

Grade 2/3 St John's Lutheran Primary School, Portland at Pacific Hydro's Cape Bridgewater Wind Farm



Clean Energy Council

Clean Energy Australia 2010

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The Clean Energy Council is the peak body representing Australia's clean energy sector. It is a not-for-profit industry association made up of more than 450 member companies operating in the fields of renewable energy and energy efficiency.

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## Introduction

Clean energy is one of the world's fastest-growing sectors. In Australia the national Renewable Energy Target will deliver 20 per cent of the country's electricity from renewable sources such as solar and wind by 2020.

It will unlock more than \$20 billion in investment and create more than 55,000 jobs, in addition to more than 8000 existing jobs. Much of this growth will be in regional Australia, creating employment opportunities and an economic boost for towns and communities. In 2009-10 alone, clean energy in Australia generated just under \$1.8 billion in investment.

The Renewable Energy Target is projected to avoid 380 million tonnes of greenhouse gas emissions, making it the most significant climate change initiative in Australian history.



# Australian Renewable Energy Snapshot

## Percentage of electricity generation from renewables

The Australian electricity industry generated 251 terawatt hours of electricity in the past year to October. Renewable energy accounted for 8.67 per cent of electricity generated. This is a significant rise from previous years and was mostly due to the increased generation from hydro. Increased rainfall in key hydro catchments across the country provided a significant boost in hydro electricity. The increased capacity of wind power across the country also helped to boost generation. Although solar power still makes a relatively small contribution to the energy mix in Australia, the uptake of the technology has grown rapidly in 2010.

Figure 1. Estimated annual electricity generation

Source: Clean Energy Council Renewable Energy Database, ABARE 2010, REC Registry, AEMO, IMO

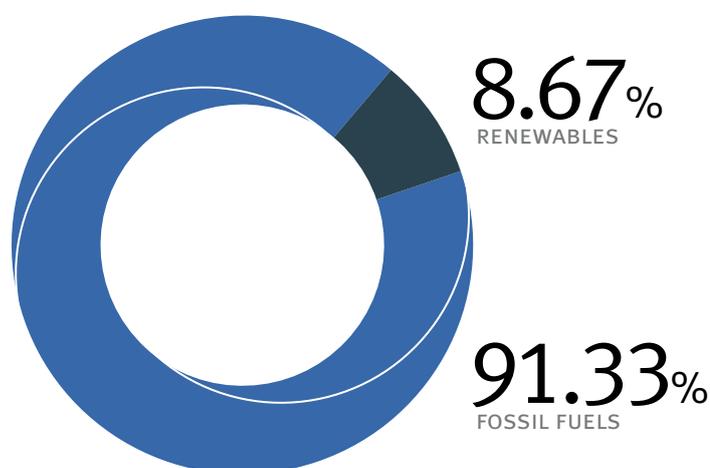


Table 1. Annual renewable electricity generation

Electricity generated between October 2009 and 30 September 2010.

Source: Clean Energy Council Renewable Energy Database, ABARE 2010, REC Registry, AEMO, IMO

FUEL SOURCE	ESTIMATED ELECTRICITY GENERATION PER YEAR (GWh)	EQUIVALENT IN HOUSEHOLDS
Hydro	13,793	1,943,000
Wind	4985	702,000
Bioenergy	2500	352,000
Solar PV	464	65,000
Solar Thermal	4.4	620
Tidal and Wave	1.5	150
Geothermal	0.5	70
Solar Water Heating*	1600	225,000
<b>Renewable Total</b>	<b>21,751</b>	<b>3,062,840</b>

\* As solar water heating does not produce electricity it has not been included in the total generation figures

# Australian Renewable Energy Snapshot

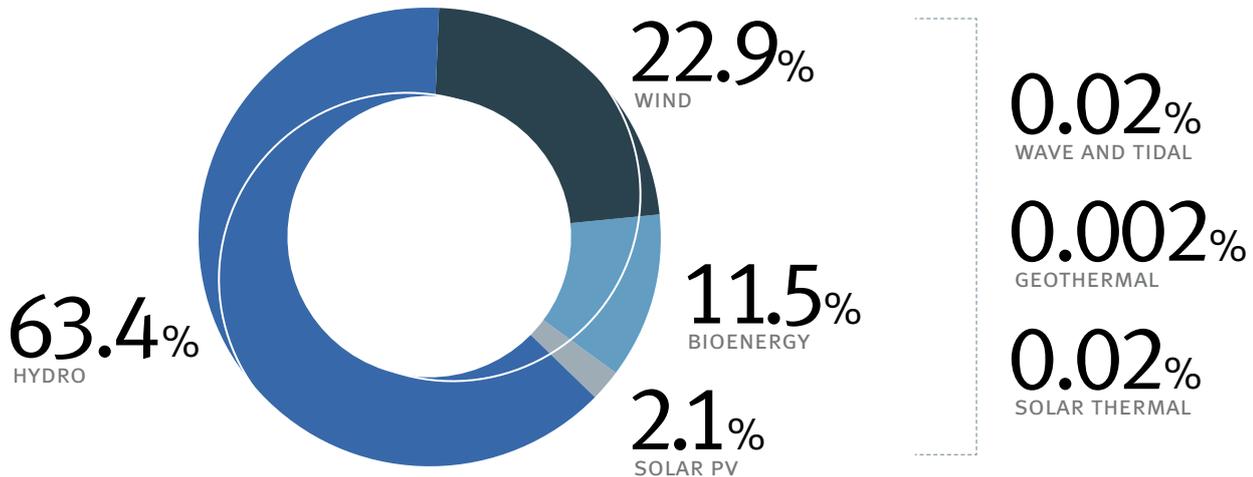
The renewable energy projects operational at the beginning of October 2010 will produce enough energy to power the equivalent of more than three million average Australian households.

This year hydro electricity accounted for over 60 per cent of the renewable energy generated in Australia, making rainfall one of the strongest determinants of the country's clean energy generation.

Wind power made a growing contribution (23 per cent) followed by bioenergy (12 per cent) and solar photovoltaic (PV) power (2 per cent).

Figure 2. Estimated percentage contribution of each technology to renewable generation

Source: Clean Energy Council Renewable Energy Database, ABARE 2010, REC Registry, AEMO, IMO



# Renewable Energy Year in Review

## Household clean energy technologies

The clean energy success story of 2010 was household solar power. There was more solar power added to the grid between January and October this year than the sum total of every other calendar year in the history of the Australian solar industry. And there is now more than ten times the amount of solar power installed than at the end of 2008.

Governments of all levels have vastly underestimated the Australian public's appetite for solar power over the past 18 months – and for the uptake of systems under a range of different incentives. In the absence of an emissions trading scheme, everyday Australians are investing in solar power to respond to climate change and to combat rising electricity bills. At the beginning of October this year 301 megawatts (MW) of solar power systems had been installed on Australian rooftops, the equivalent of a peak load power plant.

Along with the Federal Government's Solar Credits program, the various state solar schemes helped to drive the rapid installation of solar, as seen in the graph below.

Figure 3. Cumulative installed capacity of small-scale solar PV

2010 data based on first nine months of year only. Source: SunWiz 2010

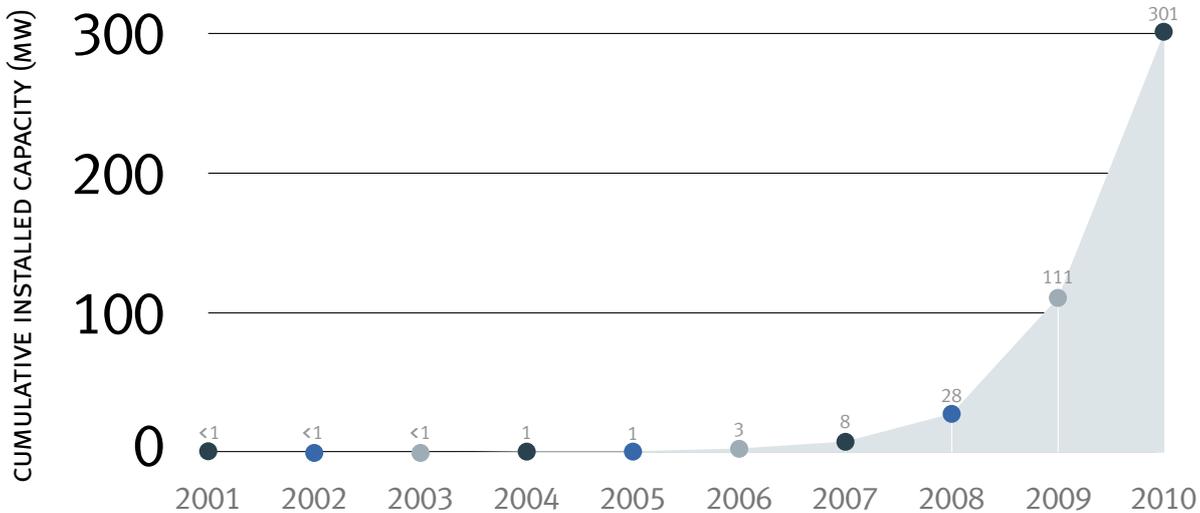


Table 2. Household clean energy systems

Source: SunWiz 2010

FUEL SOURCE	INSTALLED CAPACITY (MW)	NUMBER OF SYSTEMS INSTALLED
Solar PV	301 MW	187,000
Solar Water Heater/Heat Pumps	*1400 MW	574,000

\*2008 data, IEA

# Renewable Energy Year in Review

## Large-scale renewable energy projects

Industrial scale renewable energy grew modestly in 2010 compared with previous years. Seventeen new large-scale renewable energy power plants became operational this year, adding 210 MW of generating capacity to the national electricity grid. This figure is down significantly on 2009, when clean energy projects totalling approximately 993 MW came online. At the beginning of October 2010 there were 332 large-scale clean energy power plants (larger than 100 kW) in Australia.

The three largest new projects operational in 2010 were wind farms. Wind power is likely to be the dominant technology during the early years of the national 20 per cent Renewable Energy Target. It is currently the least expensive form of renewable energy and has a proven track record of being rolled out on a large scale.

Policy and investment uncertainty played a major role in the drop in new projects in 2010 compared with the year before. The success of household renewable energy such as solar power and solar hot water in 2009 led to an oversupply of renewable energy certificates (RECs). These commodities bridge the gap between black energy and green energy and their price is impacted by supply and demand. With a glut of RECs in the market, the price remained low.

For large-scale projects this REC price is critical. Combined with the financial crisis, the situation made it extremely difficult for developers to secure financing. The priority for the Clean Energy Council until mid-2010 was the reform of the national Renewable Energy Target. The Federal Government's decision to split the scheme into large and small technologies was supported by both sides of politics and will be effective from 1 January 2011. It should go a significant way towards returning some stability and supporting renewable energy investment in Australia.

Table 3. Major projects delivered in 2010

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	INSTALLED CAPACITY
Wind	Hallett 2	AGL	SA	71 MW
Wind	Clements Gap	Pacific Hydro	SA	58 MW
Wind	Lake Bonney Stage 3	Infigen Energy	SA	39 MW
Hydro	Jounama	Snowy Hydro	NSW	14 MW
Hydro	Poatina upgrade	Hydro Tasmania	TAS	9 MW
Hydro	Sugarloaf	Melbourne Water	VIC	4.7 MW
Hydro	Prospect Reservoir	Sydney Water	NSW	3.5 MW
Hydro	Lake Margaret Lower	Hydro Tasmania	TAS	3.2 MW
Sewage Gas	Werribee expansion	AGL	VIC	2 MW
Food and Agricultural Wet Waste	Bromelton	Quantam Bioenergy	QLD	1.26 MW
Hydro	North Head	Sydney Water	NSW	1.2 MW
Landfill Gas	Woodlawn Bioreactor	Veolia Environmental Services	NSW	1.1 MW
Food and Agricultural Wet Waste	Leongatha Dairy Plant	Quantam Bioenergy	VIC	0.76 MW
Landfill Gas	Birkdale	Landfill Management Services	QLD	0.75 MW
Photovoltaic	Marble Bar	Horizon Power	WA	0.58 MW
Sewage Gas	Melton	Western Water	VIC	0.2 MW
Hydro	Woronora	Sydney Water	NSW	0.16 MW
<b>Total capacity installed in 2010 (to date)</b>				<b>210 MW</b>

# Renewable Energy Year in Review

Table 4. Total capacity of new renewable energy projects in 2010 – by technology

Source: Clean Energy Council Renewable Energy Database (only includes projects larger than 100 kW)

FUEL SOURCE	INSTALLED CAPACITY (MW)	NUMBER OF PROJECTS
Wind	167	3
Hydro	36	7
Sewage Gas	2.2	2
Food and Agriculture Wet Waste	2.0	2
Landfill Gas	1.8	2
Large-scale Solar Photovoltaic	0.6	1
<b>Total</b>	<b>210</b>	<b>17</b>

## Major projects under construction

There were 11 new clean energy projects under construction as at October this year. Together these power plants will add 1045 MW of new clean energy capacity to the national electricity market. Almost all of this new capacity will come from seven wind projects, with the 420 MW Macarthur wind farm in western Victoria easily the largest of those underway. If completed in its current form it will be the largest in Australia.

