



Australian Government
Department of the Environment and Energy

Australian Energy Update

2019

September 2019



Australian Energy Update 2019

Australian Energy Statistics

September 2019

Department of the Environment and Energy (2019), *Australian Energy Update 2019*, Australian Energy Statistics, September, Canberra.

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Acknowledgements

The authors would like to express their appreciation for the assistance and support provided by colleagues in the Department of the Environment and Energy, the Department of Industry, Innovation and Science, the Clean Energy Regulator, the Bureau of Infrastructure, Transport and Regional Economics, and the Australian Bureau of Statistics.

Cover image: Foreshore Road, Sydney, New South Wales

ISSN (Online): 2203-8337

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The Department acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respects to them and their cultures and to their elders both past and present.

Foreword

The way we supply and use energy in Australia continues to change. This includes changes in the type of energy we use, how we use it and where it comes from, as new technologies are adopted, as our economy grows and changes in structure, and as awareness of our energy use and its economic and environmental cost grows.

To help understand these and other changes, to plan for Australia's energy future, and to make sound policy and investment decisions, we need timely, accurate, comprehensive, comparable and readily-accessible energy statistics.

The *Australian Energy Statistics* is the authoritative and official source of energy statistics for Australia to support decision making and international reporting, and to help understand how our energy supply and use is changing. It is updated each year and consists of detailed historical energy consumption, production and trade statistics and balances. It includes all types of energy and all parts of the economy.

This edition contains data to 2017–18 for Australian energy consumption, production and trade, and calendar year 2018 for electricity generation. This report, the full dataset, and the guide are available at <https://www.energy.gov.au/government-priorities/energy-data/australian-energy-statistics>.

Feedback regarding the Australian Energy Statistics can be provided to australianenergystatistics@environment.gov.au.

Energy Statistics and Analysis Section
Economics and Analysis Branch
Department of the Environment and Energy
September 2019

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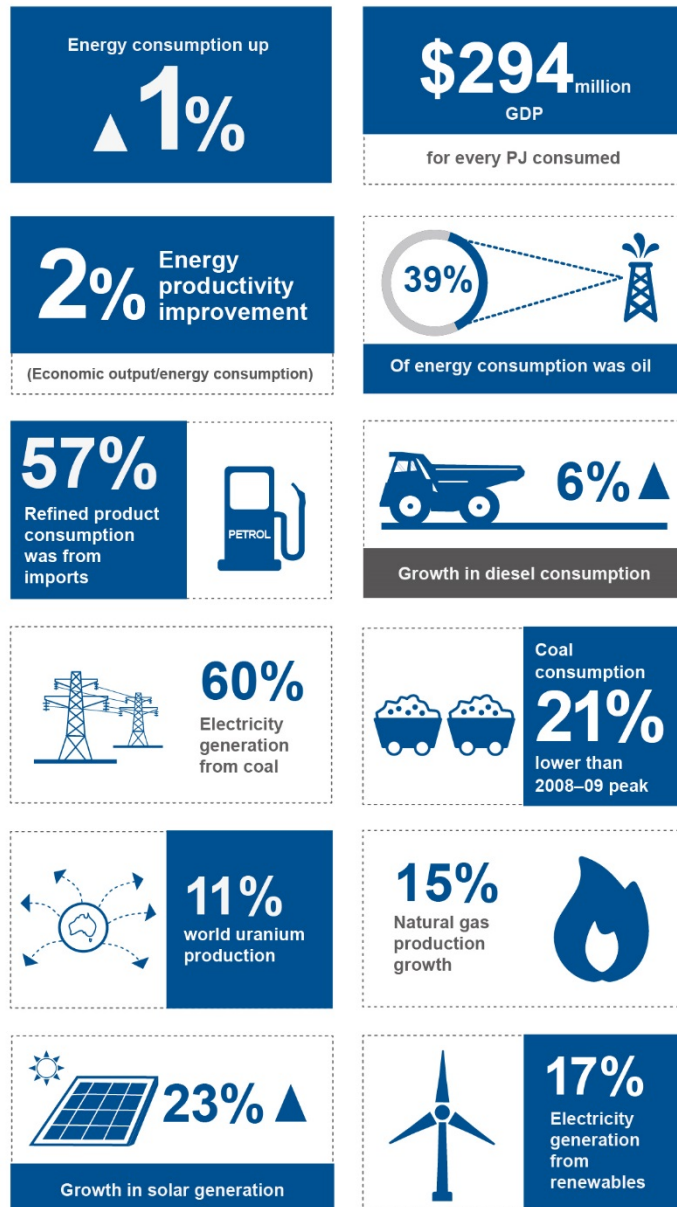
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Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
APS	Australian Petroleum Statistics
BITRE	Bureau of Infrastructure, Transport and Regional Economics
BREE	Bureau of Resources and Energy Economics (former)
CSG	Coal seam gas
GWh	Gigawatt hours
GDP	Gross domestic product
IEA	International Energy Agency
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
NGERS	National Greenhouse and Energy Reporting Scheme
NGL	Natural gas liquids
ORF	Other refinery feedstock
OCE	Office of the Chief Economist
PJ	Petajoule
PV	Photovoltaic

Executive summary

Australian Energy Statistics In 2017–18



- Australia's energy consumption continues to rise
- Energy productivity is improving
- Fossil fuels still provide nearly all our energy
- Coal use is falling, but still dominates electricity mix
- Oil is becoming more important in our energy mix
- Rising transport demand met by oil imports
- LNG export growth leading growth in our energy use

Energy consumption

- The Australian economy grew by 2.8 per cent in 2017–18 to reach \$1.8 trillion. Population grew by 1.6 per cent to reach 25.0 million people.
- Australia's energy consumption rose by 0.9 per cent in 2017–18 to reach 6,172 petajoules. This compares with average growth of 0.6 per cent a year over the past ten years. Growth in 2017–18 was 52 petajoules, the same amount of energy from filling a 55-litre tank of petrol 28 million times.
- Energy productivity (gross domestic product (GDP) divided by energy consumption) improved by 2.0 per cent in 2017–18, and by 20 per cent over the past ten years. Australia now creates \$294 million in GDP for every petajoule of energy consumed, almost \$50 million more than a decade ago.
- Most of the growth in energy use in 2017–18 occurred in the mining sector, which rose by 9 per cent, mostly increased natural gas and electricity consumption to support liquefied natural gas (LNG) exports. Energy use also increased in other parts of the mining sector.
- Transport remained the largest user of energy and grew by 2 per cent in 2017–18, underpinned by higher diesel use in road transport and increased use of jet fuel. Total refined product use rose by 3 per cent in 2017–18, and was nearly three times larger than total electricity consumption.
- Energy use for electricity generation fell by 4 per cent in 2017–18 despite a slight increase in electricity output, reflecting reduced brown coal use and an increase in renewable generation.
- Energy use in manufacturing was relatively flat in 2017–18. Consumption fell by 7 per cent in food, beverages and tobacco product manufacturing.
- Oil accounted for the largest share of Australia's primary energy mix in 2017–18, at 39 per cent, followed by coal (30 per cent) and natural gas (25 per cent). Renewable energy sources accounted for 6 per cent.
- Coal use fell by 4 per cent in 2017–18, and was 21 per cent below its peak in 2008–09. The decline was all from a reduction in brown coal following power plant closures, with black coal consumption increasing.
- Natural gas consumption grew by 4 per cent in 2017–18. Gas use in LNG plants increased commensurate with higher output, as well as in electricity generation, but fell slightly in the manufacturing sector.
- Renewable energy consumption grew by 1 per cent in 2017–18. Strong growth in solar and wind energy was largely offset by a fall in hydro and biomass consumption.

Energy production

- Energy production rose by 4 per cent in 2017–18 to 18,603 petajoules, primarily as a result of increased natural gas and black coal production. This outweighed a fall in oil and brown coal production.

- Natural gas production grew by 15 per cent in 2017–18, underpinned by increased production in Western Australia for LNG exports. Coal seam gas accounted for one-third of Australian gas production and over two-thirds of east coast gas production in 2017–18.
- Black coal production grew by 2 per cent in 2017–18, while brown coal output fell by 19 per cent, reflecting the fall in brown coal-fired electricity.
- Crude oil and condensate production continued its longer term decline, falling by 4 per cent in 2017–18.

Electricity generation

- Total electricity generation in Australia rose marginally in 2017–18 to 261 terawatt hours (940 petajoules). This figure includes industrial, rooftop solar PV and off-grid generation.
- About 13 per cent of Australia’s electricity was generated outside the electricity sector by industry and households in 2017–18.
- Brown coal-fired generation fell by 17 per cent in 2017–18, while black coal rose by 3 per cent, with the combined share of coal at 60 per cent of total generation. The share of coal was also 60 per cent in calendar year 2018.
- Australia is now less reliant on coal than at the beginning of the century, when coal’s share was more than 80 per cent of electricity generation.
- Natural gas-fired generation grew 7 per cent in 2017–18, remaining at about 21 per cent of total electricity generation. Its share fell in calendar year 2018, to 19 per cent of total generation.
- Renewable generation increased 10 per cent in 2017–18, contributing 17 per cent of all generation. The majority of renewable electricity growth was in wind, but growth also occurred in solar. Generation from municipal and industrial waste and biogas was 3 per cent of renewable generation.
- Renewable generation grew in calendar year 2018, to 19 per cent of total generation. Hydro accounted for 7 per cent of total generation in 2018, while wind accounted for 6 per cent.
- Solar accounted for 5 per cent of total generation in 2018, with the majority of this small-scale PV. Large-scale solar was the fastest growing source of generation in 2018.

Energy trade

- Most of Australia’s energy production is exported. Net exports (exports minus imports) were equal to two-thirds of production in 2017–18.
- Energy exports grew by 4 per cent in 2017–18 to 14,739 petajoules. LNG exports grew by 18 per cent to 3,376 petajoules, as new capacity in Western Australia came online. Exports of black coal and crude oil grew by 1 per cent and 2 per cent respectively.
- Australia is also a significant exporter of uranium oxide, for use in nuclear power plants overseas. Uranium exports grew by 15 per cent in 2017–18 to 8,118 tonnes.

- Energy imports increased by 6 per cent to 2,454 petajoules in 2017–18. Most imports are of refined petroleum products and crude oil. Domestic refineries imported over three-quarters of their feedstock, while nearly 60 per cent of refined product consumption in Australia was met by imports.

1. About the Australian Energy Statistics

The *Australian Energy Statistics* (AES) is the authoritative and official source of annual energy statistics for Australia. It provides information designed to increase the understanding of energy supply and use in Australia, to support decision making in government and industry, and to meet annual international energy reporting obligations. The dataset also supports the calculation of Australia's greenhouse gas emissions from energy supply and use.

The AES provides detailed energy consumption, production and trade statistics and balances, by state and territory, by energy type and by industry, in energy content and physical units. Where possible, the data is compiled and presented using concepts and definitions intended to align the AES with the framework used by the International Energy Agency (IEA).

Key data sources include facility level reporting from the National Greenhouse and Energy Reporting Scheme (NGERS), the *Australian Petroleum Statistics* (APS), the *Resources and Energy Quarterly*, datasets and estimates from other Australian and state government agencies, internal estimates using statistical techniques, and public company reporting. Some datasets from private subscription services and industry associations are also used to compare with these estimates and sources.

The AES has been published by the Department of the Environment and Energy (2017 to present), the Department of Industry, Innovation and Science (2015 and 2016), the Bureau of Resources and Energy Economics (BREE) (2012 to 2014), the Australian Bureau of Agricultural and Resources Economics and Sciences (ABARES) (1989 to 2011), and various previous Australian government agencies, since the mid-1970s.

The full AES dataset is made available through tables in Excel format at <https://www.energy.gov.au/government-priorities/energy-data/australian-energy-statistics>. A list of the AES tables available on the website is provided in Table 1.1.

The AES is accompanied by this report, the *Australian Energy Update*, which highlights recent trends in Australian energy consumption, production and trade.

The *Guide to the Australian Energy Statistics* is designed to assist users in better understanding the AES and to increase the transparency of the dataset. It contains information on the publication tables, definitions and concepts, data sources and methodology, conversion factors, confidentiality and historical revisions.

The main unit in the AES is the petajoule (PJ). One petajoule = 1×10^{15} joules. One petajoule, or 278 gigawatt hours, is the heat energy content of about 43,000 tonnes of black coal or 29 million litres of petrol. A car using 6 litres of petrol per hundred kilometres could drive approximately 483 million kilometres on one petajoule. One petajoule is equivalent to filling up a car with a fuel tank capacity of 55 litres of petrol around 532,000 times.

