June 2005

ENERGY UPDATE

2005

Australian energy consumption and production, 1973-74 to 2003-04

Over the past thirty years, energy consumption in Australia has more than doubled from around 2600 petajoules to almost 5350 petajoules. Coal has maintained a fairly constant share of the national fuel mix, remaining Australia's largest source of energy. Natural gas and renewable energy are gradually replacing oil as the second largest source of energy.

Until the 1990s, energy consumption in Australia tended to grow at a rate that closely matched growth in gross domestic product. In the past ten years, in contrast, energy consumption has grown more slowly than gross domestic product.

Production and trade

Total energy production in Australia is estimated to have increased by 1.5 per cent in 2003-04, with increased production of black coal and uranium more than offsetting falls in the production of crude oil and condensate (table 1). Total production in 2003-04 is estimated to have been 15 690 petajoules. Coal production, which accounts for approximately 53 per

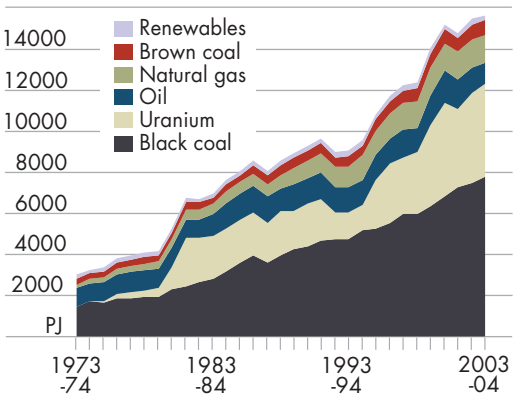
1 Australian energy production

	1973-74	1980-81	1990-91	2001-02	2002-03	2003-04
	PJ	PJ	PJ	PJ	PJ	PJ
Black coal	1 464	2 325	4 396	7 282	7 331	7 615
Brown coal	263	312	484	669	654	658
Crude oil and condensate	858	854	1 182	1 336	1 233	1 031
Naturally occurring LPG	54	79	94	122	124	123
Natural gas	172	416	840	1 388	1 444	1 468
Uranium		1 066	2 063	3 782	4 399	4 529
Renewables [a]	198	207	239	257	266	265
Total	3 008	5 260	9 298	14 837	15 451	15 690

[a] Includes hydroelectricity, wood and woodwaste, bagasse, biogas (landfill and sewage gas) and solar heating.

cent of total production in contained energy terms, is estimated to have increased by almost 4 per cent in 2003-04 on 2002-03 levels (figure A).

A Energy production, by fuel

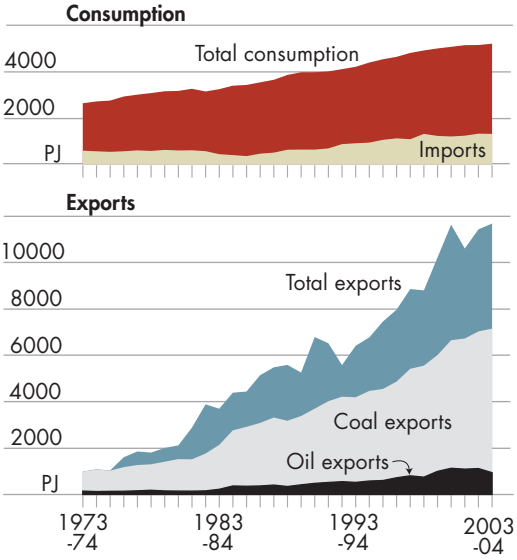


As illustrated in figure B, Australia remains overwhelmingly an energy exporter, with trade in energy dominated by exports of coal. Australia's exports of black coal are estimated to have increased by 5 per cent in 2003-04, from 5909 to 6208 petajoules (208 to 218 million tonnes). Coal exports accounted for 40 per cent of total Australian energy production in 2003-04.

Even though there is little consumption of uranium in Australia, uranium contributes significantly (29 per cent in 2003-04) to total Australian energy production. Uranium exports are estimated to have risen by 3 per cent in 2003-04 to 4529 petajoules.

Australia is a net importer of liquid hydrocarbons (including crude oil, LPG and other refined and semirefined petroleum products). In 2003-04, Australia exported around 900 petajoules of liquids (excluding LNG but including international bunkers) and imported around 1270 petajoules of liquid fuels. Exports of liquid fuels have decreased in the past three years while imports have increased, leading to a greater reliance on overseas sources for Australian feedstock and petroleum products. The increasing net imports reflect a decrease in both production of crude oil and refinery output. Since 2000-01, refinery output is estimated to have fallen by nearly 10 per cent, largely because of the closure of the Port Stanvac refinery in South Australia. This closure resulted in a marked decline in South Australian primary energy consumption in 2003-04, with crude oil consumption falling from over 130 petajoules to just 2 petajoules. The South Australian refinery is on a care and maintenance basis and is not expected to be operational in the medium term.