Table 5. Major renewable energy projects under construction

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	OWNER	LOCATION	STATE	EXPECTED COMMISSION YEAR	INSTALLED CAPACITY
Wind	AGL / Meridian Energy	Macarthur	VIC	2013	420 MW
Wind	Roaring 40s	Musselroe	TAS	2013	168 MW
Wind	AGL	Hallett Stage 4 (Nth Brown Hill)	SA	2011	132 MW
Wind	Roaring 40s	Waterloo	SA	2010/2011	111 MW
Wind	Union Fenosa	Crookwell 2	NSW	2011	92 MW
Wind	AGL	Oaklands Hill	VIC	2011	67 MW
Wind	AGL	Hallett Stage 5 (Bluff Wind Farm)	SA	2012	53 MW
Photovoltaic	University of Queensland	St Lucia Campus	QLD	2010/2011	1.2 MW
Photovoltaic	Alice Springs Airport	Alice Springs	NT	2010	0.24 MW
Photovoltaic	Horizon Power	Nullagine	WA	2010	0.2 MW
Solar Thermal	CSIRO	Mayfield	NSW	2011	0.2 MW
<b>Total capacity under construction</b>					<b>1045 MW</b>

# Renewable Energy Jobs

## Current employment

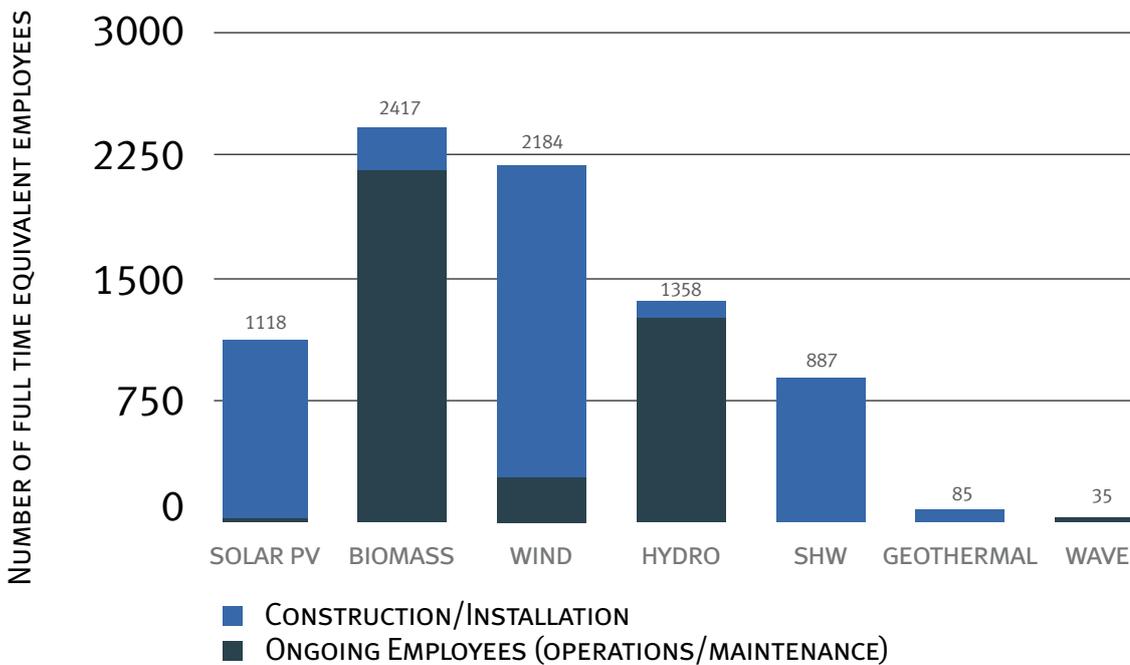
It is estimated there are currently 8085 full time jobs in the Australian renewable energy industry.

The employment figures listed below are those directly involved with construction, installation, operations and maintenance activities associated with clean energy generation. They do not include sales, administration, management and other staff associated with the ongoing running of a business. An example of the flow-on employment can be found in the solar hot water (SHW) industry, which employs an estimated total of 6000 people across distribution, sales and installation.

The number of accredited solar PV installers across the country has tripled in the last 18 months to just under 3000, but not all of these are full time solar installers – many will alternate between mainstream electrical contracting and solar installations.

Figure 4. Full time equivalent jobs in the renewable energy industry

Source: SKMMA, 2010



# Renewable Energy Jobs

## Employment by state

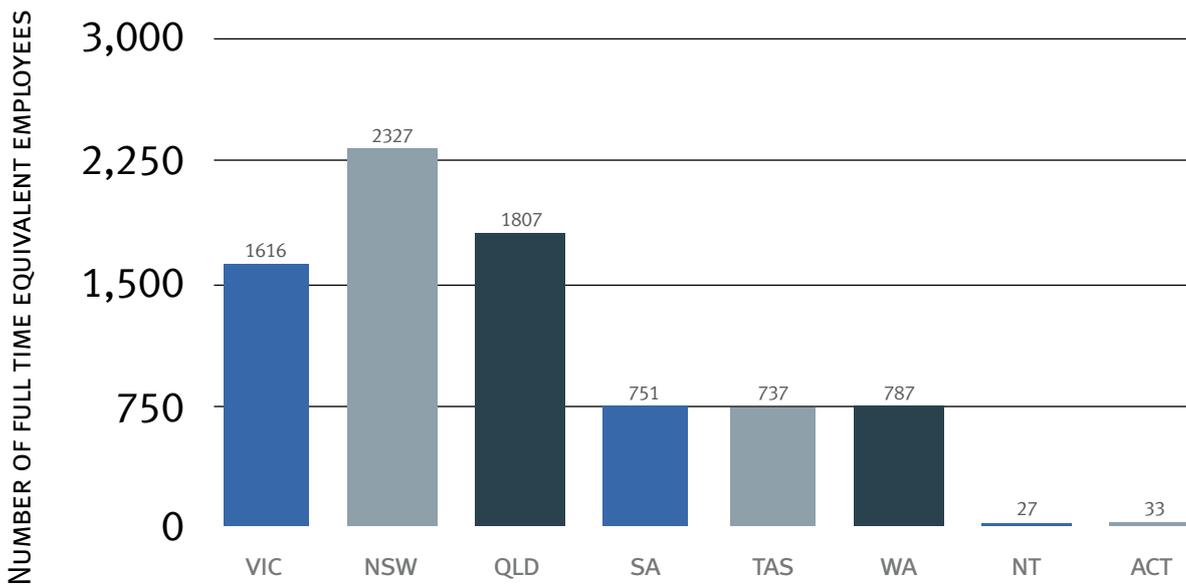
The highest number of employees in the renewable energy industry is in NSW. The decades-old Snowy Mountains Hydro-electric Scheme is still a major employer and producer of renewable energy.

In Queensland, bioenergy such as bagasse generation from sugar cane waste provided the majority of the employment, while most jobs in Victoria came from its wind sector.

The comparatively large number of people directly employed in Tasmania compared to much larger states shows the strength of Tasmania's renewable energy sector.

Figure 5. Full time equivalent employees in the renewable energy industry – by state

Source: SKMMA, 2010



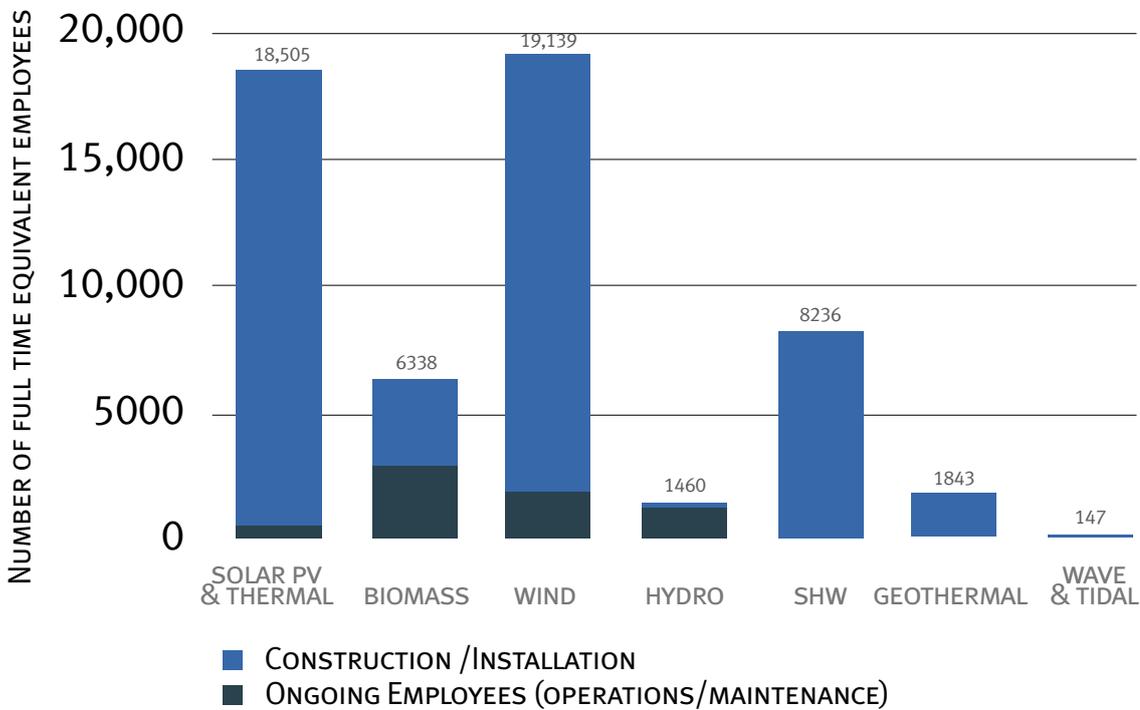
# Renewable Energy Jobs

## 2020 employment

By 2020 it is expected that the number of full time employees will have grown to around 55,000 with the largest increase being attributed to growth in the solar photovoltaic and wind sectors.

Figure 6. Estimated numbers of employees in the renewable energy industry in 2020

Source: SKMMA, 2010

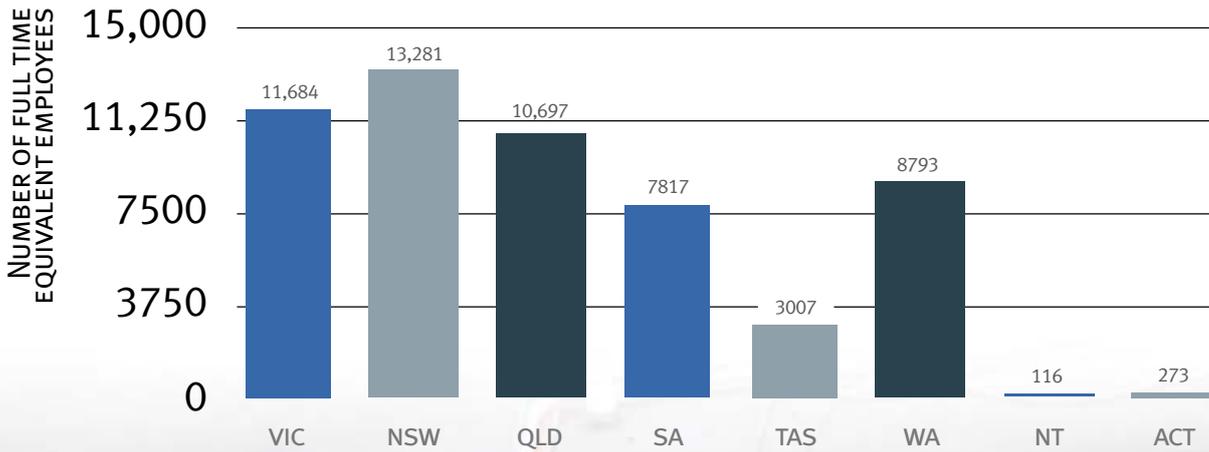


# Renewable Energy Jobs

## 2020 employment – by state

Figure 7. Estimated number of employees in the renewable energy industry in 2020 – by state

Source: SKMMA, 2010



Source: AGL

# Investment

Table 6. New financial investment, Australia, FY 2009 & 2010 (US\$m)

