumption (PJ) – historically consistent methodology	Industrial:	52.29	52.59	0.31	0.6%
	Residential	44.03	43.91	-0.12	-0.3%
	Commercial (incl. Transport)	34.33	34.52	0.19	0.5%
	Agriculture, Forestry and Fishing	9.24	9.08	-0.15	-1.6%
	Unallocated Onsite Generation	2.70	2.70	0.00	0.0%

Electricity demand rose 0.2 per cent, driven by increased demand from the industrial and commercial sectors. Despite low hydro inflows in the South Island and an increased need for fossil-fueled generation, increased North Island hydro generation and higher output from geothermal plants saw 82 per cent of electricity generated in 2017 come from renewable sources.

Generation

In 2016 high storage levels led to increased hydro generation, resulting in 85 per cent of electricity generation being from renewables. This trend continued at the beginning of 2017, with rainfall leading to high levels of inflows and above average storage in both islands.

Figure 31: Generation by Fuel Type



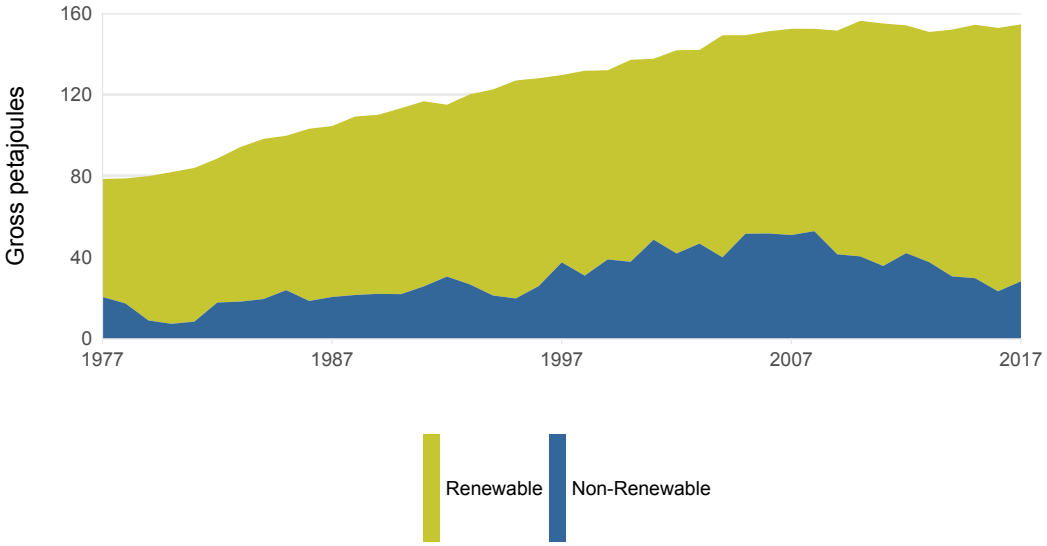
The North Island continued to experience strong inflows, with hydro generation in the North Island reaching its highest level since 2004. The South Island, in contrast, saw more variability in its hydro generation over the rest of the year, where low inflows saw South Island hydro generation in winter fall to its lowest level since 2012. Higher rainfall in spring saw a recovery in output, but warm and dry conditions in the South Island towards the end of the year saw hydro generation decline again.

With two-thirds of the country's hydro capacity in the South Island, the increase in hydro generation from the North Island was not enough to compensate for the reduced output from South Island hydro. This resulted in national hydro generation falling 2.9 per cent, to its lowest level in five years.

More variable hydro generation and lower **wind** generation (down 7.2 per cent) led to an increased need for fossil fuels to meet demand. Coal-fired generation was up by 16 per cent, and gas-fired generation increased 22 per cent to its highest level in five years.

However, even with a significant increase in generation from non-renewables, 82 per cent of electricity in 2017 was generated from renewable sources. This is a contrast to previous dry years, such as 2008 and 2012, where coal-fired generation increased significantly in order to maintain supply.

