

Are households using renewable energy?

While most greenhouse gas emissions are produced by industry, the amount and type of energy used by households also has considerable implications for the environment. The average household produces about 14 tonnes of greenhouse gas each year, much of it from energy use.¹

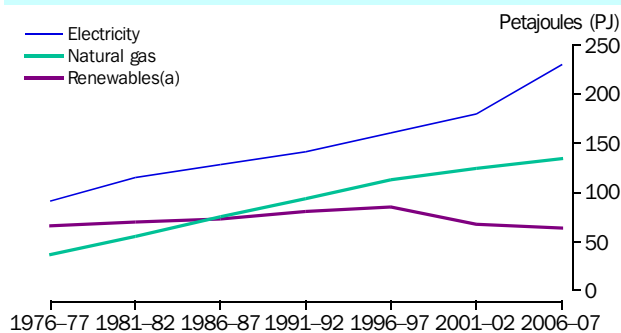
In 2006–07, household energy consumption made up about 8% of total energy use.² Electricity is used by almost every Australian household and accounts for around 85% of household greenhouse gas emissions (excluding car use, which is another major contributor, but is not covered in this article).³ Some electricity for households comes from renewable energy (8%), but most electricity (92%) comes from burning fossil fuels such as coal and gas.⁴ While coal and gas are the lowest cost fuel sources for electricity in Australia, they have higher greenhouse gas emissions than renewable sources.⁵

Renewable energy is sourced from wind, water, sun and biomass products, such as wood. There are two main ways people can use renewable energy in the home. The first is by installing small renewable generation units, or, more commonly, using wood or solar hot water. The other way is to choose to use renewable energy as part of their electricity supply, via GreenPower.

Trends in household energy use

Energy consumption by households is increasing. More people, more appliances and IT equipment per household, and bigger homes have contributed to this growth. Between 1987–88 and 2006–07, residential energy consumption grew by 49% or an average of 2.6% per year.

Type of household energy consumed



(a) Includes wood, woodwaste and solar energy

Source: ABARE 2008, Australian Energy Consumption, by Industry and Fuel; ABARE electronic datasets

Data sources and definitions

Most of the information in this article comes from annual and quarterly reports from the Australian Bureau of Agricultural and Resource Economics (ABARE) and GreenPower status reports. Other information comes from the 2008 *Environmental Issues: Energy Use and Conservation* (ABS cat. no. 4602.0.55.001) and 2007 *Australia's Environment: Issues and Trends* (ABS cat. no. 4613.0) publications.

Energy and emissions unit definitions are available on page 2 of this article.

Biomass is the generation of energy from organically based sources. Methane generated by the decomposition of biomass resources (green waste) in landfill sites, sewage treatment works or large scale composting, can be used to generate electricity. Waste materials from agricultural enterprises such as forestry, sugar cane (known as bagasse), winery and cotton production can also be used to generate electricity. Biomass can also be processed to produce liquid biofuels (biodiesel) or a gas biofuel (biogas).

Hydro-electric power is electricity produced from the energy of falling water using dams, turbines and generators.

Solar/solar photovoltaic: Photovoltaics, or PV for short, converts sunlight directly into electricity. Photovoltaic systems are different to solar hot water systems, which absorb sunlight directly into the water-carrying tubes contained in the panel.

Wind turbines can be used to drive a generator to create electricity.

The size and characteristics of people's homes have significant impacts on household energy use and greenhouse gas emissions. As an example, the amount of floor space will affect the amount of energy used to heat and cool a home. In 2008, 37% of separate houses had four or more bedrooms, while 77% of all households used a heater and 67% used a cooler. Household use of heaters and coolers is the major contributor (41%) to household energy use and costs. Water heating (24%) and other appliances (13%) were also significant users of household energy. These top three energy uses produced a combined 64% of the household sector's greenhouse gas emissions in 2005.³

Community awareness of environmental issues has, in part, led to an increased use of energy saving measures in the home. In 2008, 59% of households had energy saving lighting installed (up from 33% in 2005), and energy star ratings were the main household consideration when replacing refrigerators, freezers and clothes dryers. While people are becoming more environmentally aware, more households now own coolers (67%) and dishwashers (45%) and other appliances, such as LCD and plasma

televisions, the latter using almost three times the amount of energy that a standard television uses.⁶

Types of energy used

Households depend on energy for a range of purposes. Energy is needed to cook, to heat and cool homes, to heat water, for lighting, and to run white goods and other appliances.