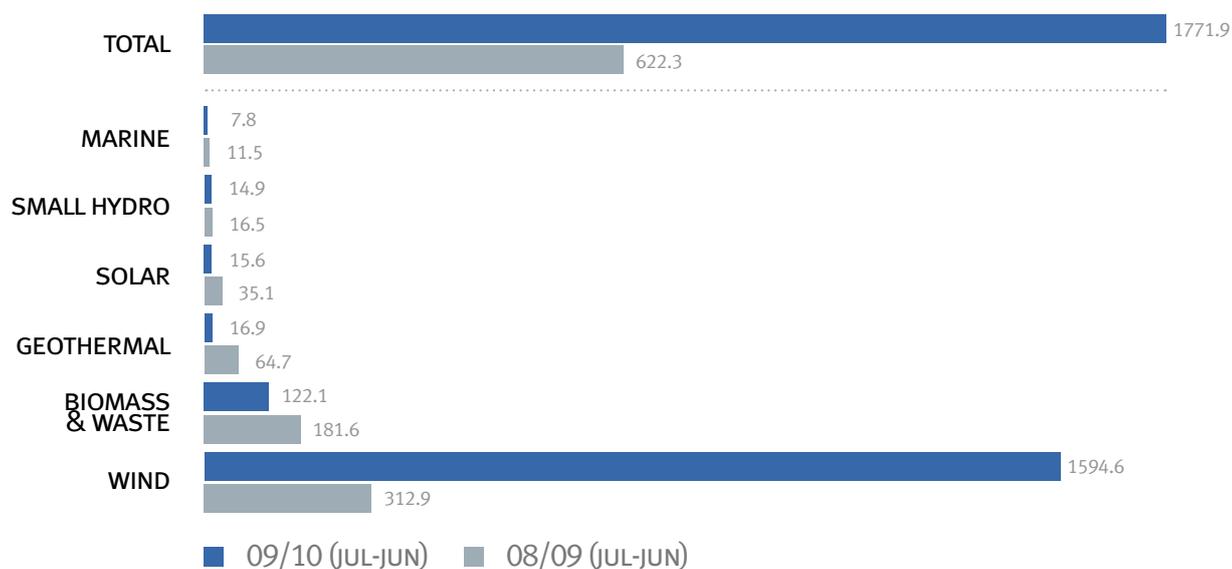
Source: Bloomberg New Energy Finance

SECTOR	08/09 (JUL-JUN)	09/10 (JUL-JUN)
Wind	312.9	1594.6
Biomass & Waste	181.6	122.1
Geothermal	64.7	16.9
Solar	35.1	15.6
Small Hydro	16.5	14.9
Marine	11.5	7.8
<b>Total</b>	<b>622.3</b>	<b>1771.9</b>

New financial Investment only (i.e. excludes corp. M&A, PE buy-outs, PM exits, and asset finance acquisitions and refinancing. Also excludes corp. and gov. R&D and small-scale project estimates. No adjustment for re-invested equity.

Figure 8. New financial investment, Australia, FY 2009 & 2010 (US\$m)

Source: Bloomberg New Energy Finance



## Electricity Prices

The amount of electricity needed in Australia is projected to grow by nearly 50 per cent between now and 2030. Australia needs to spend at least \$100 billion during the next decade to replace ageing transmission infrastructure and keep up with the increase in peak demand from the use of energy-intensive appliances such as air conditioners and flat-screen televisions.

Electricity prices in New South Wales and Queensland are projected to increase by up to two thirds by 2015 so that our increasing energy demands can be met. This additional investment in poles and wires is the primary driver behind the increase in electricity prices. Using energy more efficiently is therefore critical.

Many Australian households face price increases of 40 per cent or more over the next three years to pay for multi-billion dollar network upgrades. Tens of billions of dollars are projected to be spent on poles and wires by 2015 due to under-investment in the network dating back two decades.

By comparison, the cost of delivering renewable energy to Australia will be much smaller. Analysis for the Clean Energy Council by ROAM Consulting found that the 20 per cent Renewable Energy Target will lead to a modest rise in electricity prices. It should represent no more than six per cent of the household electricity bill by 2020.

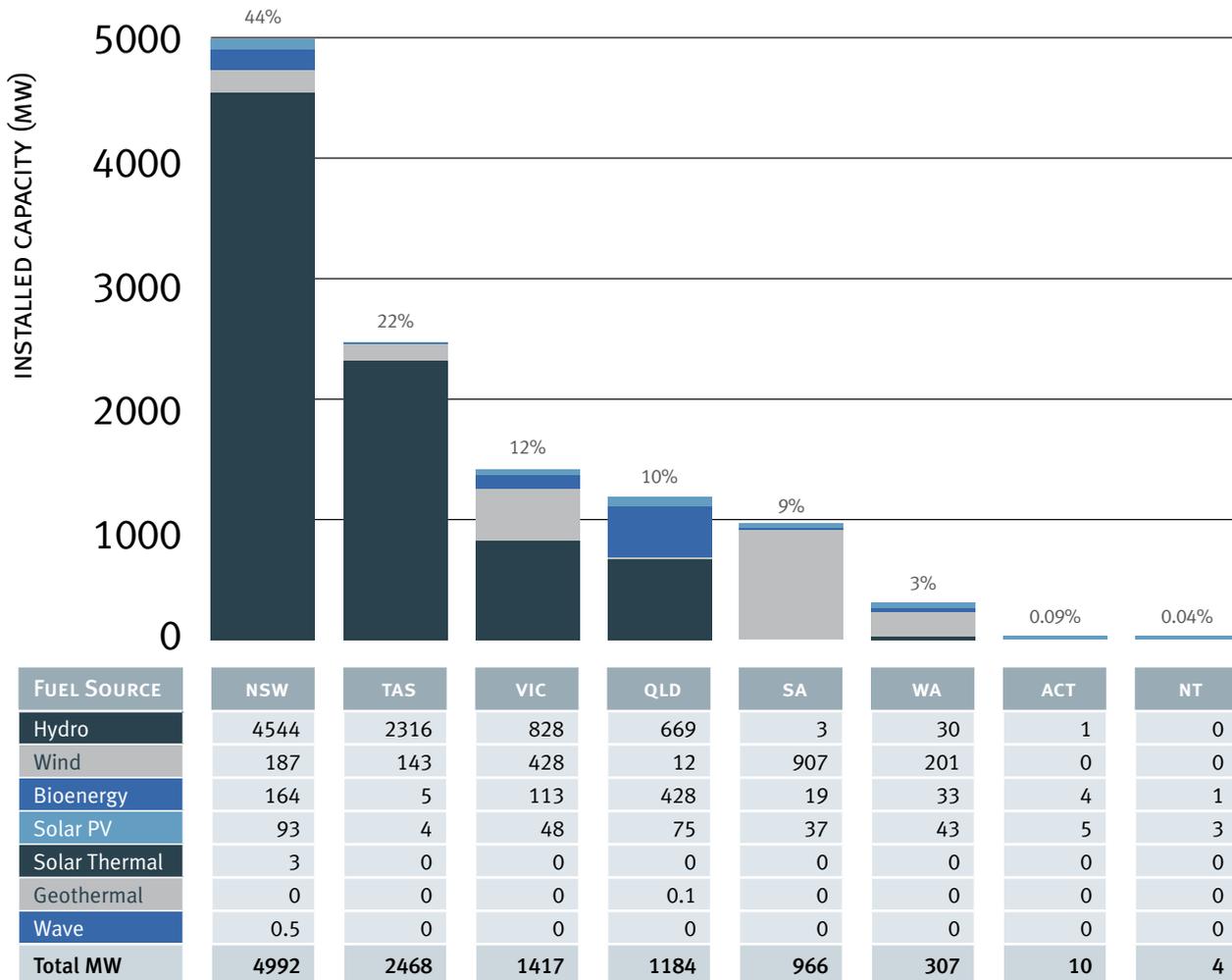
The average Australian household currently spends around three per cent of their disposable income on electricity bills.

# State by State Snapshot

## Installed capacity by state and renewable energy technology

Figure 9. Installed capacity of renewable energy projects by state

Source: Clean Energy Council Renewable Energy Database, ABARE 2010, REC Registry, AEMO, IMO



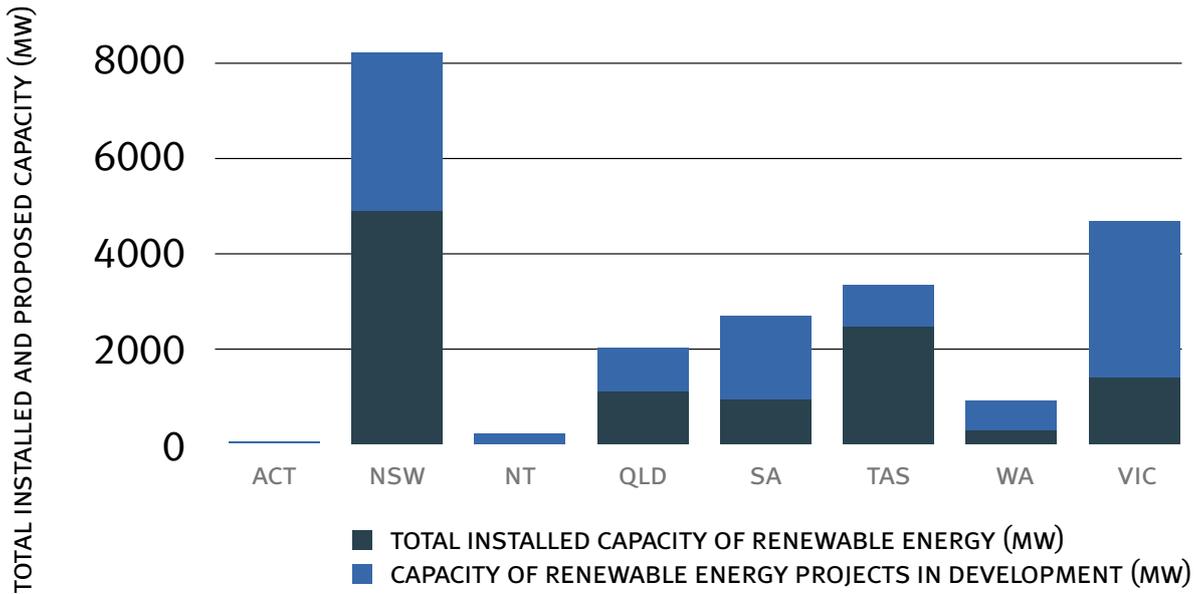
Approximately 10,000 MW of clean energy projects are in development across Australia. This means they are currently going through the approvals process or have had a permit granted. Although some of these proposals may not make it to construction, there is a clear pipeline of projects that will help to deliver the national target of 20 per cent renewable energy by 2020.

# State by State Snapshot

## Clean energy projects installed and in development

Figure 10. Total installed and proposed capacity of renewable energy projects in Australia by state

Source: Clean Energy Council Renewable Energy Database (only includes projects larger than 100 kW)



Source: BioPower Systems

# State by State Snapshot

## Summary and major energy policies

### Australian Capital Territory

Installed capacity: 10 MW

Percentage of nationwide renewable installed capacity: 0.09%

Number of projects: 5

Technologies: Bioenergy, Hydro, Solar PV

Feed-in tariff: 45.7 cents kWh (Gross)

Policy support for clean energy:

- Target of zero net greenhouse gas emissions by 2060  
Developing Sustainable Energy Policy 2010–2020 to deliver this
- Home Energy Audit Program
- Expanded feed-in tariff scheme for household, medium and large-scale solar
- NSW Greenhouse Gas Reduction Scheme (GGAS) began operating on 1 January 2003

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### New South Wales

Installed capacity: 4,992 MW

Percentage of nationwide renewable installed capacity: 44%

Number of projects: 86

Technologies: Wave, Solar Thermal, Solar PV, Bioenergy, Wind, Hydro

Feed-in tariff: 20 cents kWh (Gross)

Policy support for clean energy:

- NSW Wind Renewable Energy Precincts
- State Government's \$700 million Climate Change Fund, established in July 2007. Funds allocated in the following areas:
  - \$170 million Home Saver Rebates Program
  - \$30 million NSW Green Business Program
  - \$30 million Public Facilities program
  - \$40 million Renewable Energy Development Fund
  - \$20 million School Energy Efficiency Program
  - \$20 million Rainwater Tanks in Schools Program
  - \$150 million program under the Energy Efficiency Strategy
- Energy Savings Scheme – energy efficiency target scheme

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### Northern Territory

Installed capacity: 4 MW

Percentage of nationwide renewable installed capacity: 0.04%

Number of projects: 6

Technologies: Solar PV, Bioenergy

Feed-in tariff: N/A

Policy support for clean energy: Energy Smart Rebate Program

# State by State Snapshot

## Summary and major energy policies

### Queensland

Installed capacity: 1184 MW

Percentage of nationwide renewable installed capacity: 10%

Number of projects: 58

Technologies: Geothermal, Bioenergy, Wind, Hydro

Feed-in tariff: 44 cents kWh (Net)

Policy support for clean energy:

- State Government's Renewable Energy Plan to increase deployment of renewable energy initiatives and accelerate growth of this sector established in 2009
- \$50 million Renewable Energy Fund
- \$15 million Queensland Geothermal Energy Centre of Excellence to drive geothermal research and technology
- \$50 million Smart Energy Savings Fund

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### South Australia

Installed capacity: 966 MW

Percentage of nationwide renewable installed capacity: 9%

Number of projects: 35

Technologies: Bioenergy, Wind, Hydro

Feed-in tariff: 44 cents kWh (Net) – Legislation to increase to 54 cents kWh to be introduced