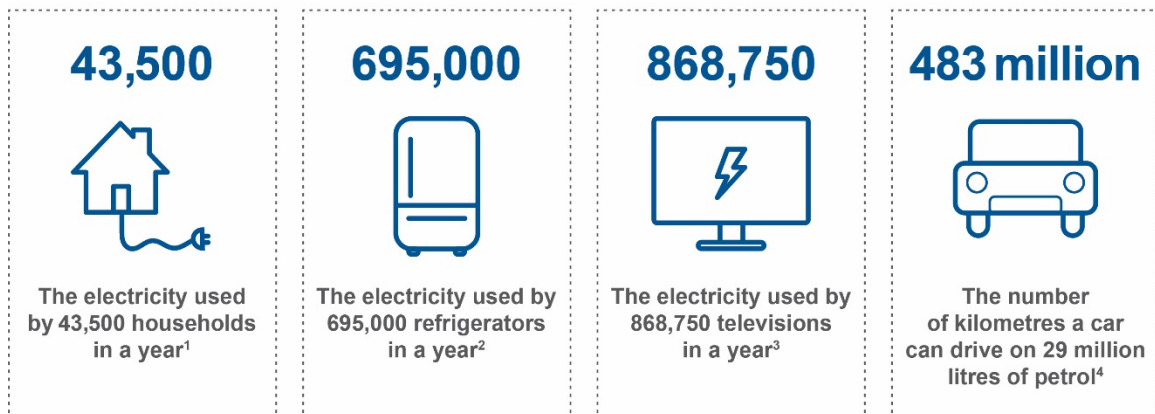
Table 1.1: 2019 Australian Energy Statistics tables

Table name	
Table A	Australian energy supply and consumption, energy units
Table B	Australian population, GDP and energy consumption, by state and territory
Table C	Australian energy consumption, by state and territory, by fuel, energy units
Table D	Australian energy consumption, by state and territory, by detailed fuel, energy units
Table E	Australian energy consumption, by state and territory, by industry, energy units
Table F	Australian energy consumption, by state and territory, by industry and fuel type, energy units
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Table I	Australian production of primary fuels, by state and territory, physical units
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Table M	Australian energy imports, by fuel type, physical units
Table N	Australian energy exports, by fuel type, physical units
Table O	Australian electricity generation, by fuel type, physical units
Table P	Australian consumption and production of coal, by state and territory, physical units
Table Q	Australian consumption and production of gas, by state and territory, physical units
Table R	Australian production of gas, by type, state and territory, energy units
Table S	Australian production and exports of uranium, physical and energy units

One petajoule (PJ) explained

The joule is the standard unit of energy in general scientific applications. One joule is the equivalent of one watt of power radiated or dissipated for one second.

One petajoule is 10^{15} joules (1 million billion) or 278 gigawatt hours.



¹The average home uses approximately 23 gigajoules of electricity in 2017–18

²A typical 3 star fridge uses 400 kWh of electricity per year

³A 55 inch 5 star label television uses 320 kWh of electricity per year

⁴A car consuming 6 litres of unleaded petrol per 100 kilometres

2. Energy consumption

Energy consumption measures the amount of energy used in the Australian economy. It is equal to domestic production plus imports minus exports (and changes in stocks). It includes energy consumed in energy conversion activities (such as electricity generation and petroleum refining), but nets off derived or secondary fuels (such as electricity and refined oil products) produced domestically to avoid double counting of energy. It is equivalent to total primary energy supply. Further detail is provided in Department of the Environment and Energy (2019) *Guide to the Australian Energy Statistics*.

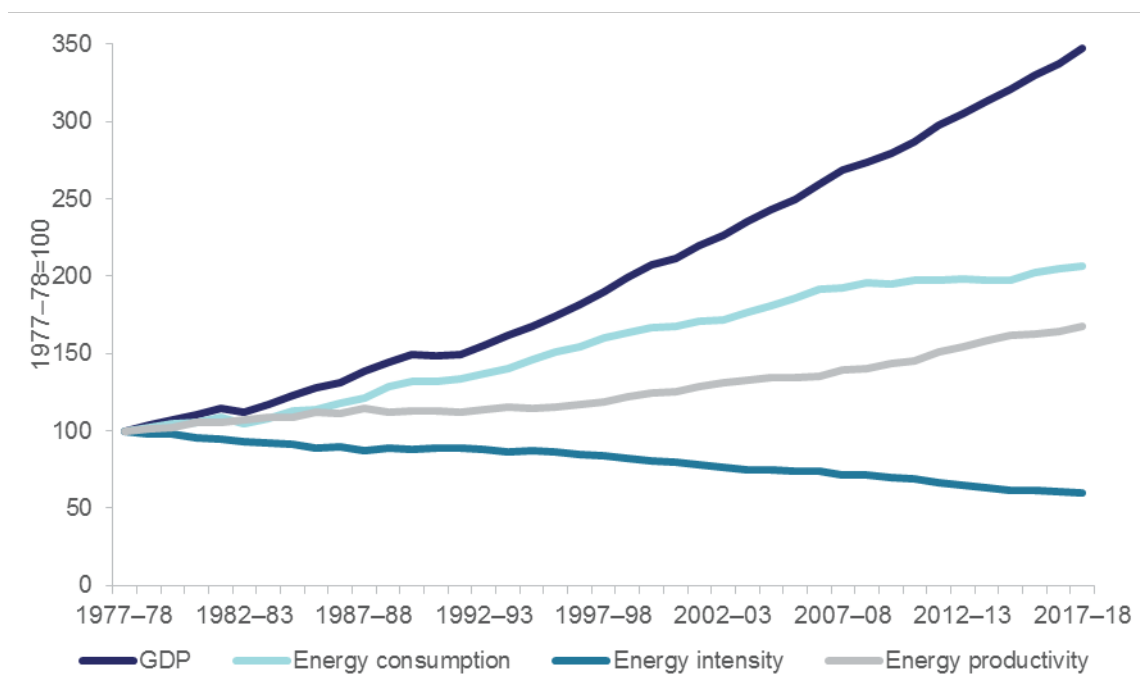
Energy consumption rose by 0.9 per cent in 2017–18 to 6,172 petajoules, its highest ever level. This compares with average growth of 0.6 per cent a year over the past ten years. Growth in 2017–18 was 52 petajoules, the same amount of energy from filling a 55-litre tank of petrol 28 million times.

In 2017–18, the Australian economy grew by 2.8 per cent to reach \$1.8 trillion. The Australian population grew by 1.6 per cent to reach 25 million people.

2.1 Energy productivity

The relationship between energy use and economic output can be described in terms of the energy intensity, or inversely, the energy productivity, of the Australian economy. Energy intensity measures the amount of energy used to produce a unit of economic output (energy consumption/GDP), while energy productivity measures the amount of economic output produced per unit of energy input (GDP/energy consumption).

Figure 2.1: Australian energy intensity and energy productivity



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table B

Table 2.1: Australian population, GDP and energy consumption

	2008–09	2017–18	Average annual growth	
			2017–18 (per cent)	10 years (per cent)
Population (millions)	21.7	25.0	1.6	1.6
GDP (\$ billion)	1,432.3	1,814.5	2.8	2.7
Energy consumption (PJ)	5,843.6	6,171.7	0.9	0.6
Energy consumption per person (GJ)	269.4	246.9	-0.7	-1.0
Energy intensity (GJ/\$ million)	4,079.7	3,401.3	-1.9	-2.0
Energy productivity (\$ million/PJ)	245.1	294.0	2.0	2.0

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table B

The Australian economy has tended towards lower energy intensity and higher energy productivity over time, as economic growth in Australia over recent decades has generally outpaced growth in energy consumption (Figure 2.1). This reflects cumulative improvements in energy efficiency as well as a shift in the Australian economy away from highly energy-intensive industries such as manufacturing towards less energy-intensive industries such as services. Increased use of renewable energy instead of fossil fuels for electricity generation has also had a positive impact on energy productivity.

Energy productivity improved by 2.0 per cent in 2017–18 and by 20 per cent over the past ten years (Table 2.1). Australia now creates \$294 million in GDP for every petajoule of energy consumed, nearly \$50 million more than a decade ago. Alternatively, Australia now uses 17 per cent less energy per dollar of economic output than a decade ago. Australia also uses 8 per cent less energy per person than a decade ago.

2.2 Energy consumption, by fuel type

Fossil fuels (coal, oil and gas) accounted for 94 per cent of Australia's primary energy mix in 2017–18. Oil, including crude oil, liquefied petroleum gas (LPG) and refined products, accounted for the largest share of energy consumption, at 39 per cent in 2017–18 (Table 2.2). This figure includes domestic and imported crude used by Australian refineries, and imported refined products used by industry and households, but nets off refined products produced domestically to avoid double counting of energy.

Oil consumption increased by 3 per cent in 2017–18, due to increased consumption of refined products, mostly for transport.

Table 2.2: Australian energy consumption, by fuel type

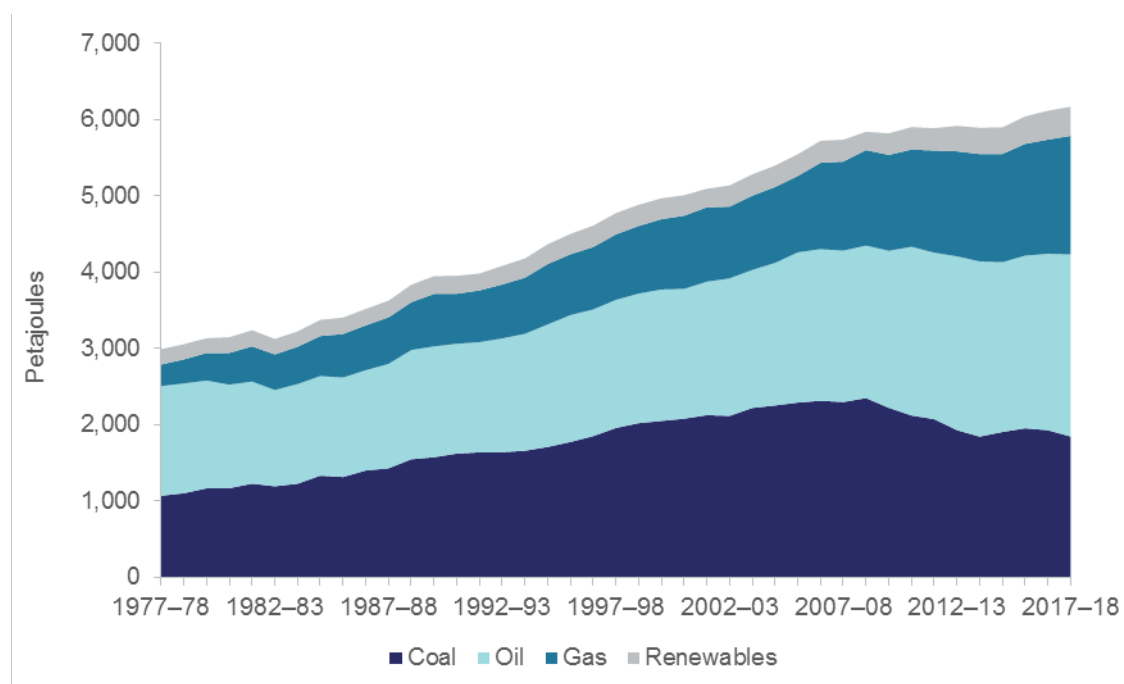
	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Oil	2,387.8	38.7	3.2	2.0
Coal	1,847.2	29.9	-4.3	-2.6
Gas	1,554.6	25.2	3.8	2.4
Renewables	382.1	6.2	0.9	5.3
Total	6,171.7	100.0	0.9	0.6

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table C

Coal remained the second largest fuel consumed in 2017–18, accounting for 30 per cent of energy consumption (Figure 2.2). Coal consumption fell by 4 per cent in 2017–18. The decline was due to the closure of brown coal-fired power stations such as Hazelwood part way through the previous year, which more than offset an increase in black coal used for electricity generation.

Australia’s coal consumption in 2017–18 was 21 per cent lower than its peak in 2008–09, when the coal share of the energy mix was around 40 per cent. Coal consumption has returned to the level seen in Australia in the mid-1990s.

Figure 2.2: Australian energy consumption, by fuel type



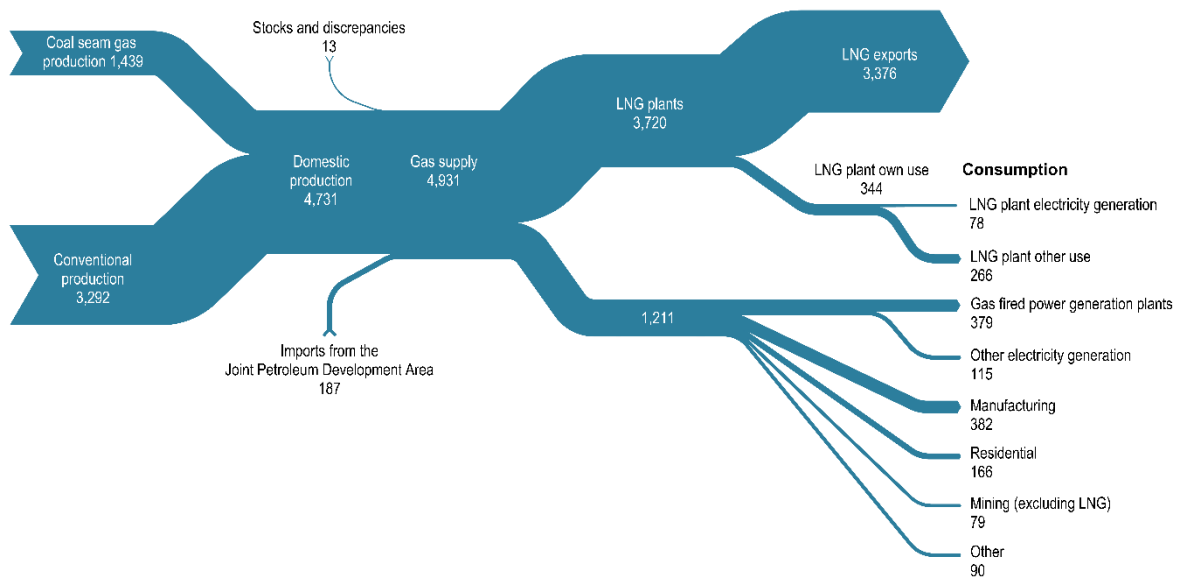
Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table C

Natural gas accounted for 25 per cent of energy consumption in 2017–18. Gas consumption rose by 4 per cent in 2017–18, with increased use in mining in Western Australia to support the expansion of LNG exports.