Figure 32: Total Generation by Renewables and Non-Renewables

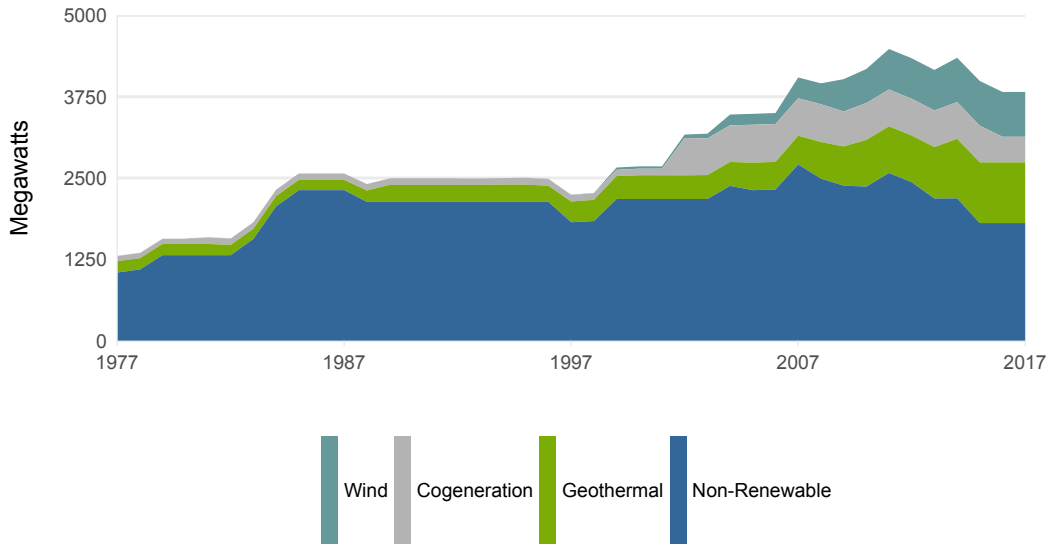


Since 2012 there have been significant changes in the capacity available to the market, impacting the resulting generation mix:

› Geothermal capacity has increased 5.4 per cent (215 MW) as large plants, most notably Ngatamariki and the first stage of Te Mihi, have come online.

› There have been reductions in coal and gas capacity with closures of plants and retirements of units. In 2015 two large natural gas plants were closed in Auckland: Contact Energy's Otahuhu B plant, and Mercury's Southdown Power Station. Genesis has also retired a total of 500 MW of capacity at its Huntly Power Station.

Figure 33: Generating Capacity by Fuel Type (excluding Hydro)



The increase in geothermal capacity and its operation as baseload has seen continued growth in **geothermal** generation, which increased 0.5 per cent in 2017. Geothermal achieved an average capacity factor of 91 per cent in 2017. This is in contrast to the capacity factor for hydro which on average is around 50 per cent (due to variability in inflows).

Fossil fuels have historically played a large role in the country's electricity system by providing baseload, back-up, and peak supply. The growth in renewable, geothermal baseload generation has resulted in the replacement of some non-renewable baseload generation and geothermal now accounts for just under 20 per cent of total generation. Of the non-renewable capacity that remains in the market, the majority of it is now operated to meet peak load or provide back-up when hydro and wind generation is low.

Other renewable sources for electricity generation include solar and bioenergy. **Solar photovoltaic (PV)** has seen significant growth, with 17,672 connections in New Zealand at the end of 2017.[14] **Bioenergy** comes predominantly from woody biomass consumed at a number of cogeneration[15] plants located at wood processing factories. Biogas is another source of bioenergy, created from digesting waste at wastewater treatment plants and landfills. Collectively however these sources are small, comprising 1.5 per cent of generation in 2017.

Geothermal capacity will increase further in coming years. The 25 MW Te Ahi O Maui station will be completed in Kawerau in 2018 and the capacity at Ngawha is expected to nearly double in 2021, increasing from 25MW to 53 MW.

Genesis Energy announced in early 2018 that it would stop using coal at its Huntly Power Station by 2030, with coal not being used in normal market conditions from 2025 onwards.

Wholesale Market

The buying and selling of wholesale electricity is done via a pool, where electricity generators offer electricity to the market and retailers bid to buy the electricity at prices that are set half-hourly. Some large energy users also participate directly, buying their electricity on the wholesale market rather than through a retailer.