Policy support for clean energy:

- The South Australian Government claims to offer national best practice land use planning for accommodating wind farms
- Renewable energy target (RET) 33% of electricity to be produced by renewable energy by 2020
- Established Renewables SA
- \$20 million Renewable Energy Fund
- Payroll tax rebate for construction of renewable energy plant
- Residential Energy Efficiency Scheme – energy efficiency target scheme

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### Tasmania

Installed capacity: 2468 MW

Percentage of nationwide renewable installed capacity: 22%

Number of projects: 46

Technologies: Bioenergy, Wind, Hydro

Feed-in tariff: Current retail offer — at 20 cents kWh, FiT — TBC

Policy support for clean energy: The Tasmanian Government released its Energy Policy Statement in December 2009 and has set up a Tasmanian Renewable Energy Industry Development Board

# State by State Snapshot

## Summary and major energy policies

### Victoria

**Installed capacity:** 1417 MW

**Percentage of nationwide renewable installed capacity:** 12%

**Number of projects:** 73

**Technologies:** Solar PV, Bioenergy, Wind, Hydro

**Feed-in tariff:** Premium FIT for solar PV – 60 cents kWh (Net), F&R Tariff (Net) – at least 1:1 (FIT/Net)

**Policy support for clean energy:**\*

- Victorian Climate Change White Paper
  - Increase Victoria's electricity supply from large-scale solar to 5% by 2020
  - Introduce large-scale feed-in tariff
  - Green Door – 'one stop shop' for energy projects
- \$72 million Energy Technology Innovation Strategy to support the development of large-scale, pre-commercial demonstrations of sustainable energy technologies
- Energy Saver Incentive – energy efficiency target scheme

\* Victoria's change in government may result in changes to the policies above

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### Western Australia

**Installed capacity:** 307 MW

**Percentage of nationwide renewable installed capacity:** 3%

**Number of projects:** 32

**Technologies:** Bioenergy, Wind, Hydro

**Feed-in tariff:** FIT: 40 cents kWh

**Renewable Energy Buyback Scheme:** 7 cents kWh (Synergy) – 18.94 cents kWh (Horizon)

**Policy support for clean energy:** \$30 million Low Emissions Energy Development Fund



Source: CSR

# Federal Government Initiatives

## Renewables

### Connecting Renewables Initiative – \$1 billion

The Government has committed to \$1 billion over 10 years to be set aside to connect Australia's rich renewable resources to Australian homes.

The new \$1 billion Connecting Renewables initiative will bring more renewable energy into the national grid earlier. It will support the enhanced Renewable Energy Target and help deliver on the Government's commitment to 20 per cent of Australia's electricity supply coming from renewable sources by 2020.

The first \$100 million under this program will be invested over four years. Funding will be drawn from the \$650 million Renewable Energy Future Fund.

### Emerging Renewables – \$40 million

The Government will invest an additional \$40 million in emerging renewable energy technologies through the new Emerging Renewables program.

The \$40 million cost of this initiative has already been provided for in the Federal Budget through the Renewable Energy Future Fund.

The program will benefit renewable energy technologies like wave and geothermal energy.

### Renewable Energy Venture Capital Fund – \$100 million

The new fund will make critical early-stage equity investments that leverage private funds to support the commercialisation of emerging renewable technologies, for instance in geothermal, solar, wave and bioenergy technologies.

The Australian Centre for Renewable Energy will work with financial institutions to develop structured renewable energy products to help overcome this hurdle.

Funding will be provided through the \$650 million Renewable Energy Future Fund.

## Energy efficiency

### Tax Breaks for Green Buildings

From 1 July 2011, businesses that undertake capital works to improve the energy efficiency of their existing buildings – from 2 stars or lower to 4 stars or higher – will be able to apply for a one-off bonus tax deduction.

This incentive will enable businesses to claim a bonus tax deduction of 50 per cent of the cost of the eligible assets or capital works.

The total cost of this package is \$180 million over the forward estimates, and around \$1.0 billion out to 2018-19. Funding over the forward estimates has already been provided for in the Budget through the Renewable Energy Future Fund.

### National Energy-Saving Scheme

The Federal Government will work with the state governments to obligate energy retail companies to either fully fund or help to replace inefficient appliances in households.

The scheme will force energy companies to find energy savings by making people's homes more efficient. It is expected companies would provide incentives to families to reduce their consumption, such as installing power saving appliances for them, which the companies could then count toward their mandatory energy efficient targets.

# Federal Government Initiatives

## Carbon

### Low Carbon Communities

The Government will provide \$80 million to support local councils and communities to cut pollution and reduce their energy costs through energy efficient upgrades to street lighting, community facilities and council buildings.

The initiative will also assist communities to reduce pollution through investment in cogeneration facilities or energy efficient upgrades to community sites such as stadiums, education facilities, town halls or nursing homes.

### Multi-Party Climate Change Committee

The committee will explore options for the implementation of a carbon price and will help to build consensus on how Australia will tackle the challenge of climate change.

The Prime Minister chairs the committee, with the Deputy Prime Minister and Minister Combet (who will serve as co-Deputy Chair) also taking part. Senator Christine Milne (Australian Greens) will serve as co-Deputy Chair. The other committee members are Senator Bob Brown (Australian Greens), Mr Tony Windsor MP (Independent) and Mr Rob Oakeshott MP (Independent). The Government has also invited two representatives from the Coalition.

The committee is advised by a panel of four independent experts – Professor Ross Garnaut, Professor Will Steffen, Mr Rod Sims and Ms Patricia Faulkner. It is supported by a Secretaries' Group comprising Secretaries of Departments involved in implementing climate change policy.

The committee will consult, negotiate and report to the Cabinet on agreed options through the Minister for Climate Change and Energy Efficiency.

### Climate Change Business Roundtable and Climate Change NGO Roundtable

The Business Roundtable brings together leaders from across the economy including the mining, transport, manufacturing, energy, retail and finance sectors. Clean Energy Council Chief Executive Matthew Warren has been included on the Business Roundtable to provide advice on climate change and the introduction of a carbon price.

The Non-Government Organisation (NGO) Roundtable includes leaders from across the community sector including unions, social services, environment groups and local government.

Both roundtables will be expected to meet regularly until the end of 2011 to discuss a range of issues in advance of their consideration at the Multi-Party Climate Change Committee. This will ensure that Government representatives on the committee have an accurate and current understanding of the business perspective on issues.

### Tough emissions standards for new coal-fired power stations

The Government is consulting on legislation that would ensure all new coal-fired power stations:

- meet new best practice coal emissions standards
- are carbon capture and storage ready.

The new requirements would not impact upon existing plants. Planned investments which already have environmental approvals, and are determined by the energy market institutions as being sufficiently advanced in their regulatory approvals at the commencement of these standards, would also be exempt from them.

The new expanded Energy Efficiency Opportunities program will also require all existing generators, including all coal-fired power stations, to undertake regular assessments of their potential to save energy and report publicly on assessment outcomes.

### Carbon Farming Initiative

The Government will open up new opportunities for Australian farmers and landholders to participate in lucrative international markets for carbon credits in a new Carbon Farming Initiative.

Under the new scheme, the Government will help facilitate the sale of carbon credits on domestic and international markets.

## Clean Energy Ambassador Danny Frawley

“Renewable energy enjoys 90 per cent public support for good reason – it produces electricity naturally from the sun and the wind.

It’s great to see so many wind turbines and other clean energy projects taking shape. It means jobs and money going back into our communities.”

Danny Frawley, Former All Australian AFL champion and 7th generation potato farmer



# Summary of Clean Energy Technologies

# Bioenergy 11.5% of total clean energy generation

The current installed capacity of the sector in Australia amounts to 767 MW, or 6.8 per cent of the total renewable capacity. Nearly two thirds of this capacity is from bagasse combustion in the sugar industry, with the second largest contributor being landfill gas.

Source: Clean Energy Council Renewable Energy Database



Source: CSR

# Bioenergy

## Australian Bioenergy Power Plants over 100 kW



	Plants Operating	Under Development
NSW	35	2
SA	7	0
VIC	25	1
WA	14	1
TAS	4	2
QLD	44	2
NT	1	0
ACT	3	1
<b>Total Plants</b>	<b>133</b>	<b>9</b>

visit the interactive map online by [clicking here](#)

Bioenergy grew only marginally in 2010. A handful of small projects came online during the year, as shown in the table below. The continued low price of renewable energy certificates and the challenging financial environment continued to impact negatively on the financing of new bioenergy plants.

**Table 7. Bioenergy plants commissioned during 2010**

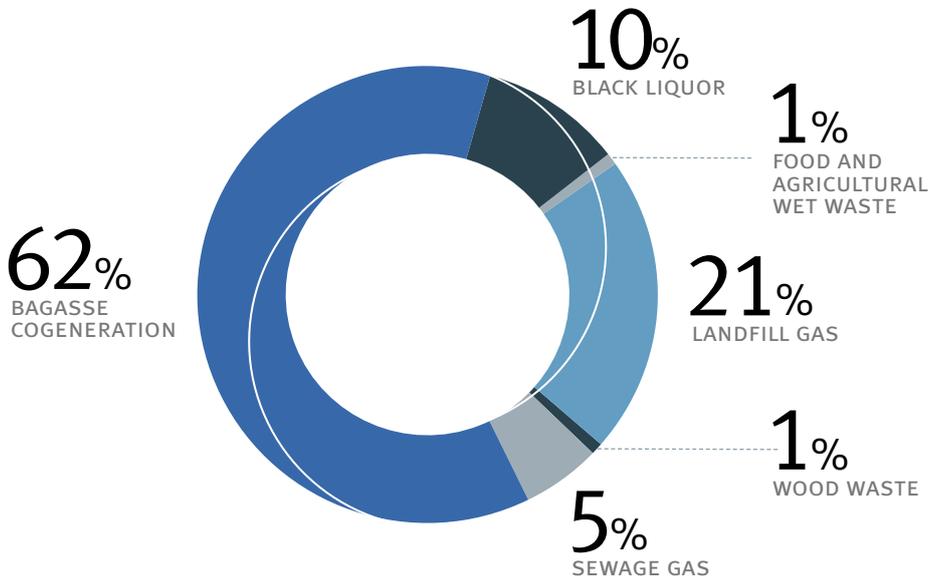
Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	INSTALLED CAPACITY
Sewage Gas	Werribee expansion	AGL	VIC	2 MW
Food and Agricultural Wet Waste	Bromelton	Quantam Energy	QLD	1.26 MW
Landfill Gas	Woodlawn Bioreactor	Veolia Environmental Services	NSW	1.1 MW
Food and Agricultural Wet Waste	Leongatha	Quantam Bioenergy	VIC	0.76 MW
Landfill Gas	Birkdale	Landfill Management Services	QLD	0.75 MW
Sewage Gas	Melton	AGL	VIC	0.2 MW

# Bioenergy

Figure 11. Installed capacity for bioenergy sub sectors by percentage

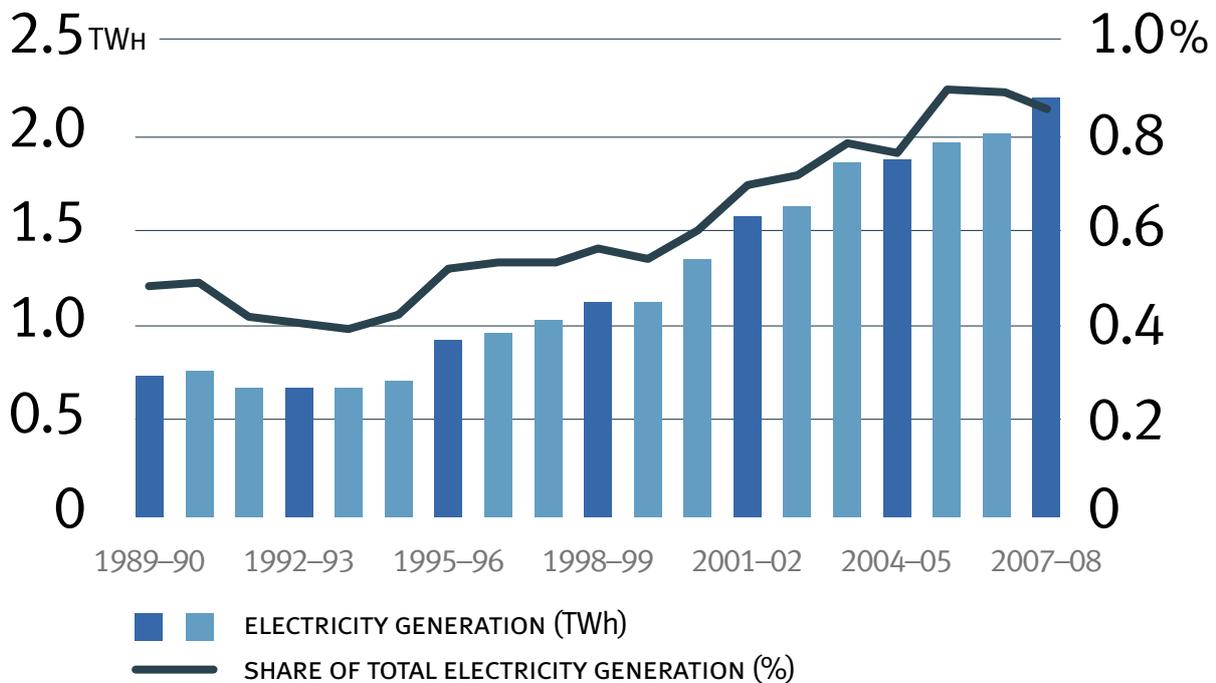
Source: Clean Energy Council Renewable Energy Database



Bioenergy currently generates around 2500 GWh per annum – a one per cent share of total electricity generation.