...electricity

Electricity is the main energy source used in people's homes. In 2006–07, 52% of the energy used by households was sourced from electricity. Household electricity consumption rose to 231petajoules (PJ) in 2006–07, up 39% from 1997–98.

...natural gas

Natural gas is the second most common source of energy used in the home. In total, households used 135PJ of natural gas in 2006–07, equivalent to 30% of total household energy use, or a 16% increase since 1997–98.

...wood and solar

The most accessible sources of renewable energy available to households are wood and solar energy. Used primarily as a source of heating, wood use by households has declined 26% in the last 10 years, from 82PJ in 1997–98 to 61PJ in 2006–07. Due to air pollution concerns, households, over time, have been encouraged to stop using wood for heating or to convert open fires to slow combustion fires, which are more energy efficient and release only 5% of the

Energy and emissions units

The basic unit of energy is the *joule* (J). A *Petajoule* (PJ) is one thousand trillion joules.

Energy delivered by electric utilities is usually expressed and charged for in kilowatt-hours (kWh):

- *Kilowatt-hours* (kWh): one thousand watt hours
- *Megawatt-hours* (MWh): one million watt hours
- *Gigawatt-hours* (GWh): one billion watt hours
- *Terawatt-hours* (TWh): one trillion watt hours
- Conversion example: 1PJ = 277 thousand MWh

Megatonnes (Mt): one million tonnes. Mt is the unit of measurement used for greenhouse gas emissions. A tonne of emissions is one tonne of carbon dioxide equivalent (CO₂e), which measures all greenhouse gases.

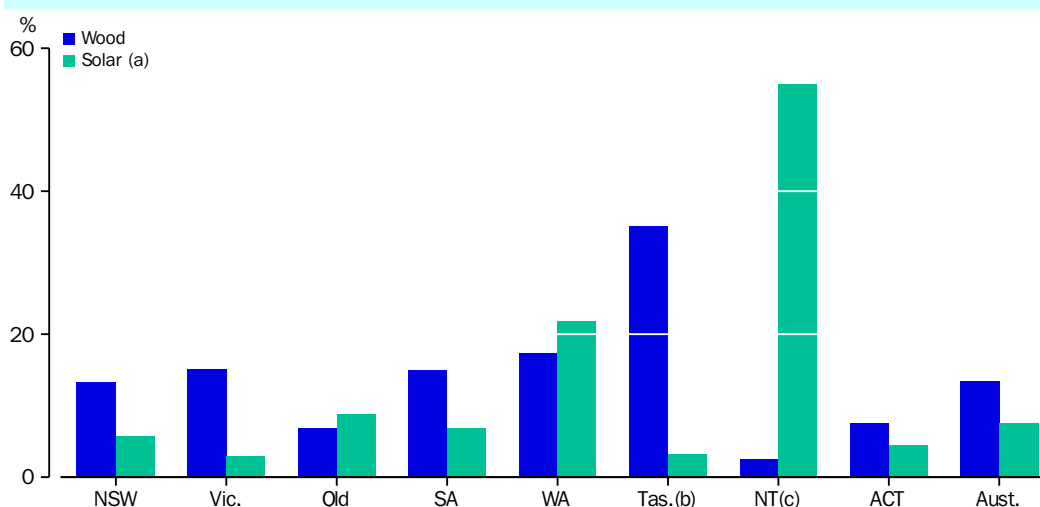
Million tonnes of oil equivalent (Mtoe): A measure of fossil fuel quantities. One Mtoe is the amount of energy released when one million tonnes of crude oil is burnt.

greenhouse emissions that open fires produce.¹

In 2008, 13% of Australian households used wood as a source of energy in the home. More than one-third (35%) of households in Tasmania used wood as an energy source, a decrease from 52% in 2002.