B Australian energy



Australian electricity production is estimated to have risen by around 10 per cent between 2000-01 and 2003-04. However, production of hydroelectricity fell by around 4 per cent in this period as the water flow available to hydro power generators, particularly in New South Wales, Victoria and Tasmania has been severely affected by continued dry conditions.

Consumption

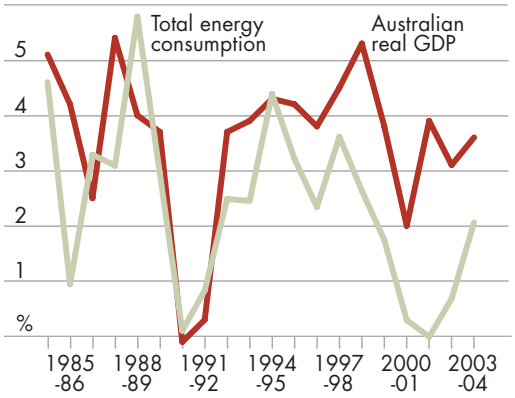
Growth in energy consumption in Australia closely follows trends in gross state product and output from key energy intensive manufacturing and minerals processing sectors, such as iron and steel, cement, pulp and paper, alumina, aluminium and LNG manufacture. Equally, the aggregate intensity of Australian energy consumption has moderated over recent decades, although this trend has been checked in the past two years.

Prior to the 1990s, growth in energy consumption was roughly in line with growth in gross domestic product. However, by the mid-1990s, a divergence emerged between economic growth and energy demand and although there was a slight convergence in the past two years, the break between the growth in economic output and energy use is still evident (figure C). The decline in energy intensity can be attributed to three factors. The first two involve a trend toward greater energy efficiency through technological improvements and fuel switching. The third factor is that the less energy intensive sectors (services) have been growing more rapidly than the more energy intensive sectors (manufacturing and mining) (see Tedesco and Thorpe, ABARE Report, September 2003).

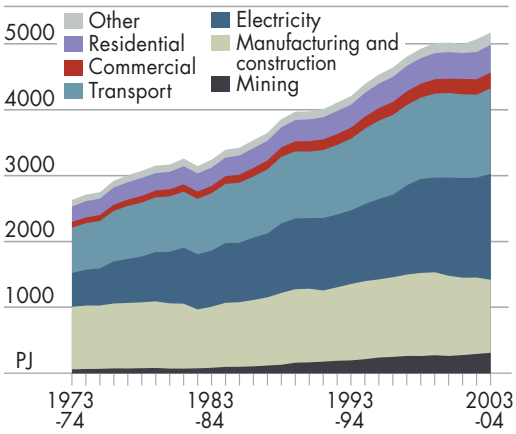
Primary energy consumption in Australia (or total domestic availability) in 2003-04 is estimated to have increased by 2.5 per cent from 2002-03 levels, to 5346 petajoules. The largest energy consuming sectors in Australia are electricity, transport and manufacturing. Energy consumption in these sectors is at least three times greater than that in the next largest sector (figure D).

The growth in energy consumption was particularly strong in the mining and electricity sectors in 2003-04, compared with that in 2002-03. Energy consumption in both sectors is estimated to have increased by approximately 6 per cent to around 309 petajoules in mining and 1629 petajoules in electricity. Energy demand in the transport sector has been more volatile than usual in the past few years, principally as a result of high oil prices and changes in international tourism. In particular, energy consumption in the aviation transport industry fell in both 2001-02 and 2002-03, before rising slightly in 2003-04. Energy consumption in the manufacturing sector fell by 1.4 per cent in 2003-04 from its 2002-03 level.

C Annual growth in energy consumption and real GDP



D Energy consumption, by industry



Over the past fifteen years, energy consumption in both Queensland and Western Australia has increased by around 4 per cent a year. The increase has been driven by state population and economic growth, in addition to the expansion of energy intensive industries. The mining sector has experienced a boom in the past two years, and this has been reflected in increased energy demand in Western Australia and the Northern Territory, where mining and minerals processing contribute significantly to both state's economies.

The economies of Victoria and New South Wales are less energy intensive than those of Queensland and Western Australia, and energy consumption growth in New South Wales and Victoria has been relatively subdued, despite considerable growth in these two state's economies over the past fifteen years. In South Australia and Tasmania, with low population and economic growth coupled with a decreasing emphasis on energy intensive industries, the growth in energy consumption over the past fifteen years has been lower than in other states. However, in recent years the growth in energy consumption has moderated in all states.