In LNG production, around 9 per cent of gas flows are consumed by the plant during liquefaction, with the remainder exported as LNG. Gas is also used at the LNG plant to generate electricity, which is included in the electricity generation sector in the AES. In total, LNG plants accounted for approximately one-fifth of Australian gas consumption in 2017–18 (Figure 2.3).

Around 37 per cent of Australia’s gas consumption in 2017–18 was for electricity generation. Of the gas used for electricity generation in Australia, about one-third is used for generation by industry. This includes electricity generation at smelters, refineries and mine sites. It also includes some unprocessed natural gas used to generate electricity during the gas production process. This consumption is included in the electricity generation sector in the AES, which allocates gas consumption to the activity of generating electricity, rather than to the original industry such as mining.

Figure 2.3: Australian natural gas flows, petajoules, 2017–18



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Tables A and F and internal sources

Renewable energy sources accounted for the remaining 6 per cent of Australian energy consumption in 2017–18, comprising mainly biomass, hydro, wind and solar energy. This includes renewable energy use for electricity generation, as well as direct use of renewables such as firewood for residential heating, bagasse use in manufacturing and solar hot water.

In 2017–18, renewable energy consumption rose by 1 per cent, despite strong growth in wind and solar (Table 2.3). Consumption of bagasse, the remnant sugar cane pulp left after crushing, declined by 9 per cent, reflecting lower sugar cane production volumes. Despite the decline, it remained the

largest source of renewable energy in Australia, at 26 per cent of total renewable energy use in 2017–18.

Use of hydro energy decreased by 2 per cent in 2017–18. Hydro production tends to fluctuate from year to year according to market and weather conditions.

Wind and solar energy have exhibited rapid growth in the past decade. Wind energy grew by 20 per cent in 2017–18, and by 17 per cent a year on average since 2008–09. Solar PV has grown from less than 0.5 petajoules a decade ago to 36 petajoules in 2017–18, and grew by 23 per cent in 2017–18.

Solid municipal and industrial waste can be used to generate electricity, and provided nearly 5 petajoules of energy in 2017–18, up from 1 petajoule five years ago. Biogas from landfill, sewerage and other sources provided a further 16 petajoules of energy in 2017–18.

Table 2.3: Australian renewable energy consumption, by fuel type

	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Biomass	189.4	49.7	-6.7	2.3
- wood, woodwaste, sulphite lyes	89.2	23.4	-3.9	0.0
- bagasse	100.2	26.3	-9.1	4.9
Municipal and industrial waste	4.8	1.3	-0.3	na
Biogas	16.1	4.2	5.1	2.9
- landfill gas	12.0	3.1	4.4	na
- other biogas	4.1	1.1	7.2	na
Biofuels	6.1	1.6	7.2	2.3
- ethanol	6.0	1.6	9.9	na
- biodiesel	0.0	0.0	-85.2	na
Hydro	57.7	15.1	-1.6	3.4
Wind	54.6	14.3	20.5	16.6
Solar PV	35.7	9.4	23.0	58.7
Solar hot water	16.6	4.3	5.5	8.1
Total	381.0	100.0	0.9	5.4

na – not available

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Tables D, F, O

2.3 Energy consumption, by sector

The electricity supply, transport and manufacturing sectors accounted for nearly three-quarters of energy consumption in 2017–18 (Figure 2.4).

The electricity supply sector accounted for 26 per cent of energy consumption in 2017–18 (Table 2.4). Energy consumption in this sector (including fuel inputs to electricity generation, own use and losses) declined by 4 per cent during this period, despite slightly higher electricity output. This reflects reduced brown coal-fired electricity generation and an increase in renewable generation.

When measuring primary energy consumption, a change in coal-fired electricity generation has a greater effect than a change in some renewable generation such as wind, solar and hydro, because these renewables are only measured when turned into electricity.

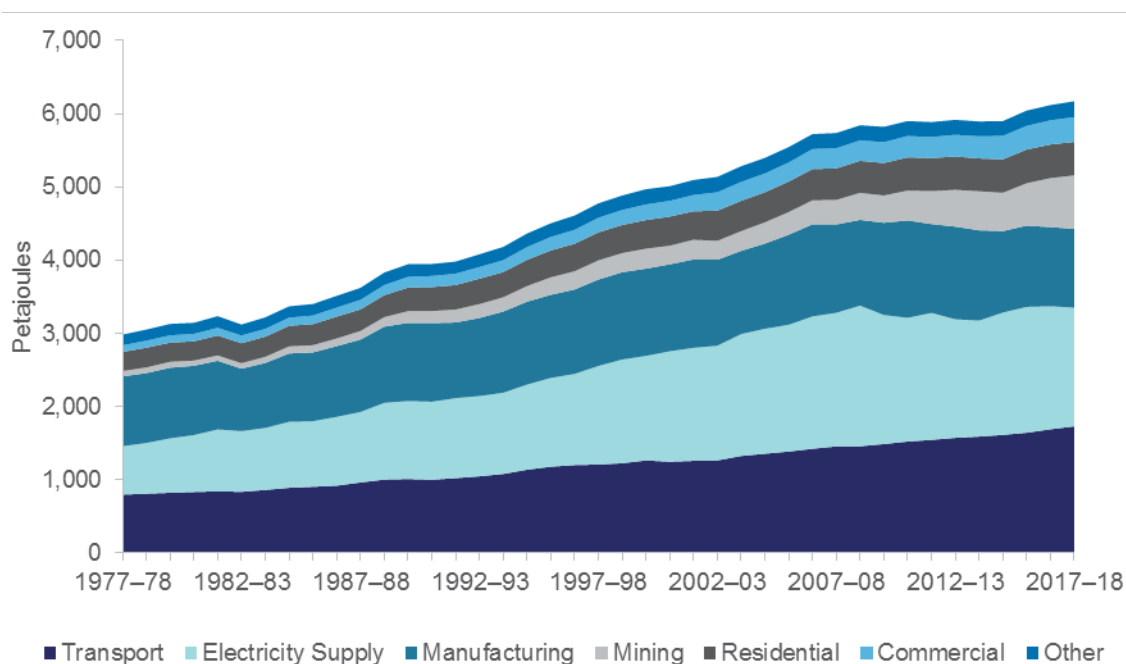
For example, if wind generation rises by 1,000 gigawatt hours, then energy consumption would rise by 3.6 petajoules, because the electricity generated is measured. If coal-fired generation rises by 1,000 gigawatt hours, then energy consumption would increase by the amount of coal consumed to generate the electricity, which would be around 10 petajoules (assuming an efficiency of 35 per cent).

Table 2.4: Australian energy consumption, by sector

	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Transport	1,731.8	28.1	2.4	1.9
Electricity supply	1,621.5	26.3	-3.6	-1.9
Manufacturing	1,076.2	17.4	-0.4	-0.9
Mining	729.7	11.8	9.1	7.9
Residential	458.8	7.4	0.1	0.5
Commercial	336.2	5.4	1.6	2.1
Agriculture	117.6	1.9	1.1	2.5
Construction	25.9	0.4	6.9	0.1
Water and waste	17.9	0.3	12.1	3.1
Other	56.2	0.9	9.8	-2.9
Total	6,171.7	100.0	0.9	0.6

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table E

Figure 2.4: Australian energy consumption, by sector



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table E

Energy use across all forms of transport increased in 2017–18 (Table 2.5). Transport energy consumption grew by 2 per cent in 2017–18, overtaking the electricity supply sector as the largest share of Australian energy consumption. Road transport accounted for nearly three-quarters of transport energy consumption in 2017–18, while air transport accounted for further 20 per cent.

Table 2.5: Australian transport energy consumption, by subsector

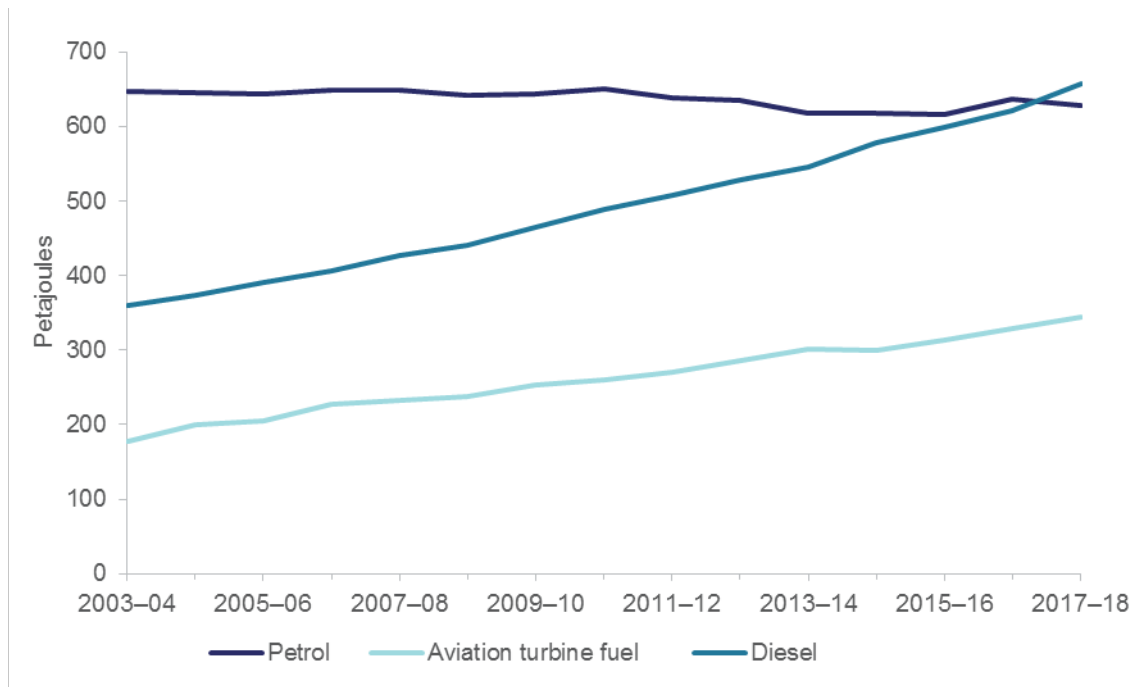
	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Road	1,239.4	71.6	1.7	1.5
Air	345.6	20.0	4.5	4.1
Rail	62.8	3.6	1.7	4.6
Water	50.4	2.9	2.1	-3.2
Other	33.6	1.9	6.6	4.9
Total	1,731.8	100.0	2.4	1.9

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table F

The growth in transport fuel consumption was mostly in diesel usage, supported by steady economic and population growth, and switching to diesel vehicles by consumers (Figure 2.5). The diesel vehicle fleet (including

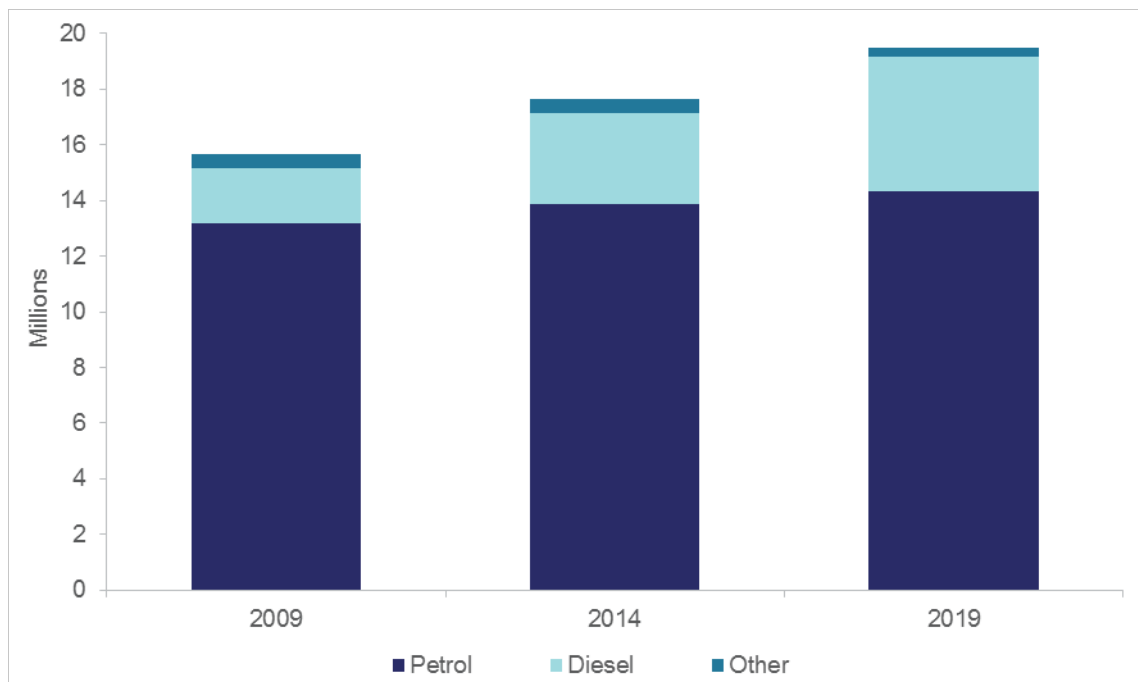
passenger, light commercial and freight) has doubled in size since 2010, to 4.8 million vehicles in 2019 (ABS 2019a) (Figure 2.6).