A range of government grants and rebates are available to households, to encourage people to use solar energy in the home. In 2008, 7% of households used solar energy to heat water, up from 4% of households in 2005. Over half of all households in the Northern Territory used solar energy to heat water (54%) – a larger proportion than any other state or territory. Western Australian households ranked second

Wood and solar use by households: state/territory — 2008



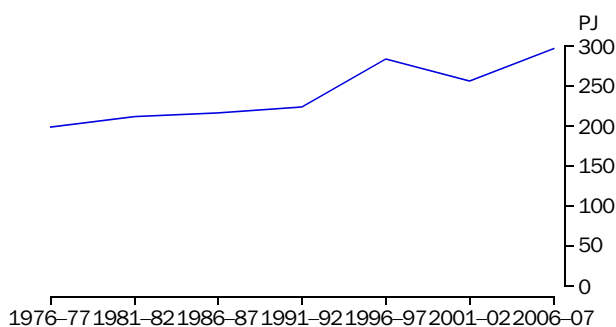
(a) Solar hot water and solar-photovoltaic

(b) Solar estimate for Tasmania has a relative standard error of 25% to 50% and should be used with caution

(c) Refers to mainly urban areas. Northern Territory wood estimate has a relative standard error of 25% to 50% and should be used with caution

Source: [Environmental Issues: Energy Use and Conservation, March 2008](#) (ABS cat. no. 4602.0.55.001)

Production of renewable energy



(a) Includes wood, woodwaste, bagasse, biofuels, hydroelectricity and solar

Source: ABARE 2008, Australian Energy Supply and Trade, by fuel type; ABARE electronic datasets

with 21% of homes using solar energy, while 9% of Queensland households used solar energy to heat water.

...wind and hydro-electricity

Other forms of renewable energy, such as small hydro systems or wind turbines, can be adapted for household use, but are less common.

Production of renewable energy

The production of renewable energy has increased over the last 30 years. In 1976-77, 200PJ of energy was produced from renewable sources. By 2006-07, this had increased to 298PJ, up 49%. Renewable energy production increased by 10% in 2006-07 compared with 2005-06. However hydro-electricity production fell by almost 10% in 2006-07, due to decreasing water availability as a result of dry conditions seen across New South Wales, Victoria and Tasmania during the last decade. Despite this decline, renewable energy maintained its 5% share of total energy supply in 2006-07, due to growth in solar/wind (up 230% to 28PJ), biomass (up 7% to 205PJ) and biogas/liquids (up 4% to 13PJ).

...supply

A range of policy measures have been introduced in Australia to support the supply and development of renewable energy into the future. The Carbon Pollution Reduction Scheme and the expanded Renewable Energy Target scheme are designed to support the reduction of Australia's greenhouse gas emissions by increasing the proportion of Australia's electricity generated from renewable energy sources.⁷

Electricity produced from renewable sources

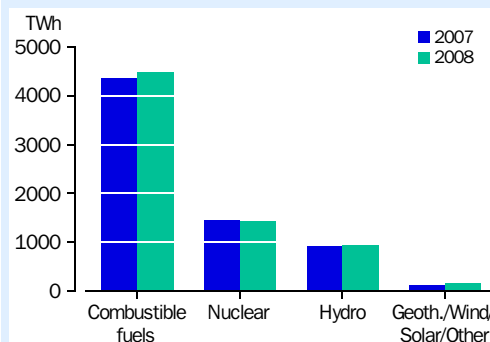
The production of electricity from renewable sources in 2006-07 rose by 6% compared with 2005-06. Over the next 20 years, electricity

International comparison



During January-August 2008, total electricity production from OECD countries rose to 7,032 terawatt-hours (TWh), an increase of 171.4 TWh, or 2.5%.⁹ Production from geothermal, wind, solar and other renewables showed the largest percentage change of any fuel type, increasing 23.5%.⁹ In the OECD Pacific region (comprising Australia, Japan, Korea and New Zealand), production of geothermal, wind, solar and other renewables increased 36.7%, to 14.6TWh, compared with January-August 2007.⁹

OECD electricity production: fuel type, January-August 2007 and 2008



Source: International Energy Agency, Monthly Electricity Statistics, August 2008

Australia's emissions per person (CO₂/pop) are high compared with other OECD countries.¹⁰ High per capita emissions relative to other countries reflect, in part, Australia's reliance on coal in electricity production and the production of goods with high levels of emissions, namely, resource and agricultural products that are destined for export and consumption in other countries.³

Energy supply and emissions: selected OECD countries — 2006

Selected OECD country	Total primary energy supply	Emissions (CO ₂)(a)	
	Mtoe	Mt of CO ₂	T CO ₂ /capita
Luxembourg	4.7	11.2	23.6
United States	2 320.7	5 696.8	19.0
Australia	122.5	394.5	19.0
Canada	269.7	538.8	16.5
Germany	348.6	823.5	10.0
Korea	216.5	476.1	9.9
United Kingdom	231.1	536.5	8.9