Figure 12. Australian electricity generation from bioenergy

Source: ABARE



# Geothermal .002% of total clean energy generation

Fifty-four companies have applied for over 400 tenements around Australia covering an area of over 430,000 square kilometers. The majority of these licence areas are in South Australia but the licence areas extend across the nation in all states and the Northern Territory. Exploration and proof of concept activities are expected to exceed AU\$2.1 billion by 2014.

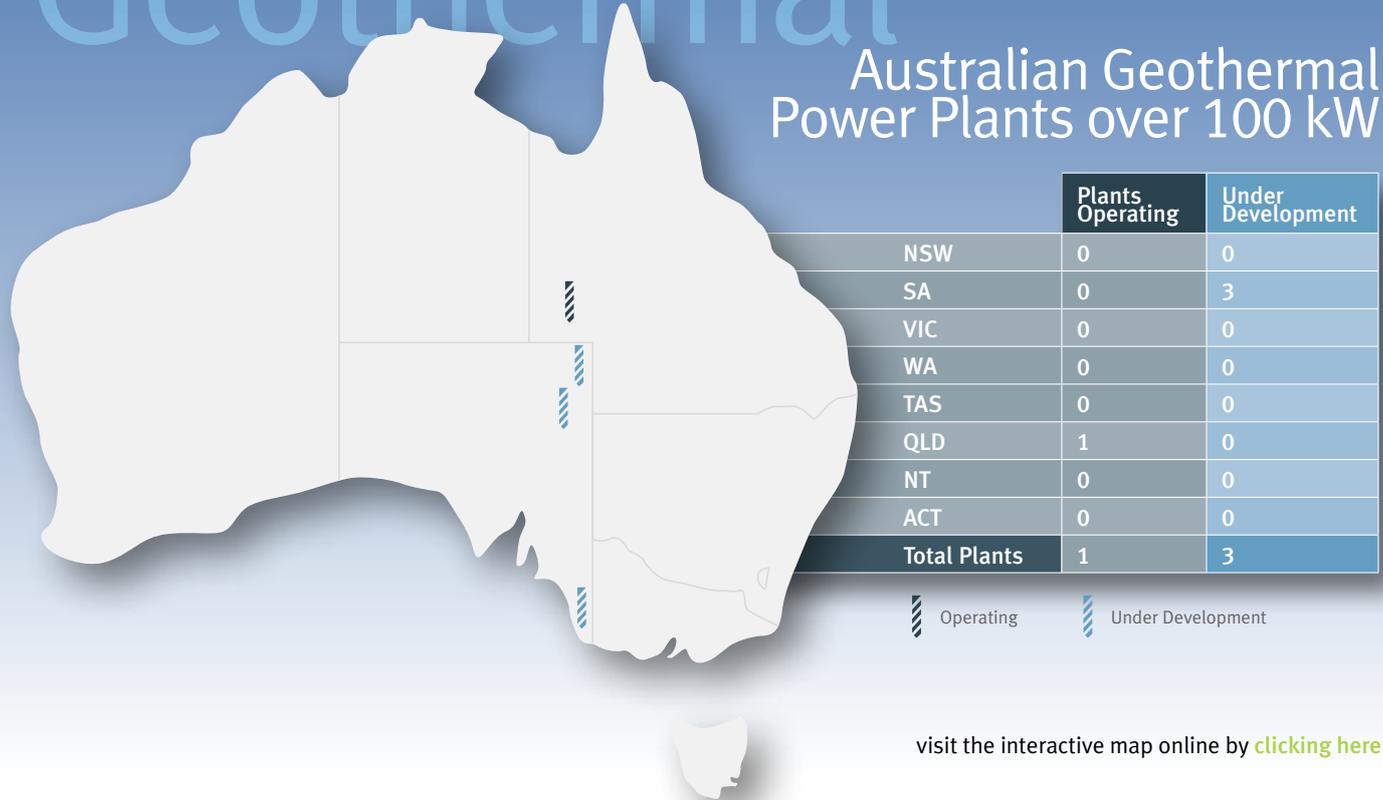
Source: Geothermal Industry Report for the Clean Energy Council, KPMG, 2010



Source: Petratherm

# Geothermal

## Australian Geothermal Power Plants over 100 kW



visit the interactive map online by [clicking here](#)

Geothermal energy has the potential to play a major role in reducing Australia’s greenhouse gas emissions and decarbonising its electricity supply. The geothermal energy within five kilometres of the surface could provide enormous amounts of emission-free base load electricity. Geoscience Australia has calculated that if just one per cent of this potential energy could be tapped, it would be the equivalent of 26,000 times Australia’s annual power use. Currently there is only one commercial plant operating, at Birdsville in Queensland.

**Table 8. Geothermal plants currently operating**

OWNER	LOCATION	STATE	INSTALLED CAPACITY
Ergon Energy	Birdsville 1	QLD	0.12 MW

The cost of drilling one well to a well depth of 5 km in Australia is estimated to be \$10–15 million. Drilling costs can account for as much as one third to one half of the total cost of a geothermal project (IEA, 2008).

**Table 9. Geothermal companies that have commenced drilling**

Source: Clean Energy Council Renewable Energy Database

OWNER	LOCATION OF PLANT	STATE	PROPOSED CAPACITY	STATUS
Geodynamics	Innaminka (Cooper Basin)	SA	25 MW by 2013	Proof of concept completed. Has drilled five wells. Awarded AU\$90 million from the Federal Government’s Renewable Energy Demonstration Program
Panax	Penola	SA	59 MW	Has drilled one well. Awarded AU\$7 million from the Federal Government’s Geothermal Drilling Program
Petratherm	Paralana	SA	30 MW	Has drilled one well. Awarded AU\$62.8 million from the Federal Government’s Renewable Energy Demonstration Program and AU\$7 million from Geothermal Drilling Program

# Hydro Power 63.4% of total clean energy generation

Existing hydro generation projects provide a solid foundation that will help Australia achieve its 20 per cent Renewable Energy Target.

Rainfall in key catchments has been the strongest influence on Australia's annual renewable energy output since the Snowy Mountains Scheme was built in the mid-1900s.



Source: Hydro Tasmania

# Hydro

## Australian Hydro Power Plants over 100 kW



	Plants Operating	Under Development
NSW	39	3
SA	1	0
VIC	32	0
WA	2	0
TAS	36	3
QLD	10	0
NT	0	0
ACT	2	1
<b>Total Plants</b>	<b>122</b>	<b>7</b>

visit the interactive map online by [clicking here](#)

Australia currently has over 100 operating hydro power stations totalling 8390 MW of capacity which produced an estimated 13,800 GWh of electricity in the past year. This represents around 5.5 per cent of the nation's total electricity output and is enough to power approximately 1,942,000 homes. This is a 15 per cent rise in hydroelectricity generation from previous years, mostly due to increased rainfall in key hydro catchments across the country.

## Hydro Power

It is estimated that around 60 per cent of Australia’s economically feasible hydro power plants have already been developed. Most work currently undertaken by hydro power owners is in developing mini hydro power plants or in upgrading and refurbishing existing hydro power stations.

Table 10. Hydro projects commissioned during 2010

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	INSTALLED CAPACITY
Hydro	Jounama	Snowy Hydro	NSW	14 MW
Hydro	Poatina upgrade	Hydro Tasmania	TAS	9 MW
Hydro	Sugarloaf	Melbourne Water	VIC	4.7 MW
Hydro	Prospect Reservoir	Sydney Water	NSW	3.5 MW
Hydro	Lake Margaret Lower	Hydro Tasmania	TAS	3.2 MW
Hydro	North Head	Sydney Water	NSW	1.2 MW
Hydro	Woronora	Sydney Water	NSW	0.16 MW

Table 11. Top five largest hydro plants in Australia – by capacity

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	INSTALLED CAPACITY
Hydro	Tumut 3	Snowy Hydro	NSW	1500 MW
Hydro	Murray 1	Snowy Hydro	NSW	950 MW
Hydro	Murray 2	Snowy Hydro	NSW	550 MW
Hydro	Wivenhoe	Tarong Energy	QLD	500 MW
Hydro	Gordon	Hydro Tasmania	TAS	432 MW

# Photovoltaic Solar Panels 2.1% of total clean energy generation

The total number of Australian households with solar panels has increased almost 10 times in less than two years.



Source: Solar Shop

# Photovoltaic Solar Panels

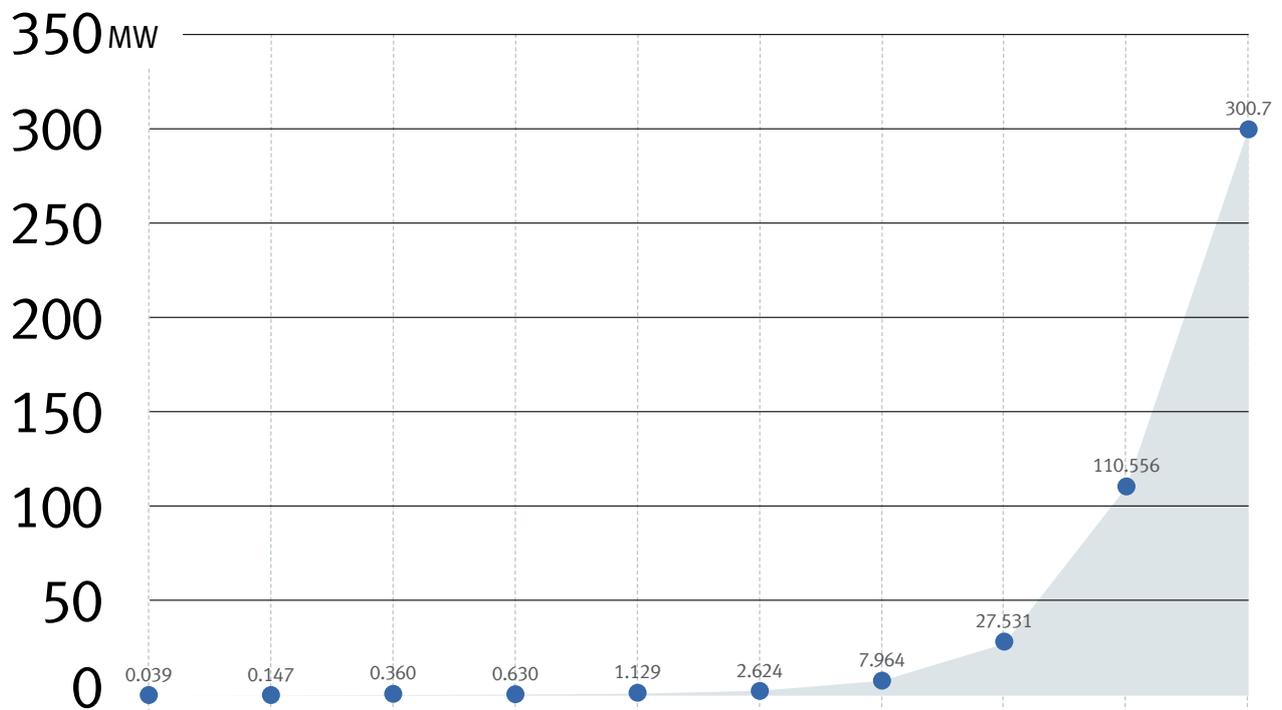
There were over 187,000 solar photovoltaic (PV) systems installed at the beginning of October 2010, around 170,000 of which were installed during the last two years. The number of accredited solar installers and designers has almost tripled in 18 months to 2726.

Solar has become extremely popular with homeowners, who see it as an opportunity to take action on climate change and protect themselves from rising electricity costs. A range of state and federal government incentives has helped to make solar power more affordable for the average householder and the price of systems has fallen by about half in the last three years. These costs are expected to continue to come down, with the full installation price for solar power expected to decrease by up to 60 per cent by 2020.

Australia and the United States announced a research agreement in 2010 to try and make the cost of solar competitive with fossil fuels within five years.