Figure 2.5: Australian transport energy consumption, by major fuel type



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table F

Figure 2.6: Australian motor vehicle registrations, by fuel type



Source: Australian Bureau of Statistics (2019a) *Motor Vehicle Census, Australia, 31 Jan 2019*, cat. no. 9309.0

In contrast, petrol consumption declined slightly in 2017–18, reflecting increased fuel efficiency. Use of jet fuel for air transport increased, supported by a 2 per cent increase in passenger and freight tonne kilometres (BITRE 2019).

Energy consumption in the manufacturing sector was relatively flat in 2017–18, after declining by an average of about 1 per cent a year for the past decade (Table 2.6).

Table 2.6: Australian manufacturing energy consumption, by subsector

	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Ferrous metals	119.3	11.1	2.9	-1.5
Non-ferrous metals	336.6	31.3	0.2	-1.6
Chemicals	195.9	18.2	0.8	0.6
Food, beverages, tobacco	152.2	14.1	-6.9	2.7
Petroleum refining ^a	84.4	7.8	3.3	-2.6
Wood, paper and printing	58.0	5.4	-0.1	-0.5
Cement	55.1	5.1	0.2	-2.8
Other	74.7	6.9	-1.4	-3.3
Total	1,076.2	100.0	-0.4	-0.9

Notes: ^a Energy consumption in petroleum refining equals total energy consumption (feedstock and own use) minus derived fuel production. The derived fuel production is netted off to avoid double counting of this energy in other sectors.

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table F

Energy consumption grew in metals production in 2017–18, especially ferrous metals production, where a 3 per cent increase in energy consumption was supported by increased steel production. Non-ferrous metals energy use was flat in 2017–18.

Energy consumption fell most strongly in food, beverages and tobacco product manufacturing in 2017–18, down by 7 per cent. This was driven by lower levels of sugar cane production and crushing, which resulted in less combustion of the waste product bagasse for heat and electricity. Bagasse combustion accounts for about half of the energy consumption in this sub-sector.

Energy consumption in the mining sector was approximately 730 petajoules in 2017–18, up 9 per cent on the previous year (Table 2.7). This is slightly higher than average growth in energy use over the past decade.

Table 2.7: Australian mining energy consumption, by subsector

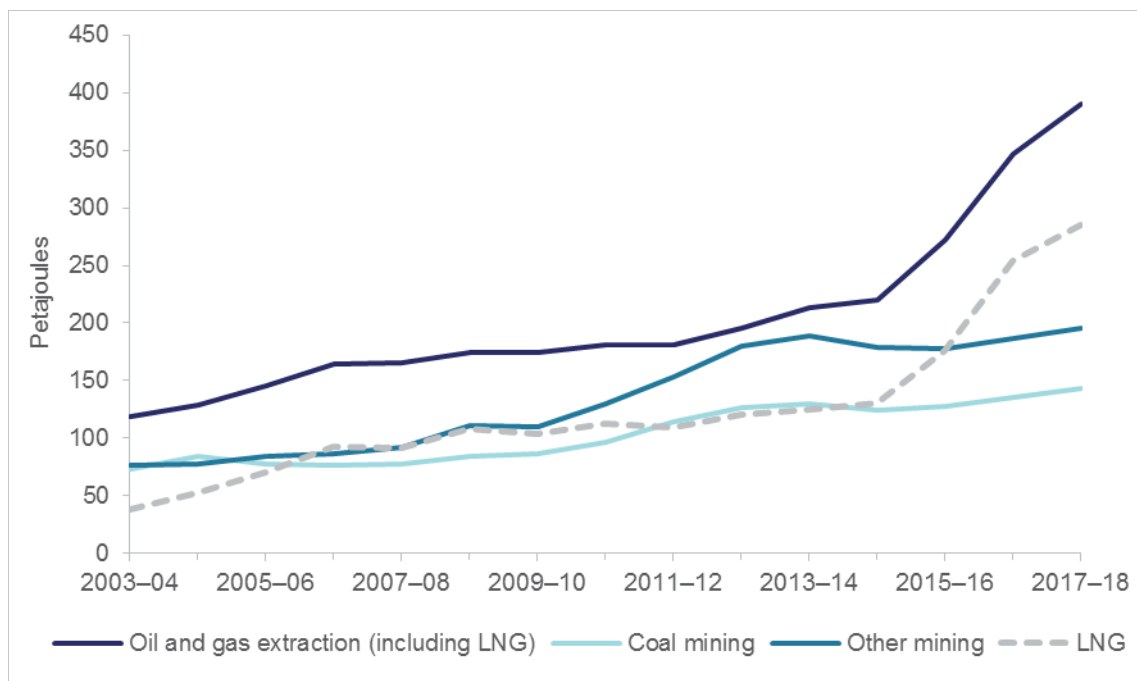
	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Oil and gas	390.0	53.4	12.5	9.3
- LNG	285.5	39.1	12.6	11.4
Coal	143.7	19.7	5.7	6.2
Other mining	196.0	26.9	5.2	6.6
Total	729.7	100.0	9.1	7.9

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table F

Much of the growth in 2017–18 was again due to growth in natural gas used for liquefaction at LNG plants (Figure 2.7). This is underpinned by new capacity in Western Australia, including the Gorgon and Wheatstone LNG plants.

In 2017–18, own-use natural gas consumption at Australia’s LNG facilities increased to 286 petajoules, supporting growth of LNG exports from 52 million tonnes to 62 million tonnes. LNG plants now account for around one-fifth of Australia’s gas consumption, up from around one-tenth a decade ago.

Figure 2.7: Australian energy consumption in mining



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table F and internal sources

This excludes gas used for electricity generation at gas processing and liquefaction plants of around 78 petajoules, which is included in the electricity

generation sector of the AES. The mining sector includes electricity consumption at these facilities, which also increased strongly in 2017–18.

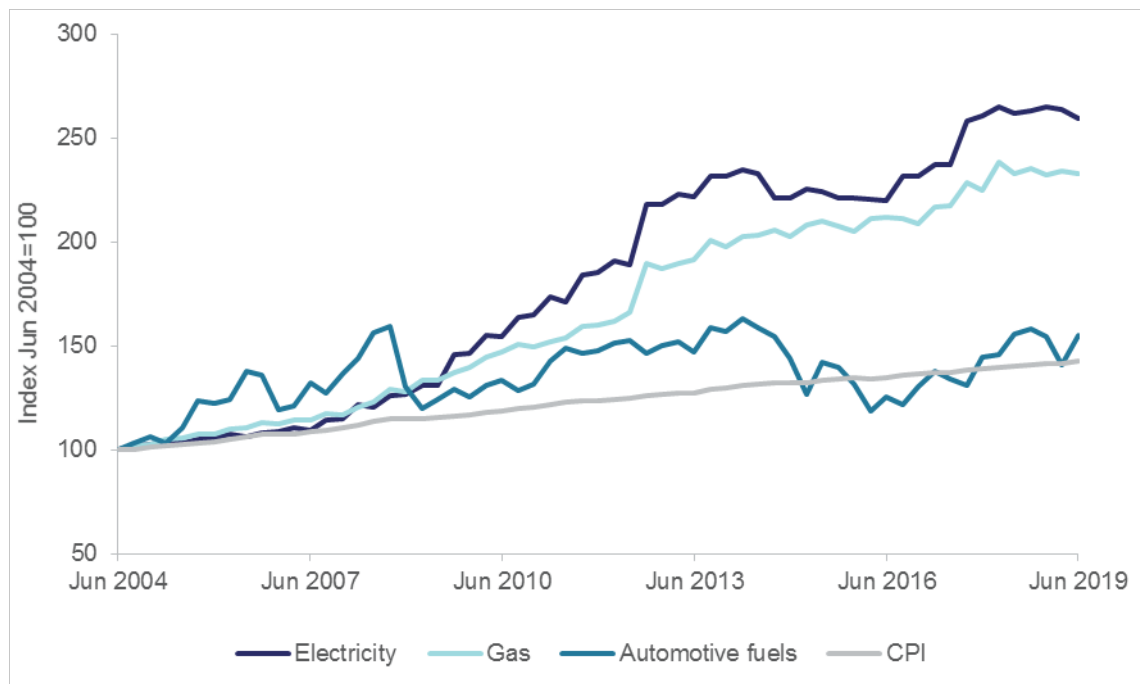
Other parts of the mining sector also recorded large increases in energy use in 2017–18. In particular, there was an increase in diesel consumption in Queensland’s coal mining industry and in Western Australia’s other mining industry. Iron ore production increased by 4 per cent in 2017–18 (Department of Industry, Innovation and Science 2019).

Commercial and services energy consumption rose moderately by 2 per cent in 2017–18. This is attributable to growth in activity, with industry value added across the commercial sector up by 3 per cent in that year (ABS 2019b).

Energy consumption in the residential sector was steady in 2017–18. Consumption in the residential sector includes the use of electricity generated from rooftop solar photovoltaic (PV) systems and from the grid. While Australia’s population has been growing, individual households are using less energy over time. Household energy use reductions have coincided with higher electricity prices and adoption of more energy efficient practices, appliances and housing.

Retail electricity prices for households rose by 12 per cent in 2017–18, but have eased since then. Electricity prices rose by 0.5 per cent in 2018–19, and fell in the June 2019 quarter to their lowest level since September 2017. Household gas prices also increased by 8 per cent in 2017–18, then by just 1 per cent in 2018–19. Automotive fuel prices increased by 10 per cent in 2017–18 and a further 5 per cent in 2018–19 (Figure 2.8) (ABS 2019c).

Figure 2.8: Quarterly household energy price index



Source: Australian Bureau of Statistics (2019c) *Consumer Price Index, Australia*, June 2019, 6401.1

In the agriculture sector, energy use increased by 1 per cent in 2017–18. The drought conditions, particularly in eastern Australia, affected energy demand for agricultural operations, particularly for cropping. A slight increase in dairy output, as well as increased use of pumping for irrigation contributed to the growth in agricultural energy consumption (ABARES 2019; ABS 2019d).

2.4 Final energy consumption

Final energy consumption is the energy used by the final or end-use sectors, and is a subset of total energy consumption. It includes all energy consumed, except energy that is used to convert or transform primary energy into different forms of energy. For example, refinery feedstock that is used to produce petroleum products and fuels consumed in the generation of electricity are both excluded, as are fuels used in coke ovens and blast furnaces in iron and steel manufacturing.

Final energy consumption increased by 3 per cent in 2017–18, which is above the ten year average annual growth rate of 2 per cent (Table 2.8 and Table 2.9).

In 2017–18, refined petroleum products accounted for more than half of Australia’s final energy consumption, followed by natural gas and electricity. Refined petroleum product consumption is nearly three times larger than electricity consumption.

Consumption of diesel alone has surpassed electricity consumption in recent years (Figure 2.9).

Table 2.8: Australian total final energy consumption, by fuel

	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Coal	117.8	2.7	-0.3	-1.7
Refined products	2,263.9	52.1	3.2	2.0
Gas	943.0	21.7	4.0	2.9
Electricity	835.4	19.2	1.7	0.9
Renewables	185.6	4.3	-6.3	2.5
Total	4,345.7	100.0	2.5	1.9

Notes: Excludes fuels used for electricity generation and other conversion.