Box 1 Total energy consumption

Total energy consumption, as depicted in figure D, is a net concept. In order to avoid double counting, the energy used to produce the energy products consumed in other sectors does not count toward the estimate of total energy consumed in the sector where the products are produced. For example, in the electricity generation sector, total energy consumption comprises fuel inputs of all types less the amount of electricity produced; where one petajoule (PJ) of energy approximates to 278 gigawat hours (GWh) of electricity.

In net energy terms the electricity generation sector accounts for approximately 31 per cent of total energy consumption. The transport and manufacturing sectors both account for 24 per cent. However, in terms of primary energy consumption, the electricity generation sector accounts for around 30 per cent of total energy consumed, while electricity represents 21 per cent of final energy consumed.

Coal, petroleum and gas dominated domestic Australian energy consumption in 2003-04 (figure E). Black and brown coal — used mainly to generate electricity — accounted for around 42 per cent of primary energy consumption in Australia and crude oil for about

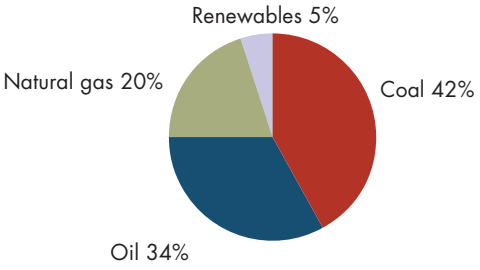
2 Energy consumption, by state

	Consumption		Shares		Average annual growth	
	1988-89	2003-04	1988-89	2003-04	1988-89 to 2003-04	2002-03 to 2003-04
	PJ	PJ	%	%	%	%
New South Wales	1 194	1 515	31.2	28.3	1.6	2.4
Victoria	1 090	1 386	28.4	25.9	1.6	1.1
Queensland	678	1 164	17.7	21.8	3.7	7.9
South Australia	299	320	7.8	6.0	0.5	–6.2
Western Australia	428	782	11.2	14.6	4.1	1.6
Tasmania	92	102	2.4	1.9	0.7	2.4
Northern Territory	51	76	1.3	1.4	2.7	1.8
Australia	3 832	5 346	100.0	100.0	2.2	2.5

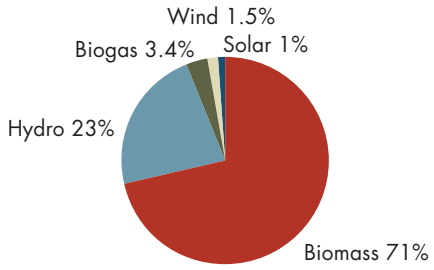
34 per cent. Natural gas represented 20 per cent of Australian energy consumption in 2003-04. Renewable energy sources, such as wind, hydroelectricity and solar energy constituted around 4 per cent of electricity consumption and 4.8 per cent of primary energy consumption. Biomass and hydro-electricity together accounted for 94 per cent of renewable electricity consumption in Australia in 2003-04 (figure F). Overall, the fuel mix in Australian domestic energy use has changed little since 2001-02. Natural gas and renewable energy consumption continues to rise steadily, while petroleum use has declined.

Use of liquefied petroleum gas (LPG) has fallen slightly since 2001-02. As LPG is a substitute for gasoline, higher petrol prices would generally be expected to result in an increase in LPG automobile conversions. However, higher petrol prices in the past two years have not led to an increase in LPG use in transport. This may be partially attributable to increases in the price of LPG in the past two years (from around 35 cents per litre in 2003 to around 45 cents per litre currently).

E Australian primary energy consumption, by fuel, 2003-04



F Renewable energy consumption, by fuel, 2003-04



The use of leaded petrol is now down to 41 petajoules (from 103 petajoules in 2000-01), and Australian refiners have not produced leaded gasoline since 2001.

Methodology changes

Owing to a change in the survey cycle, ABARE's 2005 fuel and electricity survey is able to provide information for two additional years, 2002-03 and 2003-04. Some data for 2000-01 and 2001-02 have also been revised.

In the previous cycle (2004), the survey was benchmarked to a one-off statistical collection by the Australian Bureau of Statistics (ABS). In 2003 the ABS conducted the Energy Survey 2001-02 through which they collected data on energy use across most sectors of the Australian economy. Statistics from the Energy Survey 2001-02 were published in March 2003 and are located at www.abs.gov.au/ausstats/ (ABS cat. no. 4649.0.55.001).

The general methodology used in ABARE's *Australian Energy Statistics* is unique among international energy data collections in that it balances consumption with production, where much of the production data are sourced independently. This check for internal

consistency has been an important component of the fuel and electricity survey and ensures that ABARE's estimates of energy consumption at an aggregate level are as accurate as possible.