Figure 13. Cumulative installed capacity of solar PV in Australia

Source: SunWiz 2010



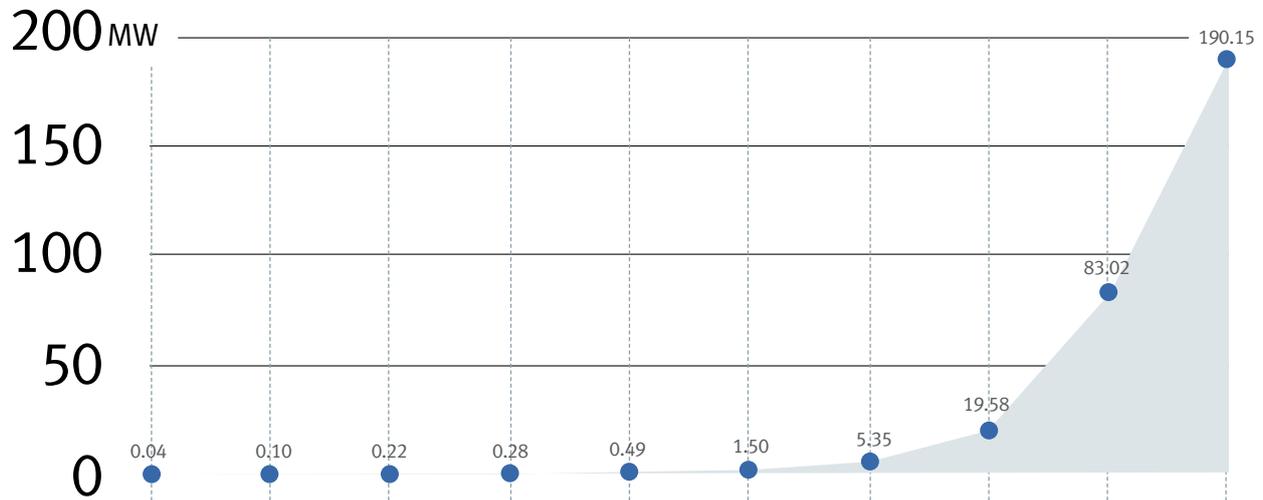
STATE	2001	2002	2003	2004	2005	2006	2007	2008	2009	*2010
ACT	0.000	0.000	0.002	0.003	0.003	0.015	0.098	0.573	1.813	4.629
NSW	0.004	0.013	0.002	0.097	0.149	0.386	1.515	5.611	24.269	91.391
NT	0.007	0.010	0.019	0.034	0.091	0.189	0.345	0.743	1.223	1.875
QLD	0.008	0.031	0.178	0.150	0.262	0.439	1.065	5.104	29.402	74.481
SA	0.015	0.073	0.178	0.280	0.454	1.093	2.743	7.555	19.777	35.435
TAS	0.000	0.000	0.000	0.001	0.002	0.002	0.035	0.261	1.930	3.919
VIC	0.002	0.002	0.009	0.029	0.090	0.281	1.318	3.963	14.497	46.811
WA	0.003	0.018	0.028	0.037	0.078	0.219	0.846	3.719	17.644	42.160
<b>Total (MW)</b>	<b>0.039</b>	<b>0.147</b>	<b>0.360</b>	<b>0.630</b>	<b>1.129</b>	<b>2.624</b>	<b>7.964</b>	<b>27.531</b>	<b>110.556</b>	<b>300.700</b>

\*2010 year data based on first nine months of year only

# Photovoltaic Solar Panels

Figure 14. Annual capacity of solar PV installed in Australia (2001–2010)

Source: SunWiz 2010



STATE	2001	2002	2003	2004	2005	2006	2007	2008	2009	*2010
ACT	0.00	0.00	0.00	0.00	0.00	0.01	0.08	0.48	1.24	2.82
NSW	0.00	0.01	0.04	0.05	0.05	0.24	1.13	4.10	18.66	67.12
NT	0.01	0.00	0.01	0.02	0.06	0.10	0.16	0.40	0.48	0.65
QLD	0.01	0.02	0.04	0.08	0.11	0.18	0.63	4.04	24.30	45.08
SA	0.02	0.06	0.11	0.10	0.17	0.64	1.65	4.81	12.22	15.66
TAS	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.23	1.67	1.99
VIC	0.00	0.00	0.01	0.02	0.06	0.19	1.04	2.65	10.53	32.31
WA	0.00	0.01	0.01	0.01	0.04	0.14	0.63	2.87	13.92	24.52
<b>Total (MW)</b>	<b>0.04</b>	<b>0.10</b>	<b>0.22</b>	<b>0.28</b>	<b>0.49</b>	<b>1.50</b>	<b>5.35</b>	<b>19.58</b>	<b>83.02</b>	<b>190.15</b>

\*2010 year data based on first nine months of year only

Table 12. Percentage of solar PV capacity by state

ACT	NSW	NT	QLD	SA	TAS	VIC	WA
2%	30%	1%	25%	12%	1%	16%	14%

\* Due to rounding, totals may not add up to 100 per cent

# Photovoltaic Solar Panels

Figure 15. Cumulative number of solar PV system installations in Australia

Source: SunWiz 2010

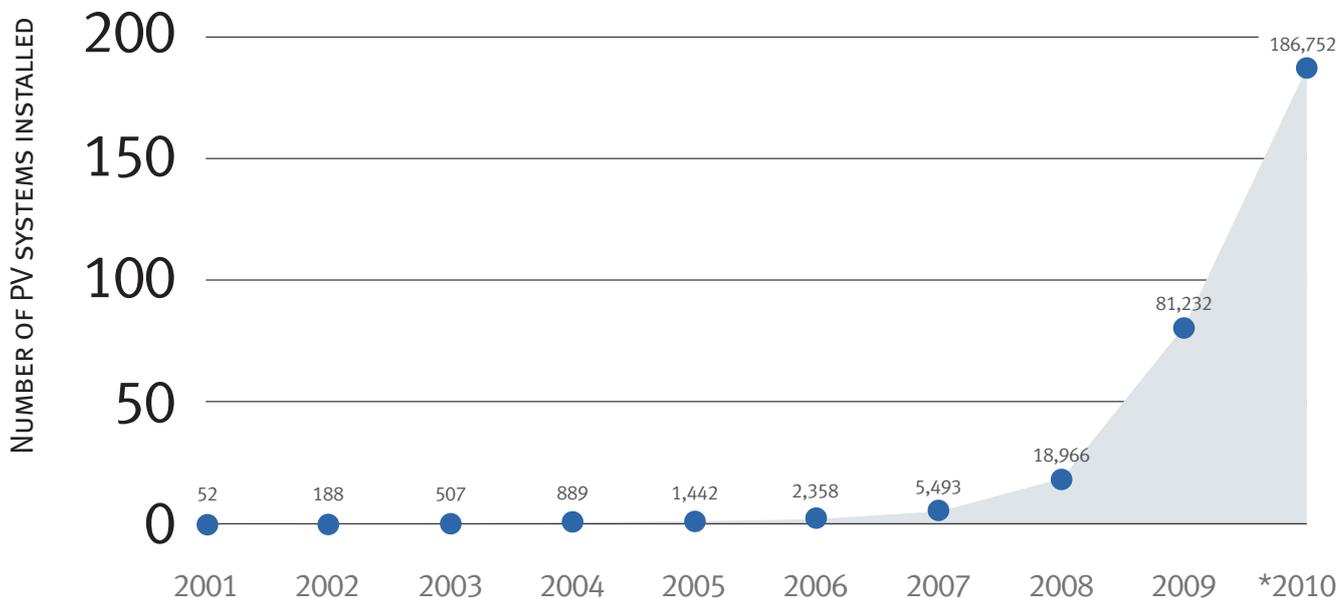


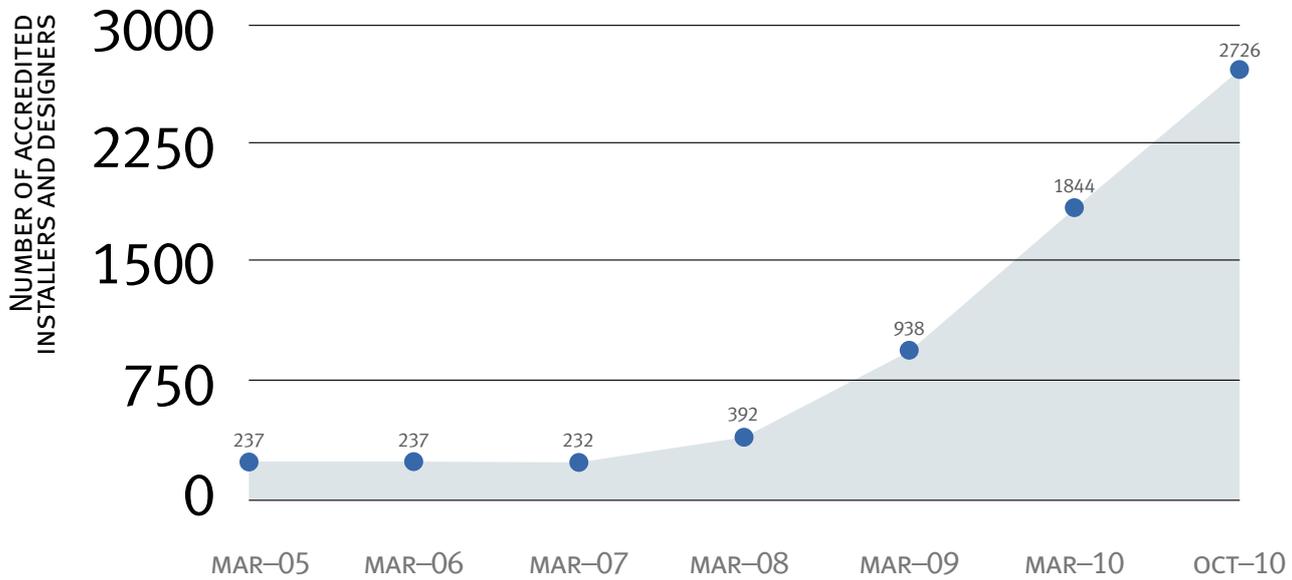
Table 13. Annual number of solar PV system installations in Australia

YEAR	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	TOTAL
2001	0	6	5	13	23	0	2	3	52
2002	0	15	2	28	80	0	1	10	136
2003	2	57	8	55	178	0	11	8	319
2004	1	75	20	95	155	1	27	8	382
2005	1	81	32	122	216	1	76	24	553
2006	10	175	27	124	397	1	132	50	916
2007	43	711	26	394	1050	21	634	256	3135
2008	277	2821	82	2866	3437	149	1828	2013	13,473
2009	789	13,875	209	18,094	8474	1437	8322	11,066	62,266
*2010	1349	32,196	343	25,594	8424	1486	21,926	14,202	105,520
<b>TOTAL</b>	<b>2472</b>	<b>50,012</b>	<b>754</b>	<b>47,385</b>	<b>22,434</b>	<b>3096</b>	<b>32,959</b>	<b>27,640</b>	<b>186,752</b>

\*2010 year data based on first nine months of year only

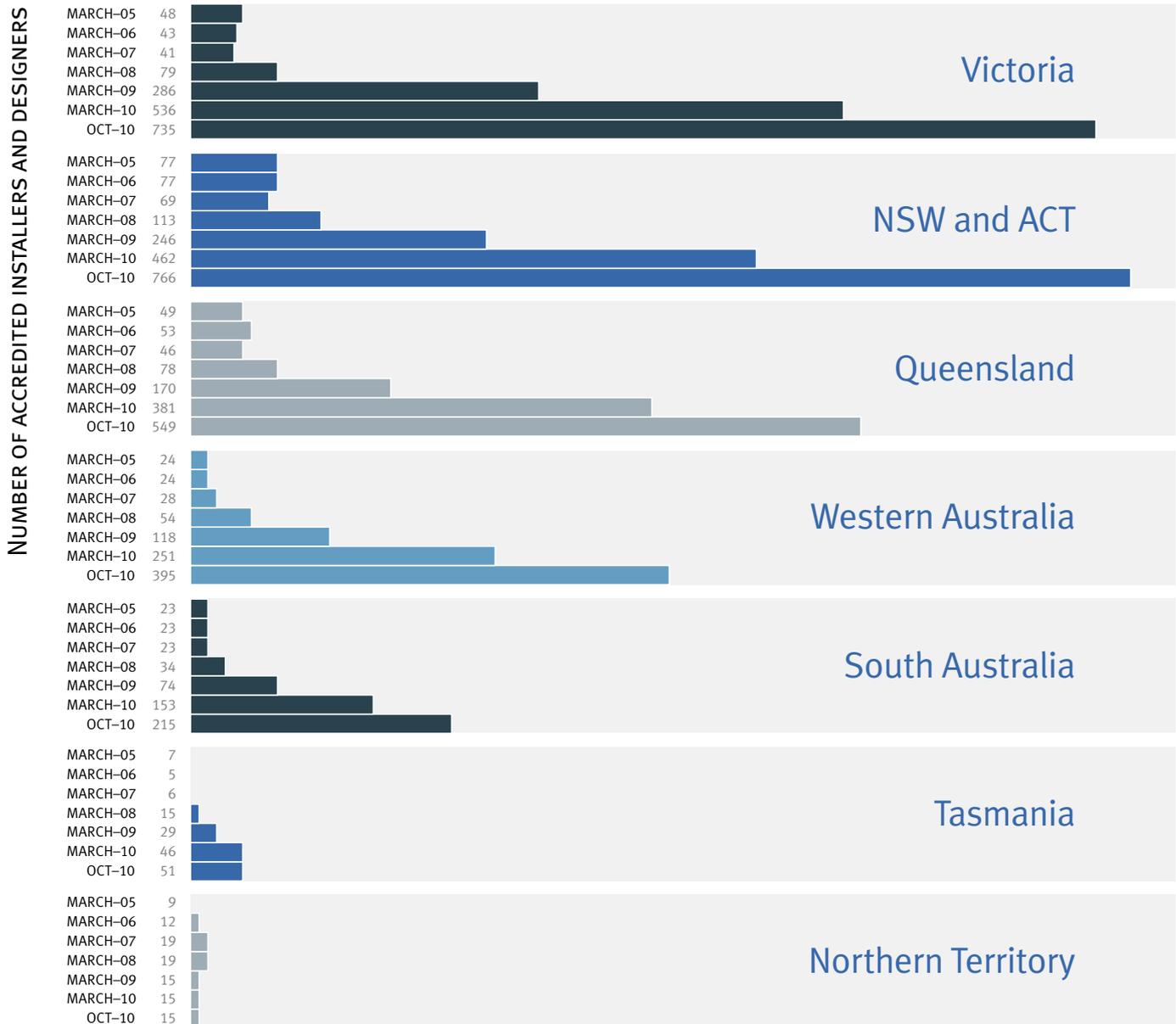
# Photovoltaic Solar Panels

Figure 16. Total number of accredited installers and designers in Australia



# Photovoltaic Solar Panels

Figure 17. Accredited solar panel installers and designers in Australia – by state