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table H

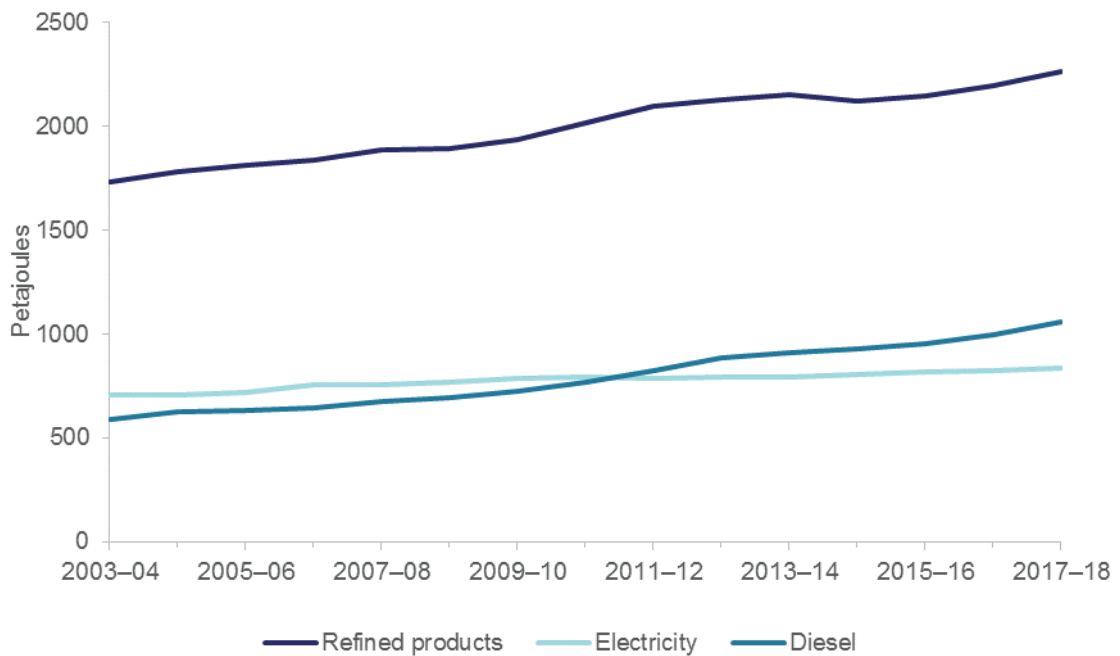
Table 2.9: Australian total final energy consumption, by industry

	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Agriculture	117.6	2.7	1.1	2.5
Mining	729.7	16.8	9.1	7.9
Manufacturing	893.1	20.6	-0.8	-0.7
Construction	25.9	0.6	6.9	0.1
Transport	1,716.6	39.5	2.3	1.9
Water and Waste	17.9	0.4	12.1	3.1
Commercial	336.2	7.7	1.6	2.1
Residential	458.8	10.6	0.1	0.5
Other	49.9	1.1	8.5	-2.6
Total	4,345.7	100.0	2.5	1.9

Notes: Energy consumption in some sectors differs from Table 3.3 due to exclusion of energy used in conversion activities.

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table H

Figure 2.9: Australian final energy consumption, refined products and electricity



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Tables F and H

2.5 Energy use, by state and territory

In 2017–18, most growth in energy use was in New South Wales, Western Australia and South Australia, while energy use in Victoria fell (Table 2.10).

In New South Wales, energy consumption grew by 2 per cent in 2017–18. This growth was spread across most sectors with the largest rises in transport and black coal for electricity generation. Energy consumption in Western Australia rose by 3 per cent in 2017–18. Nearly all of this growth was in the mining sector, including for LNG and other mining, with consumption in manufacturing and electricity generation declining.

South Australian energy consumption increased due to increased activity in most major sectors, including gas use for electricity generation, and energy use in transport and manufacturing. Tasmanian energy consumption rose slightly in 2017–18 as a result of increased consumption in metals production, while mining drove an increase in energy consumption in the Northern Territory.

Queensland energy consumption was mostly flat, with increased mining consumption offset by falling use in manufacturing sectors such as sugar and metals production, and milder weather reducing residential energy consumption for cooling.

In Victoria, energy consumption fell 5 per cent in 2017–18, reflecting the large decline in brown coal consumption for electricity generation after the closure of Hazelwood (Figure 2.10).

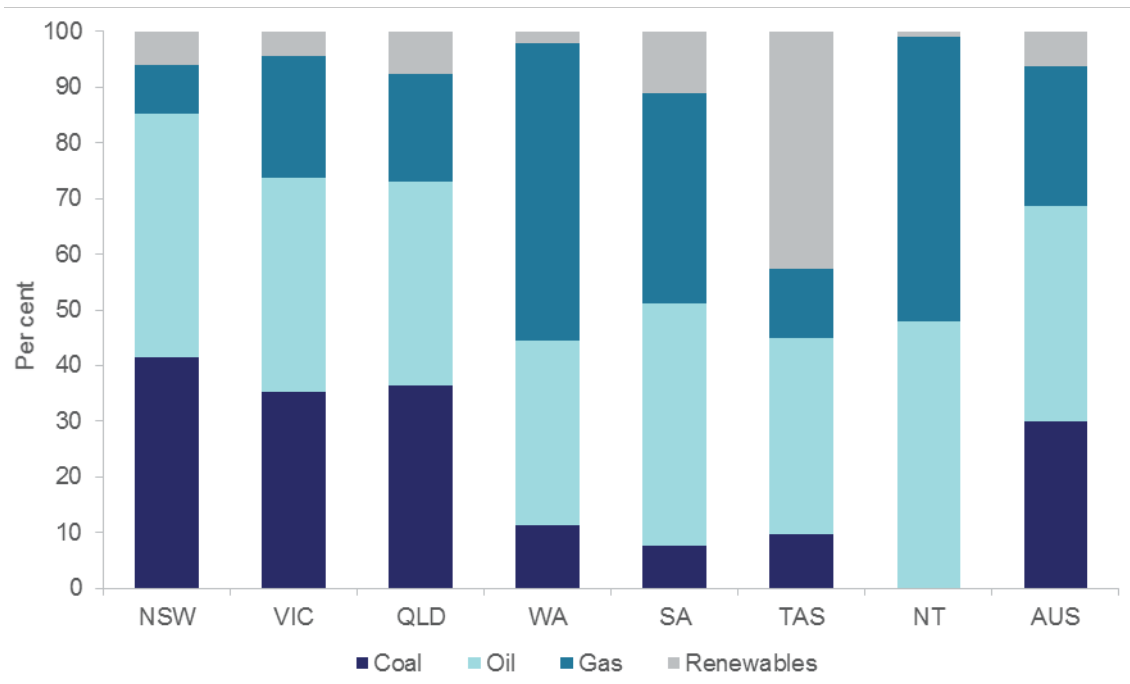
Table 2.10: Australian energy consumption, by state and territory

	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
New South Wales ^a	1,557.9	25.2	2.0	-0.2
Victoria	1,330.1	21.6	-5.0	-0.7
Queensland	1,537.7	24.9	0.5	1.5
Western Australia	1,206.6	19.5	2.7	3.1
South Australia	337.9	5.5	14.7	-0.6
Tasmania	109.6	1.8	1.5	-0.5
Northern Territory	92.0	1.5	10.6	-0.4
Total	6,171.7	100.0	0.9	0.6

Notes: ^a Includes Australian Capital Territory

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table C

Figure 2.10: Australian energy mix, by state and territory, 2017–18



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table C

3. Energy production

3.1 Primary production

Energy production is defined as the total amount of primary energy produced in the Australian economy, measured before consumption or transformation. Forms of renewable energy that produce electricity directly without a thermal component, such as wind, hydro and solar PV, are considered primary energy sources. Coal-fired electricity generation is considered secondary energy production and is not included, as the coal is already accounted for when mined.

Production of primary energy increased by 4 per cent in 2017–18, to 18,603 petajoules (Table 3.1, Figure 3.1). Australia is a net exporter of energy, including coal and natural gas, with net exports over two-thirds of production (Figure 3.2). Australia also exports large volumes of uranium oxide.

Black coal production grew by 2 per cent overall, to 12,370 petajoules (450 million tonnes), and remained Australia's largest contributor to energy production. An increased share of production was in Queensland where production grew by 5 per cent, while the other main producing state, New South Wales, saw production decline by 2 per cent. 2017–18 was a new peak for black coal production in Australia.

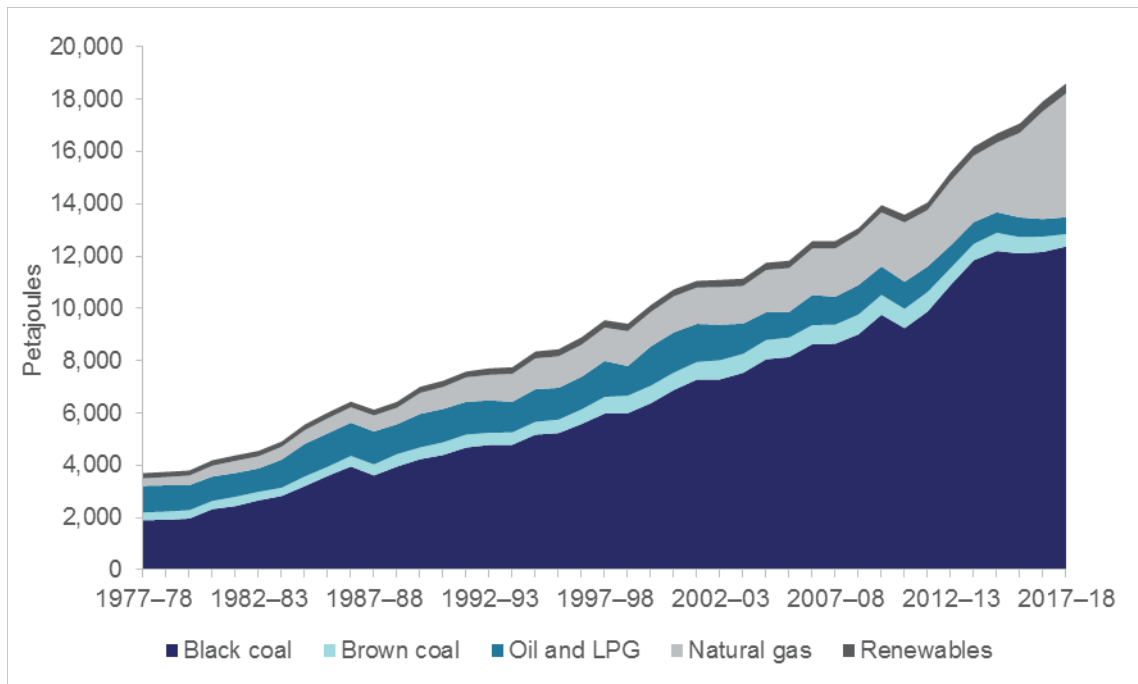
Brown coal production fell in 2017–18, by 19 per cent to 473 petajoules (46 million tonnes). Virtually all brown coal produced in Australia is used for electricity generation. Brown coal production is now 62 per cent of peak production in 2009–10. The fall in production is a result of power station closures, with 2017–18 the first full financial year without Hazelwood power station in operation.

Table 3.1: Australian energy production, by fuel type

	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Black coal	12,370.1	66.5	1.7	3.6
Brown coal	473.3	2.5	-19.0	-5.0
Natural gas	4,731.2	25.4	14.6	10.4
Oil and NGL	572.0	3.1	-4.2	-6.3
LPG	74.3	0.4	2.2	-3.9
Renewables	382.1	2.1	0.9	5.3
Total	18,602.9	100.0	3.8	4.0

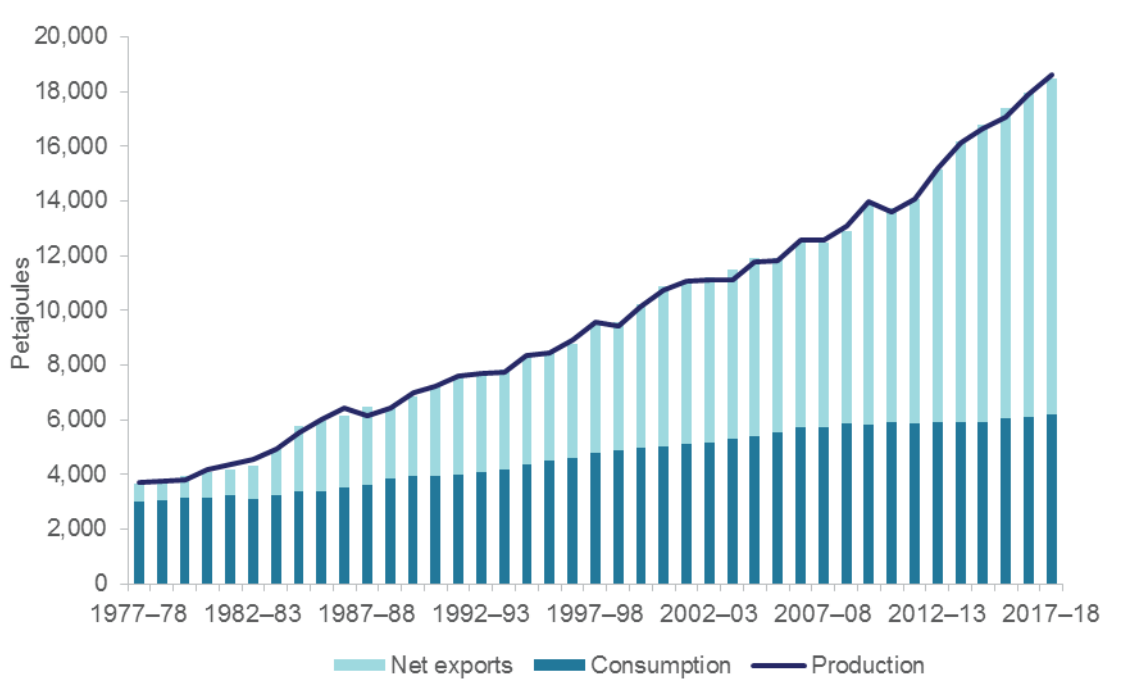
Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table J

Figure 3.1: Australian energy production, by fuel type



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table J

Figure 3.2: Australian energy balance



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Tables C and J

Natural gas production rose by 15 per cent in 2017–18 to 4,731 petajoules (121 billion cubic metres) to support additional LNG exports. Western Australia remained Australia's largest producer of natural gas, increasing 25 per cent in 2017–18 to 2,714 petajoules (68 billion cubic metres), over half of total gas production. Queensland accounted for 31 per cent of total production in that year. Queensland gas production of 1,484 petajoules (40 billion cubic metres) in 2017–18 was nearly five times what it was in 2013–14.