In addition to the improvements made in the previous survey cycle, some changes were made in this survey cycle to the methodology used to estimate the energy consumption of the agricultural and residential sectors. The methodology involved benchmarking estimates of energy consumption with ABARE's farm survey data, Customs data, the 1998-99 ABS Household Expenditure Survey and estimates of household expenditure on energy for subsequent years. This new methodology has resulted in changes to previous estimates for this sector.

Australian energy statistics – information available online from ABARE's web site

Number	Title	Range
Table A1— A26	Australian energy supply and disposal – energy units	1973-74 to 2003-04
Table B*	Australian energy consumption, by industry – energy units	1973-74 to 2003-04
Table C*	Australian energy consumption, by fuel – energy units	1960-61 to 2003-04
Table D*	Australian consumption of coal, by state – kilotonnes	1960-61 to 2003-04
Table E*	Australian consumption of natural gas, by state – gigalitres	1960-61 to 2003-04
Table F*	Australian energy consumption, by industry and fuel type – energy units	1973-74 to 2003-04
Table G*	Australian energy consumption, by fuel – physical units	1960-61 to 2003-04
Table H*	Australian production of primary fuels – physical units	1960-61 to 2003-04
Table I*	Australian consumption of electricity, by state – gigawathours	1960-61 to 2003-04
Table J	Australian energy supply and trade, by fuel – energy units	1973-74 to 2003-04
Table K*	Australian consumption of petroleum products – megalitres	1960-61 to 2003-04
Table L	Australian petroleum supply and disposal – energy units	1973-74 to 2003-04
Table M	Australian energy imports, by fuel – physical units	1960-61 to 2003-04
Table N	Australian energy exports, by fuel – physical units	1960-61 to 2003-04

(*) Include state level data.

ABARE's energy data are available in the following formats

Product	Format	Product code
1 Energy Update 2005	PDF available from our website	13166
2 Full historical dataset		13172–13185
3 Full projections dataset	forthcoming*	TBA

*ABARE's long term energy projections to 2029-30 will be released in late June 2005.

Industry coverage

ABARE's energy database provides detailed energy consumption and production statistics at an industry specific level. The greatest coverage of industries is provided in the energy intensive manufacturing sectors and for Australian totals. In some cases, particularly at the state level, specific industry detail is not able to be provided for reasons of confidentiality. The Overview tables also include less industry specific detail. The coverage of industries provided in ABARE's energy database includes the following.

Division	Subdivisions		Title
A			**Agriculture, forestry and fishing**
B			**Mining**
C			**Manufacturing**
	21		Food, beverages and tobacco
	22		Textile, clothing, footwear and leather
	23–24		Wood, paper and printing
	25		Petroleum, coal, chemical and associated products
		251	Petroleum refining
		252	Petroleum and coal products nec
		253	Basic chemical products
		254–256	Other chemical, rubber and plastic products
	26		Nonmetallic mineral products
		261	Glass and glass products
		262	Ceramic products
		263	Cement, lime, plaster and concrete products
		264	Nonmetallic mineral products
	27		Metal products
		271	Iron and steel
		272–273	Basic nonferrous metal products
		274–276	Other metal products
	28		Machinery and equipment
	29		Other manufacturing
D			**Electricity, gas and water**
	36		Electricity and gas
		361	Total electricity generation
		362	Gas production and distribution
	37		Water, sewerage and drainage
E			**Construction**
F–G			**Wholesale and retail trade**
I			**Transport and storage**
	61		Road transport
	62		Railway transport
	63		Water transport
		6301	International bunkers
		6302	Coastal bunkers
	64		Air transport
			Domestic air transport
			International air transport
	65-67		Other transport, services and storage
H, J–Q			**Commercial and services**
			Residential
			Solvents, lubricants, greases and bitumen

Source: Modified from Australian Bureau of Statistics and New Zealand Department of Statistics, Australian and New Zealand Standard Industrial Classification (1993 edition).

Fuel coverage

ABARE's energy database also provides detailed energy consumption and production statistics by different fuel types. As with the industry specific data, in some cases, particularly at the state level, data for specific fuels are not able to be provided for reasons of confidentiality.

The range of different fuels (both primary and derived fuels) included in the database include the following.

Black coal
Brown coal
Coke
Coal byproducts
Brown coal briquettes
Wood, woodwaste
Bagasse
Refinery feedstock
Liquefied petroleum gas (LPG)
Aviation gasoline
Aviation turbine fuel
Lighting kerosene
Power kerosene (included with lighting kerosene from 1998-99)
Heating oil
Automotive diesel oil (ADO)
Industrial diesel oil (IDF, included with ADO from 1998-99)
Fuel oil
Petroleum products nec
Solvents
Lubricants and greases
Bitumen
Natural gas
Town gas
Liquefied natural gas (LNG)
Solar energy
Electricity
Hydroelectricity
Uranium