Source: Clean Energy Council

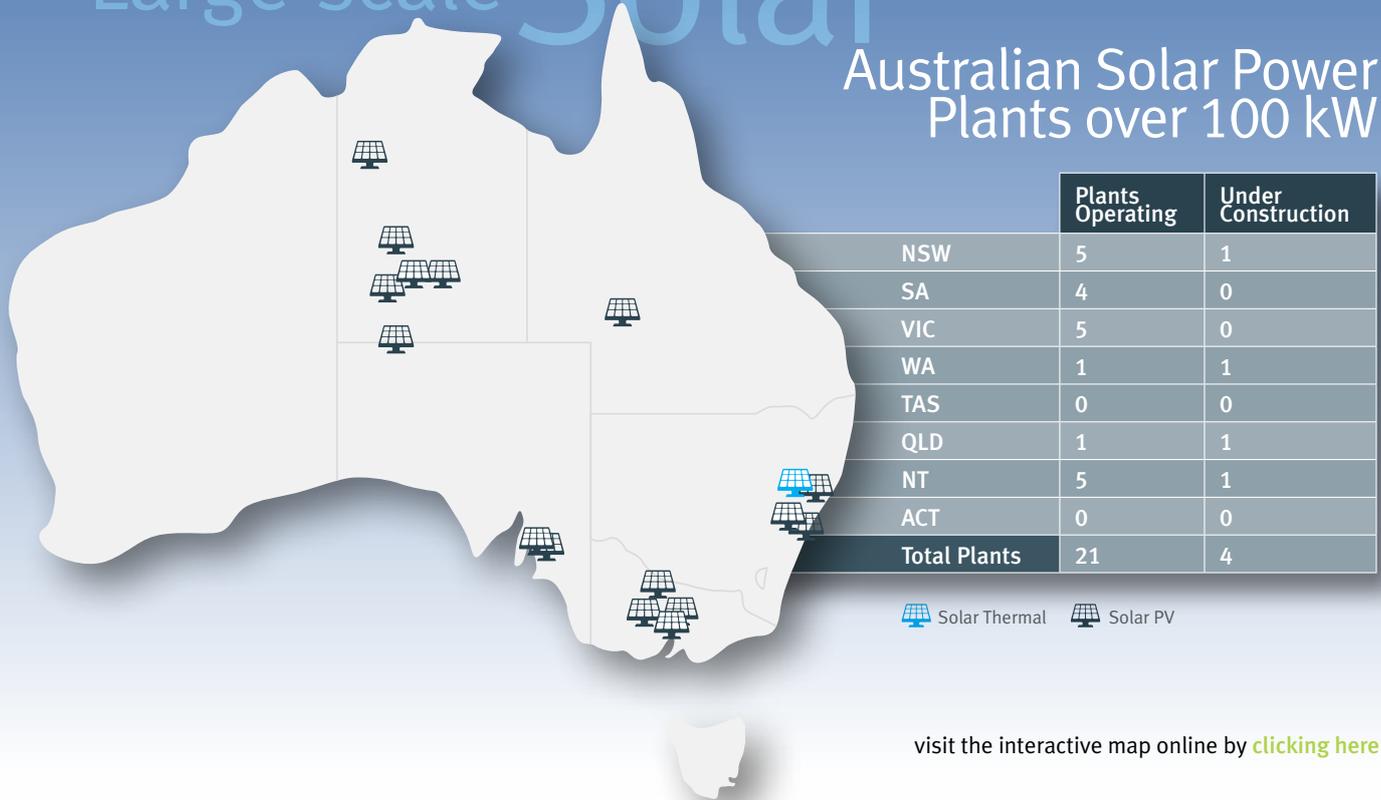
# Large-scale Solar

The Australian Bureau of Agricultural and Resource Economics (ABARE) estimates solar energy use in Australia is projected to more than triple between 2007–08 and 2029–30, growing at an average rate of 5.9 per cent per year.



# Large-scale Solar

## Australian Solar Power Plants over 100 kW



Although Australia currently has no truly large-scale solar power stations, globally the industry has been growing rapidly. Approximately 11,000 MW of concentrating solar power is forecast to be installed around the world over the next two years.

The Federal Government's \$1.5 billion Solar Flagships Program is designed to drive the development of 1000 MW of large-scale solar power stations in Australia.

Four solar PV and four solar thermal projects have been shortlisted for round one of Solar Flagships, from which two successful projects will be announced in 2011. These are expected to be operational by the end of 2015.

Australia's largest solar plant is a 3 MW facility at Liddell in NSW that utilises solar thermal concentrators.

The nation's largest solar PV plant is a 1 MW facility at the Adelaide Showgrounds, with a slightly larger PV array under construction at the University of Queensland.

## Large-scale Solar

Table 14. Examples of existing commercial solar plants

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	COMMISSION YEAR	INSTALLED CAPACITY
Solar Thermal Concentrator	Liddell	Areva/ Macquarie Generation	NSW	2009	3 MW
Solar PV	Adelaide Showgrounds	First Solar	SA	2009	1 MW
Solar PV	Marble Bar	Horizon Power	WA	2010	0.58 MW
Solar PV	Singleton	Energy Australia	NSW	1998	0.39 MW
Solar PV	Alice Springs	Alice Crown Plaza	NT	2009	0.3 MW
Solar PV	Ballarat	Central Victoria Solar City Consortium	VIC	2009	0.3 MW
Solar PV	Bendigo	Central Victoria Solar City Consortium	VIC	2009	0.3 MW
Solar PV Concentrator	Lajamanu	Power and Water Corporation	NT	2006	0.29 MW
Solar PV Concentrator	Yuendumu	Power and Water Corporation	NT	2008	0.24 MW
Solar PV	St Lucia Campus	University of QLD /Ingenero	QLD	Under construction	1.2 MW

Table 15. Projects shortlisted under Solar Flagships Program

Source: Clean Energy Council Renewable Energy Database

OWNER	TECHNOLOGY	LOCATION	INSTALLED CAPACITY
Wind Prospect CWP	Solar thermal linear fresnel	Kogan Creek, QLD	250 MW
Acciona Energy	Solar thermal parabolic trough	QLD or SA	200 MW
Infigen Suntech	Crystalline silicon solar PV	3 sites in VIC or NSW	195 MW
TRUenergy	Thin film solar PV	Mildura, VIC	180 MW
AGL Energy	Thin film solar PV	Multiple sites across ACT, NSW, VIC, QLD, SA	150 MW
BP Solar	Single axis tracking solar PV	Multiple sites across NSW	150 MW
Parsons Brinckerhoff	Solar thermal parabolic trough	Kogan Creek, QLD	150 MW
Transfield	Solar thermal linear fresnel	Collinsville, QLD	150 MW

# Solar Water Heating 7.4%

The energy saved from solar water heating is equivalent to 7.4% of the clean energy generated in Australia

Solar water heating has proven to be an effective method for reducing Australia's greenhouse gas emissions, while saving money and energy as well as helping stimulate domestic manufacturing businesses and create jobs.



Source: Quantum

# Solar Water Heating

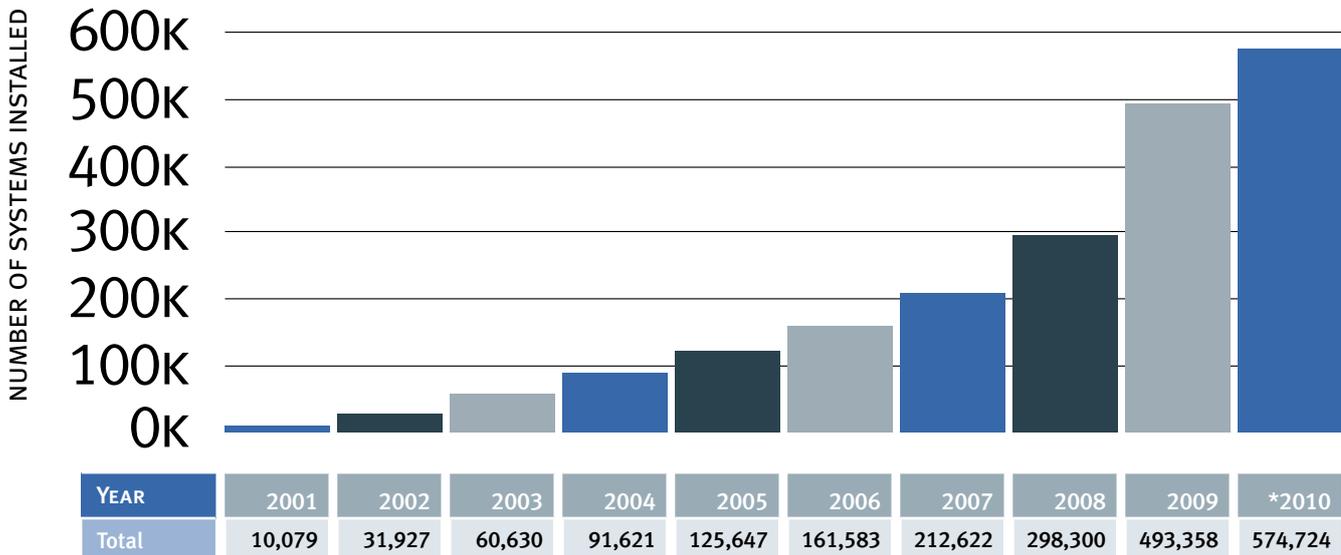
The phrase ‘solar water heating’ refers to either a stand-alone solar hot water system boosted by gas or electricity, or a heat pump, which heats water using energy from the ambient air. Both systems use natural energy to heat water.

Water heating is the largest single source of greenhouse gas emissions from the average Australian home, accounting for around 23 per cent of household emissions.

Installing a solar hot water system or heat pump can save a family hundreds of dollars off their energy bills each year. A household solar water heating system will typically save 2.4 to 3.0 tonnes of carbon emissions compared to an electric hot water system.

Figure 18. Cumulative solar water heater installations in Australia

Source: SunWiz 2010



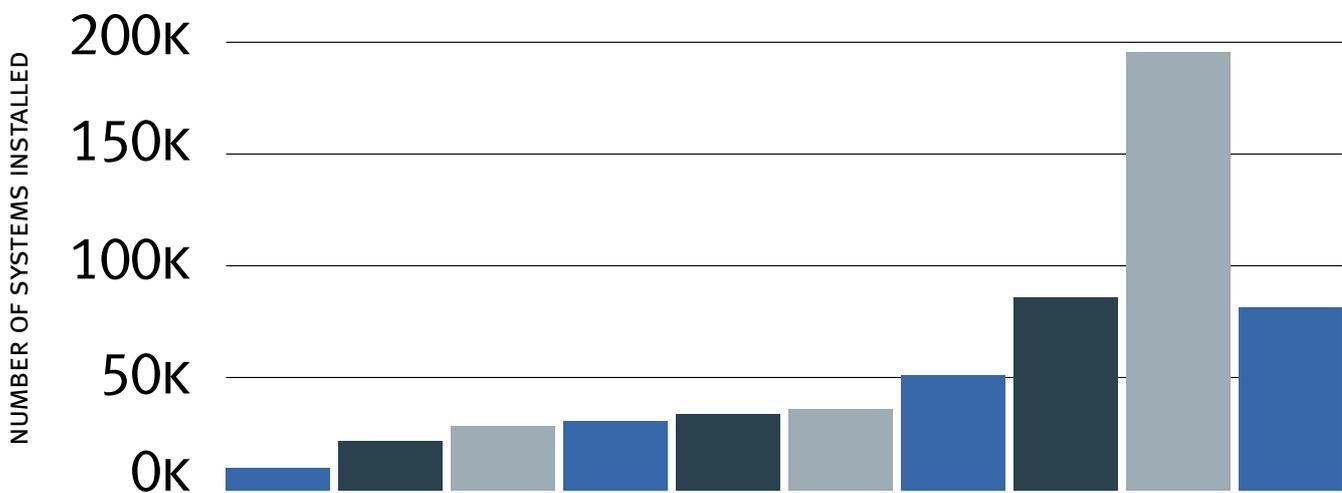
\*2010 year data based on first nine months of year only

# Solar Water Heating

A jump in sales during 2009 was the result of Federal Government rebates of up to \$1600 per system that were introduced early in that year. The rebate was reduced in February 2010, leading to a drop in the annual installation figures for this year.