Production of coal seam gas increased by 8 per cent in 2017–18 to reach 1,439 petajoules (38 billion cubic metres). Coal seam gas accounted for 30 per cent of Australian gas production on an energy content basis, and over two-thirds of east coast gas production in 2017–18.

Australia produced 572 petajoules (15.5 billion litres) of crude oil and natural gas liquids in 2017–18, a decline of 4 per cent relative to the previous year. Oil output grew by 1 per cent in South Australia, but fell across all other states and territories, attributable to continued declines in production at mature fields.

Renewable energy production increased by 1 per cent in 2017–18 to reach 382 petajoules. Wind and solar were the major sources of growth, with bagasse and hydro energy production declining. Renewable energy accounted for just over 2 per cent of total energy production in 2017–18.

Australia also produces uranium oxide, which is exported for use in nuclear power plants overseas. Uranium production decreased 9 per cent in 2017–18 to 6,654 tonnes, which is equivalent to 3,127 petajoules, despite increased exports. Uranium oxide is not included in the total primary energy production. Instead, the heat content of the steam leaving the nuclear reactor for the turbine is counted, which is not applicable for Australia.

3.2 Electricity generation

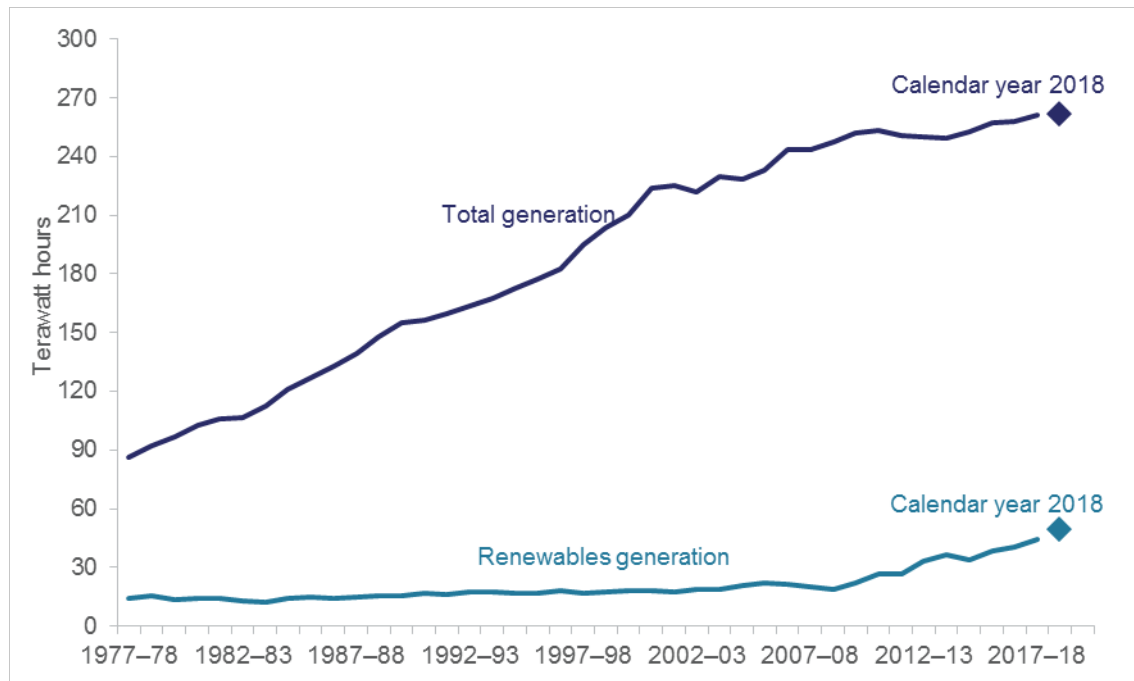
In 2017–18 total electricity generation in Australia increased modestly, by 1 per cent. Total electricity generation was 261 terawatt hours (940 petajoules) in 2017–18, the highest total generation on record for Australia (Figure 3.3).

This figure captures all electricity generation in Australia. In addition to power plant output, it includes rooftop solar PV generation, generation by industrial facilities such as in mining and manufacturing, off-grid generation, and electricity consumed by the generating entity. The inclusion of these components contributes to the difference in generation reported by the Australian Energy Market Operator.

About 13 per cent of Australia's electricity was generated by industry and households. This share varies considerably across state and territories, including contributing over one-third of total generation in Western Australia (Figure 3.4). This figure is estimated using the industry classification reported by the facility, and does not differentiate between on or off grid.

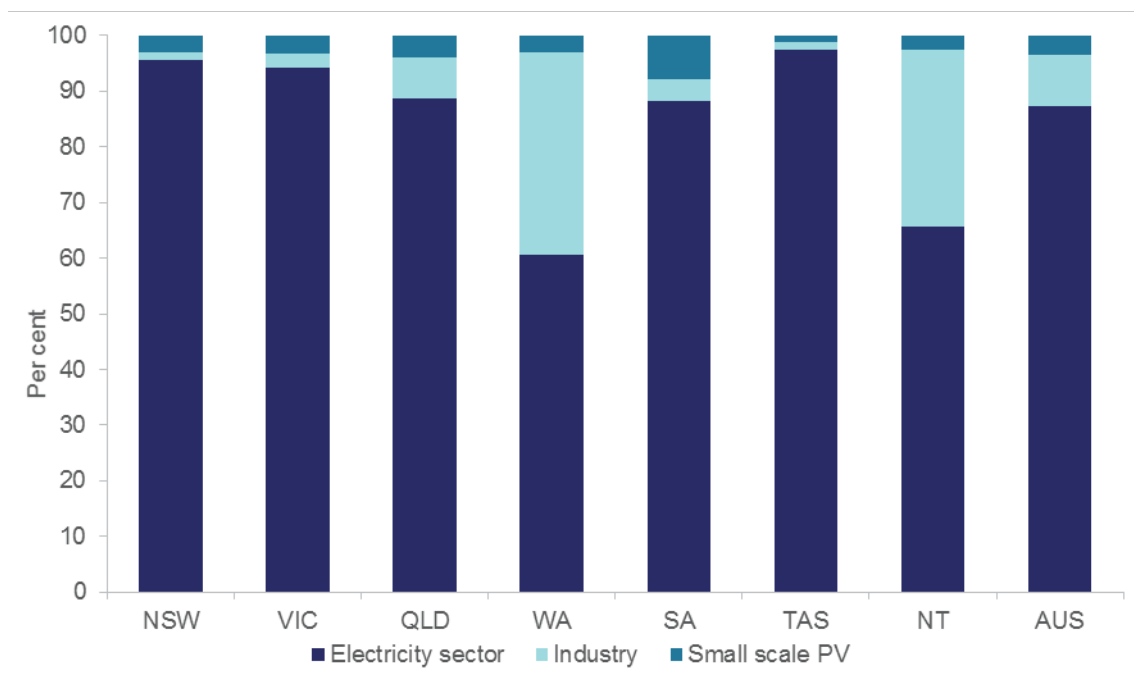
Electricity generation decreased in 2017–18 in Victoria (by 10 per cent), but increased in all other states and territories. This decline reflects the closure of the Hazelwood brown coal power station in Victoria in March 2017.

Figure 3.3: Australian electricity generation



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table L and O

Figure 3.4: Australian electricity generation, by industry, 2017-18

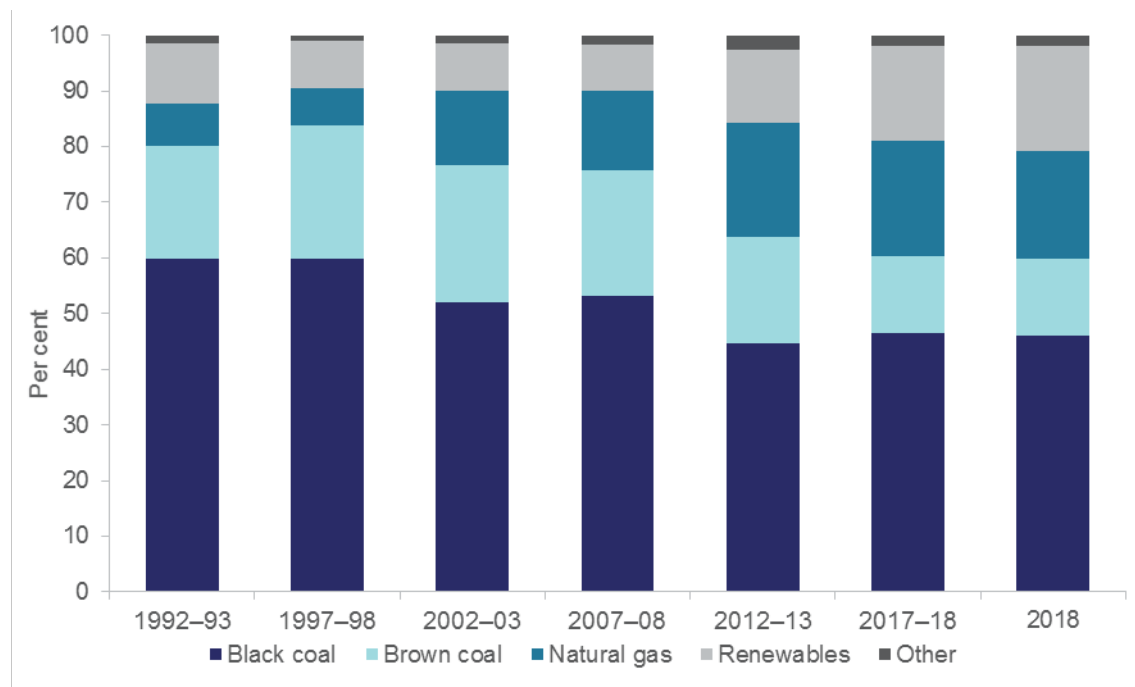


Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table O

Coal remained the major source for electricity generation in 2017-18, with its share in the fuel mix remaining at 60 percent (Table 3.2). Coal's share of the electricity generation mix is well below its share of more than 80 per cent at the beginning of the century (Figure 3.5).

Coal-fired generation increased in New South Wales and Queensland in 2017–18, with total black coal-fired generation rising by 3 percent. However, brown coal-fired generation declined by 17 per cent in 2017–18, leading to an overall decline in coal-fired generation of 3 per cent. This reverses the increase in coal-fired generation in Australia in 2014–15 and 2015–16, and returns to a previous long term trend of decline.

Figure 3.5: Australian electricity generation fuel mix



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table O

Natural gas-fired generation increased by 7 per cent in 2017–18, and continued to account for about 21 per cent of Australia’s electricity generation. Gas-fired generation fell by 9 per cent in New South Wales and by 10 per cent in Queensland, but rose in all other regions, with a 29 per cent increase in South Australia, and a 44 per cent increase in Victoria to help replace the supply that left with the closure of Hazelwood. It also increased in Western Australia to support the increase in LNG exports.

Oil-fired generation decreased by 7 per cent in 2017–18 and sits at 2 per cent of Australia’s electricity generation. This decline largely occurred in Western Australia, where it was displaced by gas generation.

Renewable energy accounted for 17 per cent of Australia’s electricity generation in 2017–18. Renewable generation increased by 10 per cent in 2017–18, driven by increases in solar and wind, which increased by 23 per cent and 20 per cent respectively. Hydro generation decreased by 2 per cent compared to 2016–17, due to increased drought conditions in eastern Australia.

Hydro continues to be the largest contributor to renewable generation, with a 36 per cent share of renewable generation in 2017–18. This compares with 95 per cent in 2000–01, with the composition of renewable energy in Australia

diversifying significantly since then, as wind and increasingly solar capacity have progressively come online (Figure 3.5). Australia's only geothermal plant closed in 2016–17.