(a) CO₂ emissions from fuel combustion only

Source: International Energy Agency, Key World Statistics, 2008

generation from renewable sources is projected to increase by around 2% a year.⁸ Wind and biomass (mainly bagasse and woodwaste) are projected to account for most of the increase in

National GreenPower Accreditation Program: customers and mega watt hours — September quarter 2008

	Total customers	Total GreenPower sales MWh	Sales growth, Sept Qtr 07 to Sept 08 %
Households	817 282	279 306	51.0
Commercial	32 016	280 518	142.5
Total	849 298	559 824	86.2

Source: National GreenPower Accreditation Program, Quarterly Status Report, September 2008

electricity generation from renewable sources.⁸ In 2007 the Australian Government committed to ensuring that 20% of the electricity supply will come from renewable energy sources by 2020.⁷

GreenPower

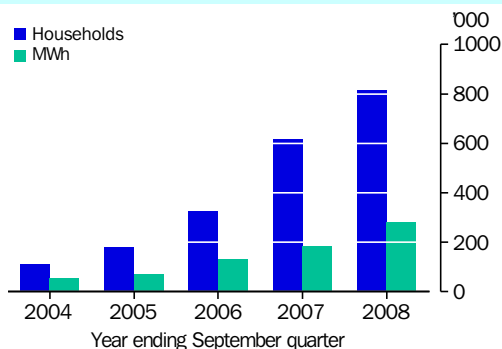
GreenPower products allow customers to replace a proportion of their electricity account with electricity generated from renewable sources, fed into the national power grid. GreenPower was first established in New South Wales in 1997 and GreenPower now has customers in all states and territories except the Northern Territory.

...uptake

Just over 817,000 households were part of a GreenPower scheme in the September quarter 2008. These households consumed just over 279,000 mega watt hours (MWh), or 1PJ of renewable energy. This was an increase of almost 149,000 MWh or 51% compared with the September quarter 2007.

In 2008, the total mega watt hours supplied to households under the National GreenPower Accreditation Program was enough to power a year of household electricity use for almost 45,000 homes.¹¹

Household customers of GreenPower



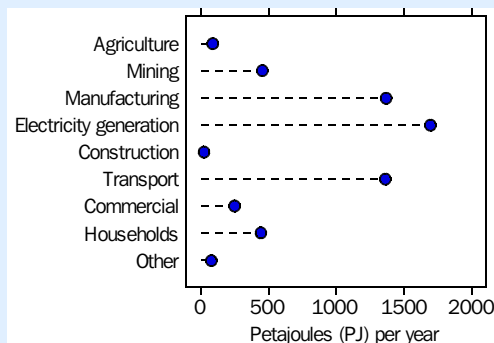
Source: National GreenPower Accreditation Program, Quarterly Status Reports, September 2004–September 2008

Total energy supply and use

Total primary energy production in Australia rose by 3.2% to over 17,000PJ in 2006–07 compared to 2005–06. Only around one third of this energy was used domestically. The energy increase largely came from hard coal production, which maintained its 51% share of total primary energy production, rising 5% to 9,292PJ.

In 2006–07, Australia's primary energy use increased by 2.3% to 5770PJ. Electricity generation, Manufacturing and Transport together accounted for more than 75% of all primary energy use.

Total energy consumption, by sector — 2006–07



Source: ABARE 2008, Energy Consumption in Australia, by industry; ABARE electronic datasets

...awareness

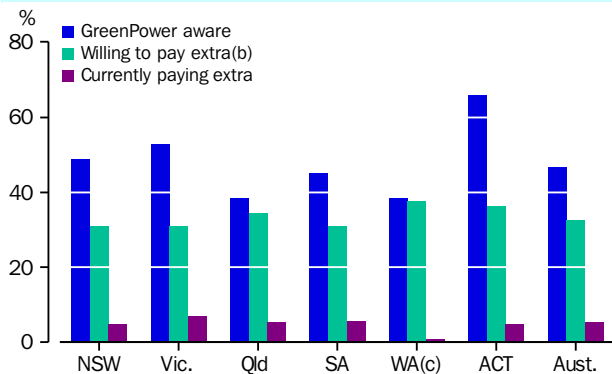
There has been an increase in the awareness of GreenPower options. In 1999 only 19% of households were aware of GreenPower. By 2008, this had risen to over half (52%) of all households, including 5% who reported that they were already paying for GreenPower. More recently, GreenPower reported the uptake at around 10% of households. Differences between the rates are related to the reference periods used and differences between survey and administrative data.