Participants can also enter into hedge contracts to manage the financial risks of trading electricity at spot prices. Since June 2013 a market for financial transmission rights (FTRs) has operated in New Zealand. FTRs allow for the holder to hedge price risk arising from price differences between injection and load points.

For more information on the wholesale market and hedge markets see the Electricity Authority's website: **www.ea.govt.nz/operations/wholesale/**

Transmission

Transpower is the state-owned enterprise that 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.

Electricity transmission between the North and South Islands is via a high voltage direct current (HVDC) link from Benmore power station in the South Island to Haywards substation in the North Island. Part of this link is a submarine cable running through the Cook Strait. The HVDC primarily allows surplus power generated in the South Island to be transmitted to the North Island, where demand is greatest. Transmission from north to south can also occur if required. This was seen in 2017 with the increased North Island generation (both from hydro and fossil fuels) making up for the shortfall in South Island generation as a result of low hydro inflows.

14 Electricity Authority (2018), Installed distributed generation trends

15 Cogeneration refers to the process in which both electricity and heat are produced

Distribution

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. These companies convey electricity from the national grid to users within their network areas.

Consumption

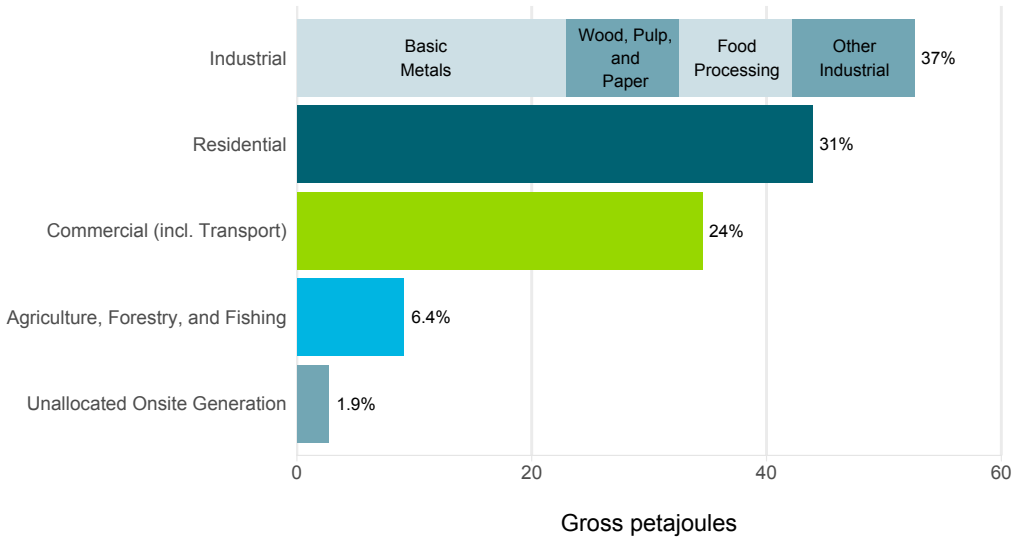
Increased demand by the industrial and commercial sectors saw total electricity consumption rise 0.2 per cent. The food processing sector drove a 0.6 per cent increase in industrial sector electricity use, while growth in the services sector increased commercial sector demand by 0.5 per cent.

The industrial sector accounts for the largest share of electricity consumption, at 38 per cent in 2017. This dominated by the basic metals subsector, which includes New Zealand Aluminum Smelters (NZAS) at Tiwai Point. The smelter is the single largest user in the country, accounting for 13 per cent of national demand in 2017.

Electricity use in some sectors is influenced by the weather:

- Residential electricity consumption is affected by the temperature, with warmer temperatures reducing the need for electricity for heating purposes.
- Irrigation demand by the agricultural sector is affected by rainfall. More rainfall reduces the need for irrigation, lowering electricity consumption by the sector.

Figure 34: Electricity Consumption by Sector in 2017



Since the closure of its fourth potline in 2012, demand by NZAS has been relatively steady. In May 2018, NZAS announced that it would be restarting the fourth potline in response to favourable market conditions.