Table 3.2: Australian electricity generation, by fuel type

	2017–18		Average annual growth	
	GWh	share (per cent)	2017–18 (per cent)	10 years (per cent)
Fossil fuels	216,497	82.9	-0.5	-0.6
Black coal	121,702	46.6	2.9	-0.5
Brown coal	36,008	13.8	-17.3	-5.0
Gas	53,882	20.6	6.8	4.1
Oil	4,904	1.9	-7.0	4.2
Renewables	44,643	17.1	10.4	10.2
Hydro	16,021	6.1	-1.6	3.4
Wind	15,174	5.8	20.5	16.6
Bioenergy	3,518	1.3	0.5	2.6
- bagasse	1,425	0.5	-0.7	na
- wood, woodwaste	315	0.1	-11.2	na
- municipal, industrial waste	95	0.0	25.7	na
- sulphite lyes, biofuels	429	0.2	-2.9	na
- landfill biogas	1,027	0.4	5.9	na
- sludge biogas	226	0.1	1.6	na
Solar PV	9,930	3.8	23.0	58.7
- small scale	8,922	3.4	20.6	56.8
- large scale	1,008	0.4	49.8	na
Total	261,140	100	1.2	0.6

na – not available

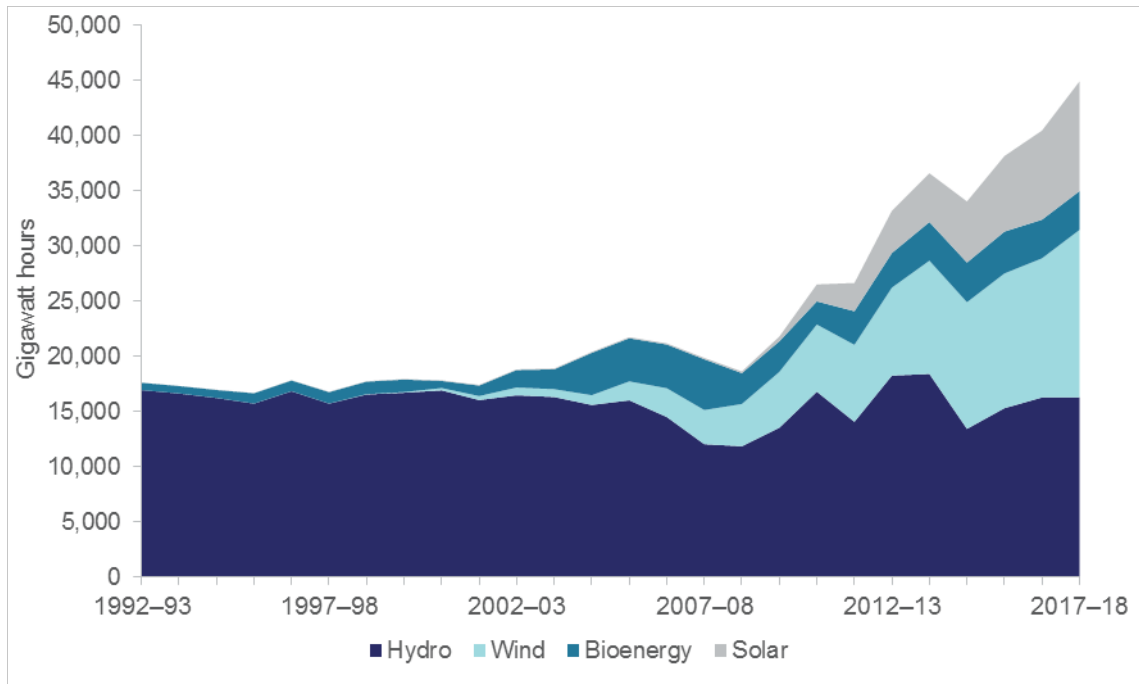
Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table O

Wind contributed 34 per cent of renewable electricity in 2017–18 and 6 per cent of total electricity generation in Australia. Wind generation rose by 20 per cent in 2017–18. Wind generation continues to be particularly prevalent in South Australia, accounting for over one-third of the total generation mix in that state for the past three years.

Solar generation continued to grow strongly in 2017–18, by 23 per cent, and accounted for 4 per cent of total electricity generation in Australia. Growth in large scale installations remained strong at 50 per cent, largely from new facilities. However, this growth was from a small base, and small scale rooftop solar PV installations continue to make up 90 per cent of total solar generation in Australia.

The use of solid municipal and industrial waste generation grew by 26 per cent from a low base, and landfill biogas generation grew 6 per cent, with electricity from waste sources accounting for around 0.5 per cent of total generation in 2017–18. Generation from bagasse during 2017–18 was lower than the previous year due to lower levels of sugar cane production.

Figure 3.6: Australian electricity generation from renewable sources



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table O

3.3 Electricity generation in calendar year 2018

Estimates of electricity generation were published in March 2019 for the 2018 calendar year, to improve the availability of up-to-date official data on total generation in Australia. Total electricity generation in Australia was estimated to be 261 terawatt hours in calendar year 2018, an increase of approximately 1 per cent compared with 2017 (Table 3.3).

Fossil fuel sources contributed 212 terawatt hours (81 per cent) of total electricity generation in 2018, a decrease of 3 per cent compared with 2017. Coal continued to account for the majority of electricity generation, at 60 per cent of total generation in 2018. Gas-fired generation decreased by 9 per cent in 2018, reflecting higher domestic prices, to represent 19 per cent of total generation.

Renewable sources contributed 49 terawatt hours, or about 19 per cent of total electricity generation in 2018. This is the highest share since the mid-1970s. The largest source of renewable generation in 2018 was hydro (7 per cent of total generation), followed by wind (6 per cent) and solar (5 per cent).

Renewable generation increased by 25 per cent in 2018, with a steep increase in large-scale solar generation (160 per cent) and growth in small-scale solar (22 per cent), wind generation (23 per cent), and hydro generation (27 per cent).

Table 3.3: Australian electricity generation, by fuel type, calendar year 2018

	2018	
	GWh	share (per cent)
Fossil fuels	212,066	81.1
Black coal	120,601	46.1
Brown coal	35,962	13.8
Gas	50,245	19.2
Oil	5,259	2.0
Renewables	49,339	18.9
Hydro	17,452	6.7
Wind	16,266	6.2
Bioenergy	3,539	1.4
Solar PV small scale	9,942	3.8
Solar PV large scale	2,139	0.8
Total	261,405	100.0

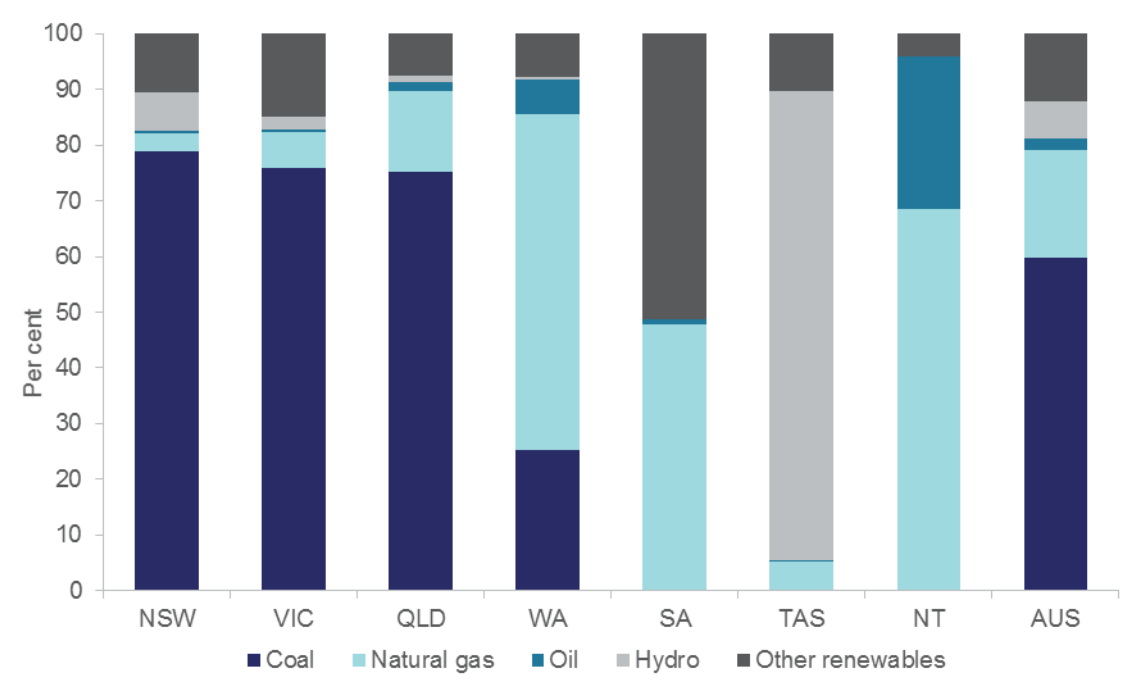
Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table O

Generation sources vary quite a lot across Australia. In 2018, more than 75 per cent of electricity generation in Queensland, New South Wales and Victoria was coal-fired (Figure 3.7). In Victoria, brown coal's share was 76 per cent in 2018, down from 85 per cent in 2016. This is largely attributable to the closure of Hazelwood in early 2017.

Gas accounted for the majority of generation in Western Australia and the Northern Territory, and Western Australia accounted for 49 per cent of Australia's gas-fired generation in 2018.

Renewable energy's share was 95 per cent in Tasmania and 51 per cent in South Australia in 2018. In Tasmania, this was mainly hydro, while in South Australia wind accounted for 40 per cent of generation and solar another 10 per cent. South Australia accounted for a little over one-third of total wind generation in Australia. Victoria accounted for 28 per cent, and New South Wales 19 per cent.

Figure 3.7: Australian electricity generation fuel mix, calendar year 2018



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table O

4. Energy trade

4.1 Exports

Australia exports a significant proportion of its energy production. Around 87 per cent of black coal production was exported in 2017–18, as was around 71 per cent of natural gas production and 84 per cent of crude oil production. Australia’s energy exports rose by 4 per cent in 2017–18 to reach 14,739 petajoules, supported by a large increase in LNG exports (Table 4.1; Figure 4.1).

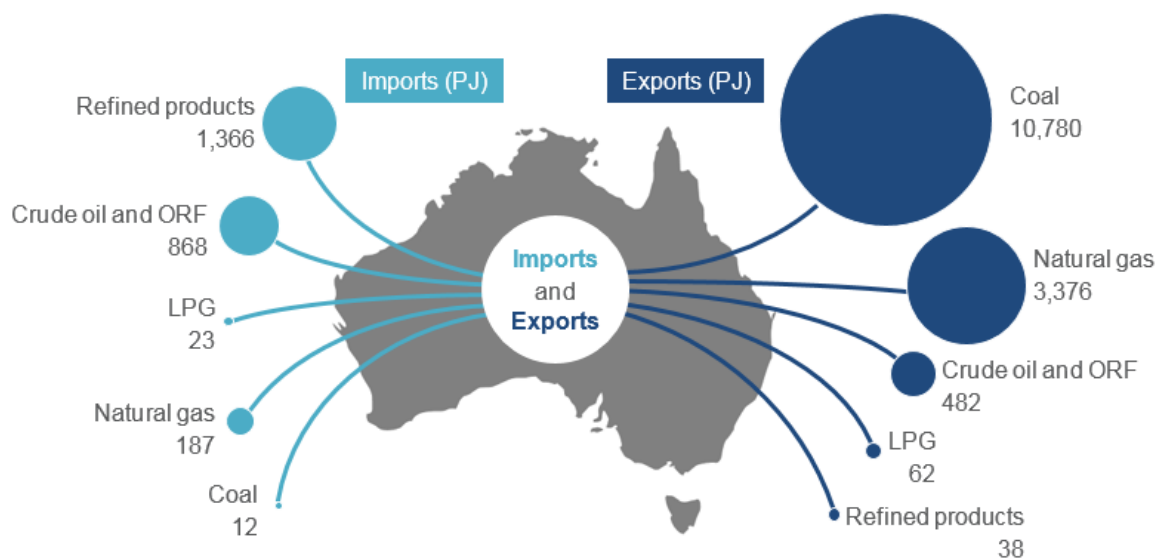
Table 4.1: Australian energy exports, by fuel type

	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Black coal	10,760.6	73.0	0.7	4.3
Coal by-products	19.7	0.1	-2.0	na
LNG	3,376.4	22.9	18.3	16.7
Crude oil	482.3	3.3	1.8	-2.6
LPG	61.7	0.4	2.4	-1.0
Refined products	38.3	0.3	-4.0	-1.4
Total	14,739.0	100.0	4.3	5.7

na – not available

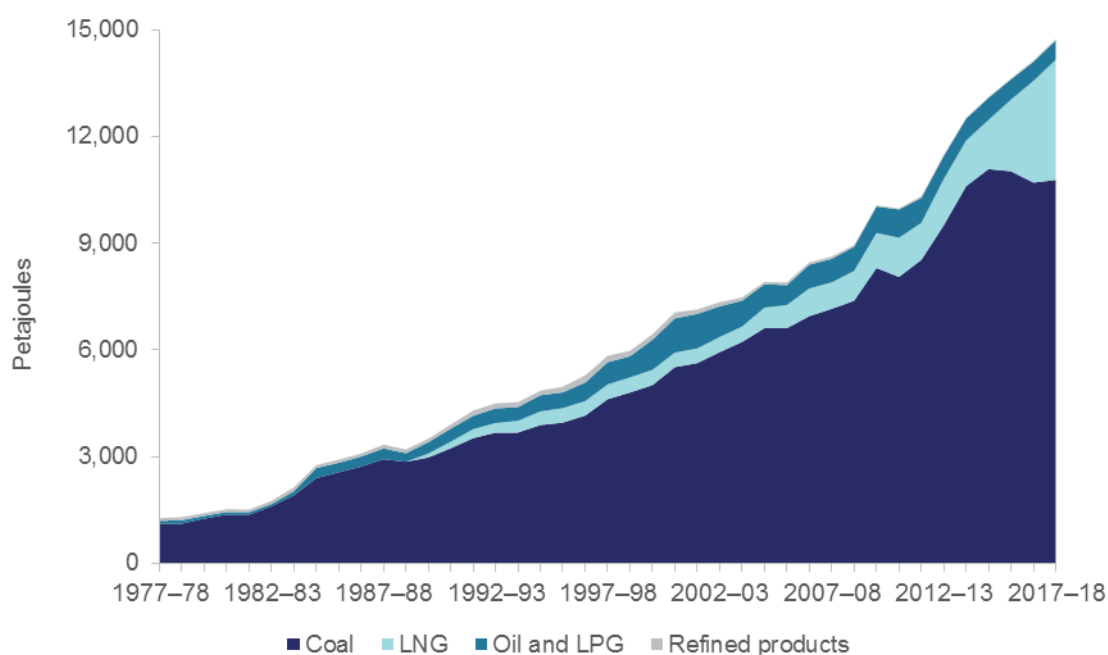
Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table J

Figure 4.1: Australian energy trade, 2017–18



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table J

Figure 4.2: Australian energy exports, by fuel type



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table J

Black coal remains Australia's largest energy export in energy content terms. (Figure 4.2). Exports of black coal grew by 1 per cent in 2017–18 in energy content terms, to 10,761 petajoules (around 382 million tonnes). On average, coal exports have grown by 4 per cent a year over the past decade.