Households in the Australian Capital Territory had the highest rate of GreenPower awareness (71%, including 5% who were paying for GreenPower) while Western Australian households had the lowest awareness (39%).

Not all households who were aware of GreenPower were willing to pay extra for electricity generated from renewable energy in 2008. Around one-third (32%) of households were prepared to pay more for electricity generated from renewable sources.

The willingness to pay extra did not necessarily translate into action. The proportion of households in each state and territory who said they were willing to pay extra for GreenPower was much higher than the proportions who were currently paying extra for a GreenPower option.

Support for GreenPower — 2008^(a)



(a) Data cover only states/territories participating in the National GreenPower Accreditation Program at the time the survey was conducted

(b) Of those who were already aware of GreenPower

(c) WA estimate for 'Currently paying extra' has a relative standard error of 25% to 50% and should be used with caution

Source: [Environmental Issues: Energy Use and Conservation, March 2008](#) (ABS cat. no. 4602.0.55.001)

Conclusion

Australia's energy supply will face many challenges over the next decade. Increasing domestic consumption, the need for investment in new assets and policy measures aimed at reducing greenhouse gases, will all shape the investment in technologies needed to drive the production of renewable energy in the medium to long term.¹²

Endnotes

- 1 Department of the Environment, Water, Heritage and the Arts (DEWHA), *Greenhouse Gas Emissions Calculator*, viewed 10 December 2008, <www.environment.gov.au>.
- 2 Australian Bureau of Agricultural and Resource Economics (ABARE), *Energy Update 2008*, electronic datasets, viewed 15 December 2008, <www.abare.gov.au>.
- 3 Department of Climate Change (DCC), *Australia's National Greenhouse Accounts: National Inventory by Economic Sector 2006*, DCC, 2008, Canberra.
- 4 Australian Conservation Foundation, Total Environment Centre and World Wildlife Fund (WWF) Australia, *Green Electricity Watch 2007*, viewed 19 December 2008, <www.greenelectricitywatch.org.au>.
- 5 Australian Energy Regulator, *State of Electricity Market 2008*, viewed 22 January 2009, <www.aer.gov.au>.
- 6 Energy Australia, *Typical Household Appliance Wattages*, viewed 29 January 2009, <www.energy.com.au>.
- 7 Department of Climate Change (DCC), *The Australian Government's Renewable Energy Target Fact Sheet*, viewed 13 February 2009, <www.climatechange.gov.au>.
- 8 Australian Bureau of Agricultural and Resource Economics (ABARE), *Energy in Australia 2008*, 2008, Canberra.
- 9 International Energy Agency (IEA), *Monthly Electricity Statistics*, August 2008, IEA, Paris, France.
- 10 International Energy Agency (IEA), *Key World Energy Statistics 2008*, IEA, Paris, France.
- 11 GreenPower, *You Can Bank on GreenPower*,

Australia's first solar city

Adelaide is one of seven regions in Australia to trial new approaches to producing and using energy as part of the Australian Government's Solar Cities Program. From now until 2013, Adelaide's local governments, businesses and the community will support the uptake of 1700 solar panels for homes and business. Consumers installing solar systems will be given financial help to do so. There will also be 7000 'smart meters' installed in homes and business and a campaign to inform the community about energy efficiency and encourage the uptake of GreenPower. The trial is expected to cut energy usage by 28GWh, representing an annual saving of \$5 million in electricity costs and a minimum of 30,000 tonnes of greenhouse gas emissions each year.¹³

viewed 26 November 2008, <www.greenpower.gov.au>.

- 12 Australian Bureau of Agricultural and Resource Economics (ABARE), *Electricity Generation: Major Development Projects – October 2008 Listing*, Canberra 2008.
- 13 Department of the Environment, Water, Heritage and the Arts (DEWHA), *Adelaide Solar City*, viewed 10 December 2008, <www.environment.gov.au>.