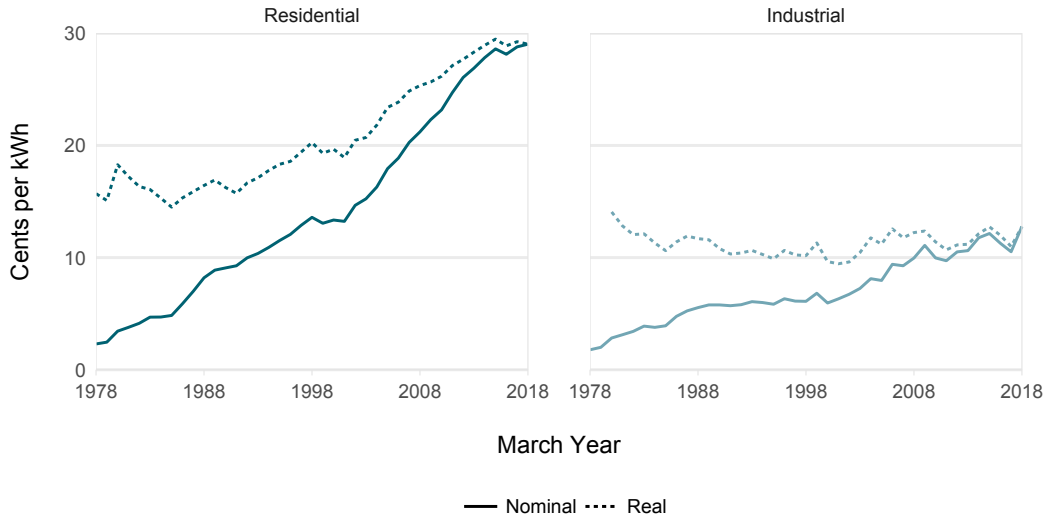
Electricity demand is expected to grow in the future as end-uses that have historically been met by the combustion of fuel are met with electricity. Known as "electrification", this is already being witnessed in the transport sector with increased uptake of electric vehicles (EVs). As at December 2017 there were 6,209 EVs registered in New Zealand, up from 2,550 in December 2016.[16] At the time of publication, several companies that currently use fossil fuels for process heat have announced their plans to switch to electricity.[17]

16 Ministry of Transport (2018), Monthly electric and hybrid light vehicle registrations

17 Process heat is energy used for industrial processes, manufacturing, and heating. For more information on process heat, see www.mbie.govt.nz/info-services/sectors-industries/energy/energy-efficiency-environment/process-heat-in-new-zealand

Electricity costs

Figure 35: Sales-Based Electricity Costs by Sector



The Ministry uses sales-based data to calculate average residential, commercial and industrial electricity costs. This data is collected from electricity retailers, and calculated by dividing income from electricity sales by the volume of electricity sold.

This analysis referred to as the cost per unit, as it is what was actually paid relative to the quantity of electricity consumed. The term ''cost'' is used to distinguish the data from the electricity price indicator series that the Ministry produces, the Quarterly Survey of Domestic Electricity Prices (QSDEP). The QSDEP shows how residential electricity tariffs have changed over time.[18]

In the year ended March 2018 the average cost per unit faced by households increased 0.8 per cent in nominal terms from the year ended March 2017. This was driven by a 2.9 per cent increase in the lines component, which covers charges related to transmission and distribution networks.

The fall in South Island hydro generation and increased fossil-fueled generation saw wholesale electricity prices in July 2017 reach their highest level since March 2013. As some industrial users purchase their electricity directly on the wholesale market, the average cost per unit faced by the industrial sector in the year ended March 2018 increased 21 per cent.

It is important to note that the cost of electricity (both current and expected in the future) is just one factor that is taken into consideration by retailers in setting tariffs. Other factors include lines charges which retailers collect on behalf of distributors, and the retailer's own costs and margins. This means that increased wholesale electricity prices in a period may not directly be passed through to retail tariffs.

18 For more information on sales-based electricity costs and the QSDEP, visit www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/statistics/prices/electricity-prices

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