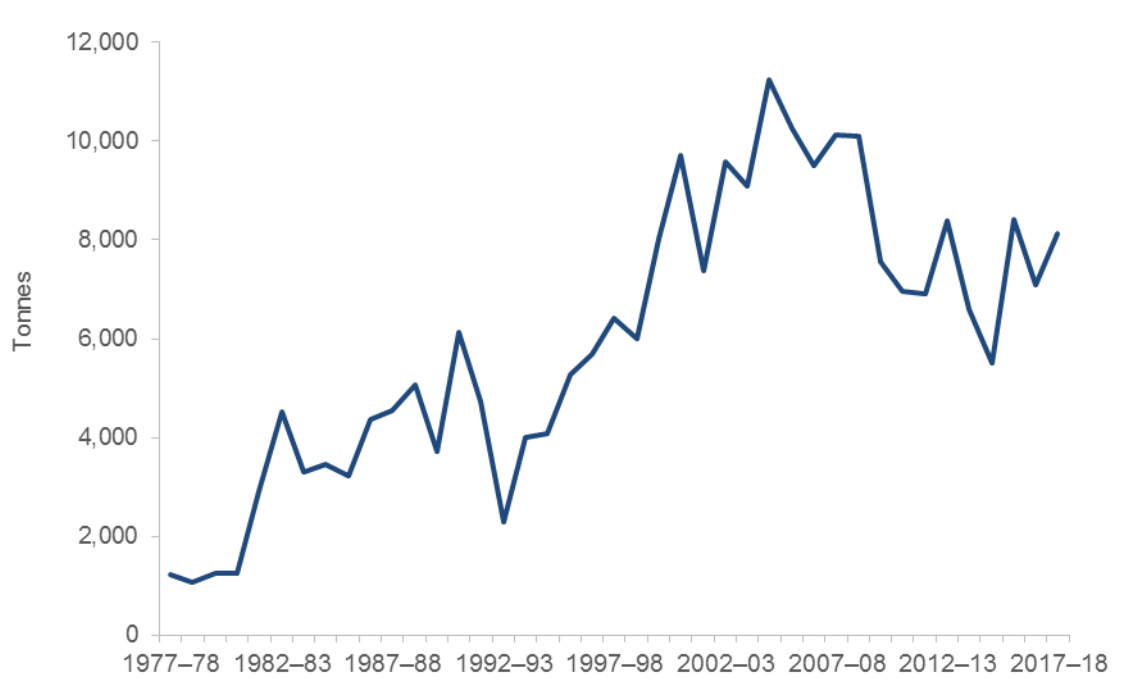
LNG exports increased by 18 per cent in 2017–18, to 3,376 petajoules (around 62 million tonnes), as new export capacity came online in Western Australia. Exports of LNG have increased by an average of 17 per cent a year over the past decade, with several new facilities commencing production.

Crude oil exports grew by 2 per cent in 2017–18 to 482 petajoules (13 billion litres). Australia also exports a small volume of refined products. Aviation turbine fuel exports increased in 2017–18, but petrol and fuel oil exports decreased. Refined product exports remain a relatively small proportion of local production.

Australia also exports large volumes of uranium oxide, which is enriched overseas for use in nuclear power plants. Australia accounted for 11 per cent of world uranium production in 2017–18 and is one of the world's largest exporters. Uranium oxide is not included in a country's energy balance. Instead, the heat content of the steam leaving the nuclear reactor for the turbine is counted, which is not applicable for Australia.

Uranium exports increased by 15 per cent in 2017–18, to 8,118 tonnes, which has an energy content of around 3,815 petajoules (Figure 4.3). While Australia exports all of its uranium production, production and export figures can differ due to stockpiling.

Figure 4.3: Australian uranium exports



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table S

4.2 Imports

Australia's energy imports increased by 6 per cent in 2017–18 to 2,454 petajoules, although as with recent years, this masked large movements in individual fuels (Table 4.2).

Refined products and crude oil are by far Australia's largest energy imports (Figure 4.4), with the majority of consumption of these commodities met by imports.

Table 4.2: Australian energy imports, by fuel type

	2017–18		Average annual growth	
	PJ	share (per cent)	2017–18 (per cent)	10 years (per cent)
Crude oil	867.6	35.3	10.1	-0.9
LPG	22.5	0.9	-16.9	-2.0
Refined products	1,365.7	55.6	5.8	7.8
Natural gas	186.5	7.6	-9.7	-2.9
Coal and coal byproducts	12.1	0.5	58.5	25.0
Total	2,454.3	100.0	5.8	2.9

Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table J

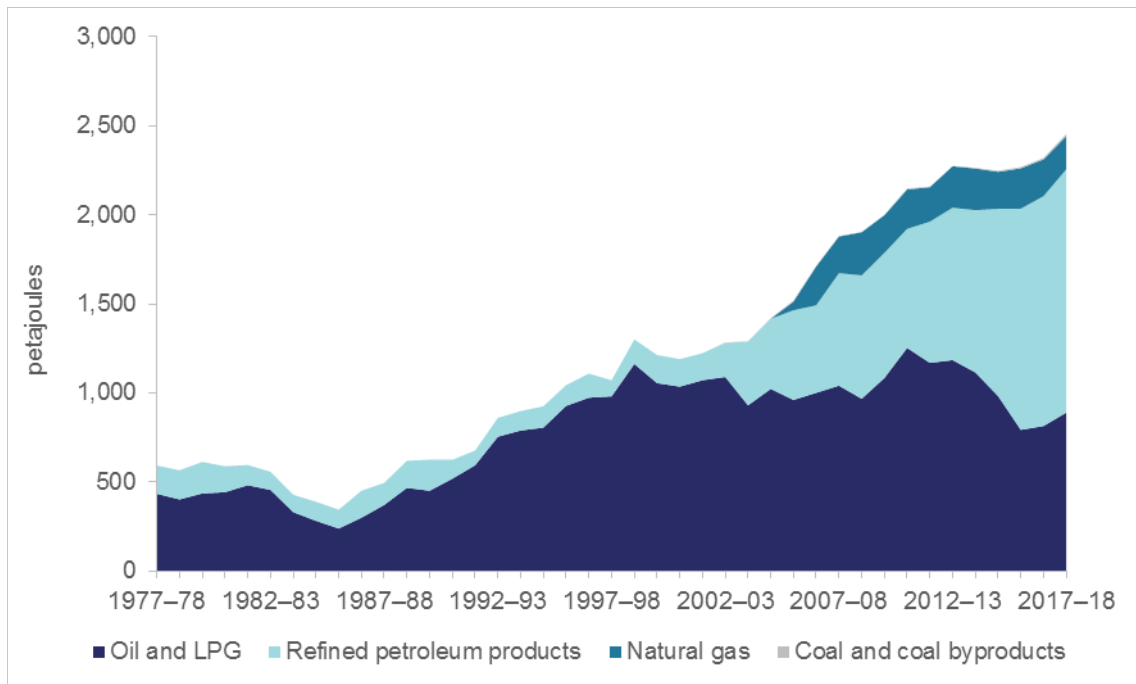
Imports of crude oil increased by 10 per cent in 2017–18, to 868 petajoules (around 22 billion litres). Australia imports a relatively large proportion of its

refinery feedstocks, with most of Australia’s oil production occurring off the north-west coast, some distance from most domestic refining capacity on the east coast. In addition, domestically produced grades of crude oil are generally not as well suited for use by local refineries as those sourced from other countries. Imports accounted for just over three-quarters of total refinery input in 2017–18 (Figure 4.5).

Refined product imports, excluding LPG, rose by 6 per cent to 1,366 petajoules (around 37 billion litres) in 2017–18. This continues the longer-term trend towards imported refined products, following the closure of several domestic refineries and continued growth in demand. Imported products now account for around 57 per cent of total refined product consumption.

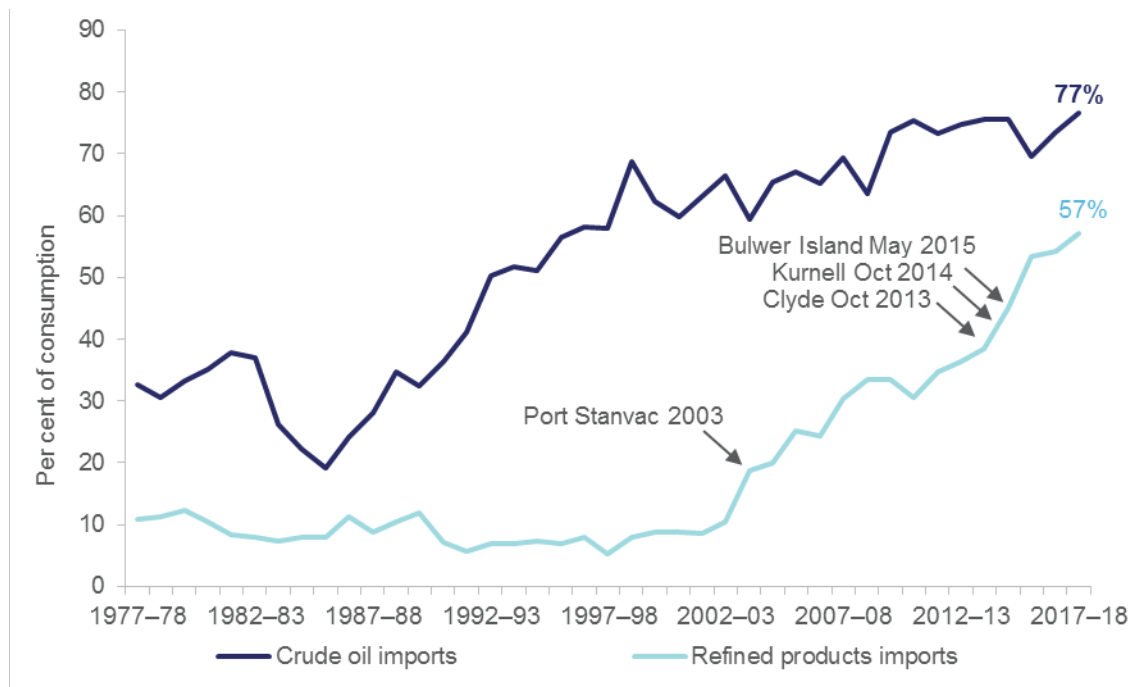
Natural gas imports are the gas produced in the Joint Petroleum Development Area which is liquefied in Darwin for export.

Figure 4.4: Australian energy imports, by fuel type



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Table J

Figure 4.5: Share of imports in total consumption of crude and refined products



Source: Department of the Environment and Energy (2019) *Australian Energy Statistics*, Tables D and J

5. References

Australian Bureau of Agricultural and Resource Economics and Sciences (2019) *Agricultural commodities: June quarter 2019*, Canberra.

Australian Bureau of Statistics (2018a) *Motor Vehicle Census, Australia*, 31 Jan 2019, cat. no. 9309.0, Canberra.

Australian Bureau of Statistics (2019b) *Australian System of National Accounts*, cat. no. 5204.0, Canberra.

Australian Bureau of Statistics (2019c) *Consumer Price Index, Australia*, June 2019, cat. no. 6401.1, Canberra.

Australian Bureau of Statistics (2019d) *Gross Value of Irrigated Agricultural Production, 2017–18*, cat. no. 4610.0.55.008, Canberra.

Bureau of Infrastructure, Transport and Regional Economics (BITRE) 2019, *Domestic Airline Performance*, Canberra.

Department of the Environment and Energy (2019) *Australian Energy Statistics*, Canberra, September.

Department of the Environment and Energy (2019) *Guide to the Australian Energy Statistics*, Canberra, September.

Department of Industry, Innovation and Science (2019) *Resources and Energy Quarterly, June quarter*, Canberra, July.