Figure 19. Annual installations of solar water heaters by state per year

Source: SunWiz 2010



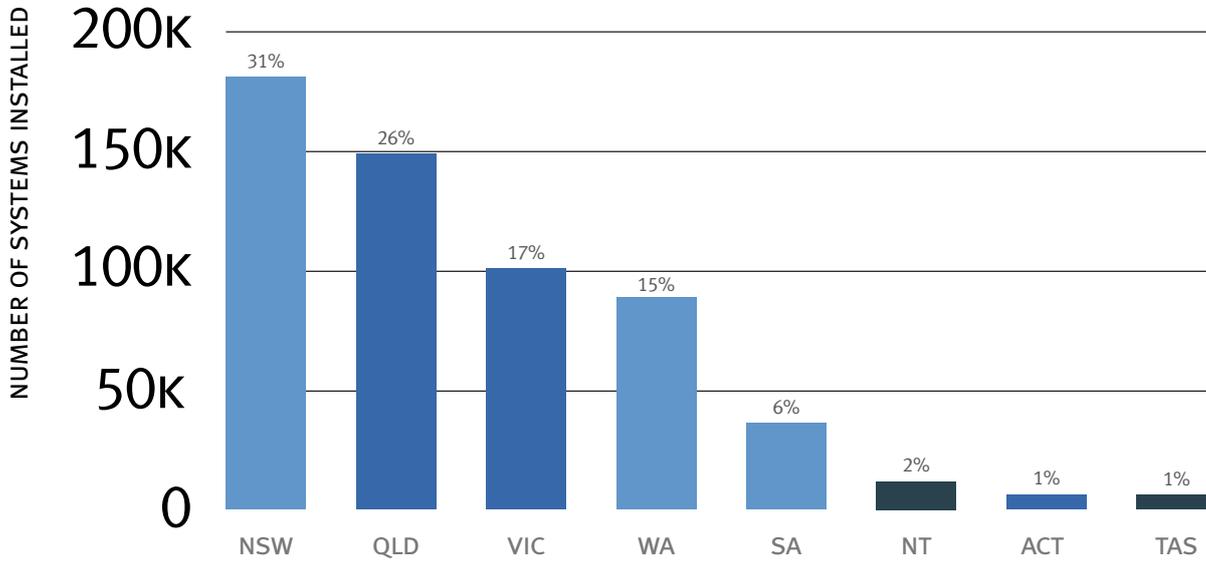
STATE	2001	2002	2003	2004	2005	2006	2007	2008	2009	*2010
ACT	70	254	434	516	448	202	454	1009	1973	649
NSW	1968	4724	7265	7870	8201	7649	8782	20,306	85,851	27,724
NT	581	957	910	1144	1171	1247	1414	1236	1733	753
QLD	4005	7702	8832	8927	8952	9947	16,846	23,399	36,681	22,622
SA	667	1887	3535	3022	3200	2416	2875	5119	8812	4359
TAS	26	97	168	160	219	139	350	908	2269	846
VIC	555	1398	1475	1800	2738	4730	9169	21,283	42,074	14,767
WA	2207	4829	6084	7552	9097	9606	11,149	12,418	15,665	9646
<b>Total</b>	<b>10,079</b>	<b>21,848</b>	<b>28,703</b>	<b>30,991</b>	<b>34,026</b>	<b>35,936</b>	<b>51,039</b>	<b>85,678</b>	<b>195,058</b>	<b>81,366</b>

\*2010 year data based on first nine months of year only

# Solar Water Heating

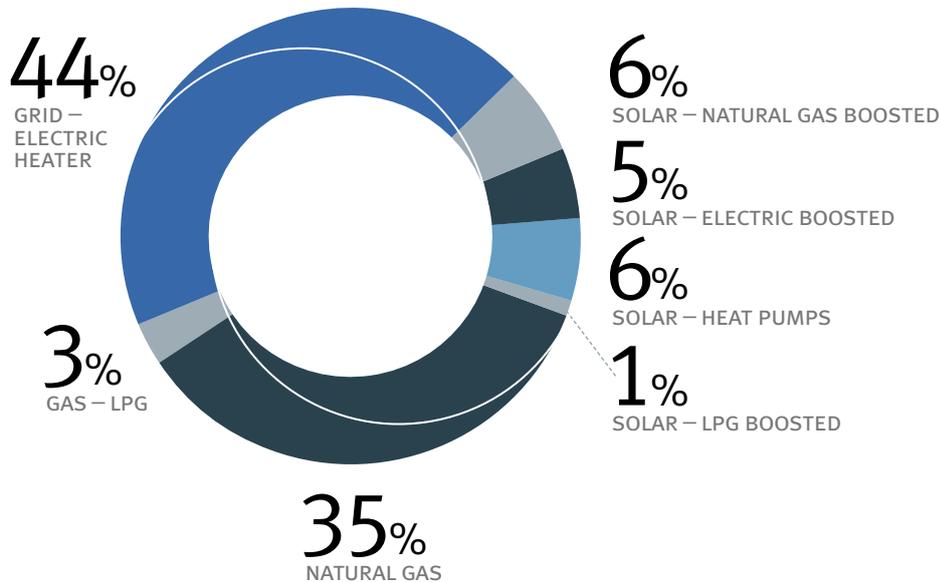
### Figure 20. Current total number of solar water heating systems installed by state

Source: SunWiz 2010. Due to rounding, totals may not add up to 100 per cent



### Figure 21. Percentage of sales made in 2008 by technology type

Source: Solar Water Heater and Heat Pump Industry Report for the Clean Energy Council, Mito Energy, 2010



# Wave and Tidal Energy 0.02% of total clean energy generation

A CSIRO study this year found that if just 10 per cent of the wave energy from Australia's southern coastline was harnessed, it would be enough to meet half of our current energy needs.



Source: Carnegie Wave Energy Limited

# Wave & Tidal

## Australian Wave and Tidal Power Plants over 100 kW



	Plants Operating	Under Development
NSW	1	0
SA	0	0
VIC	1	3
WA	1	2
TAS	0	3
QLD	0	1
NT	0	1
ACT	0	0
<b>Total Plants</b>	<b>3</b>	<b>10</b>

Operating
 Under Development

visit the interactive map online by [clicking here](#)

Wave resources are predominantly being investigated along the country's southern and western coastlines and tidal resources are being investigated mostly along the northern coastline.

Wave and tidal energy is in its infancy in Australia and internationally. Australia markets its sun and surf culture across the world, but wave energy is still struggling for government support.

There are a small number of players in the marine renewable energy market in Australia, employing different technologies that are primarily at prototype or R&D stage.

Production costs for wave and tidal energy systems are currently high, but are expected to fall as technologies mature. The International Energy Agency estimates the production costs of marine energy systems range between US\$60 per kW to US\$300 per kW (in 2005 dollars), with tidal barrage systems at the lower end of this range and tidal current and wave systems at the higher end.

**Table 16. Wave and tidal power facilities currently operating**

Source: Clean Energy Council Renewable Energy Database

OWNER	TECHNOLOGY	LOCATION	STATE	INSTALLED CAPACITY
Oceanlinx Limited	Wave	Port Kembla	NSW	0.5 MW
Atlantis Resources	Tidal	San Remo	VIC	0.15 MW
Carnegie Wave Energy	Wave	Fremantle	WA	0.1 MW

## Wave and Tidal Energy

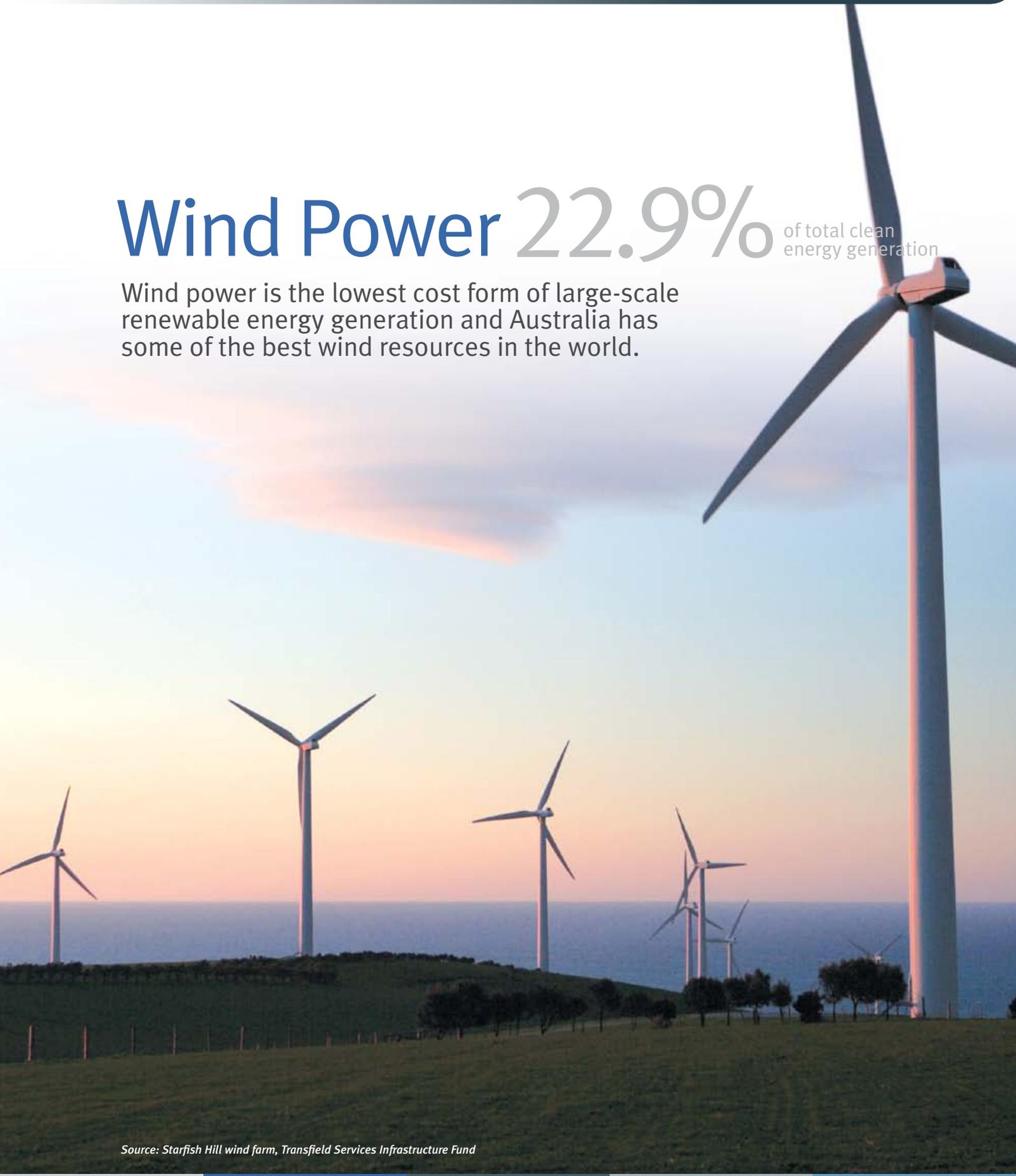
Table 17. Wave and tidal power companies investigating marine energy

Source: Clean Energy Council Renewable Energy Database

OWNER	TECHNOLOGY	LOCATION OF PLANT	STATE	STATUS OF PLANT
Advanced Wave Power	Wave	Moreton Bay	QLD	Has deployed and tested one array
Atlantis Resources	Tidal	San Remo	VIC	Completed testing of turbine
		Koolan Island	WA	Proposed project to be 1.2 MW
BioPower Systems	Wave	King Island Port Fairy Flinders Island	TAS VIC TAS	250 kW pilot project planned
Carnegie Wave Energy	Wave	Limestone Coast Portland Warrnambool Phillip Island Garden Island Eden Exmouth	SA VIC VIC VIC WA NSW WA	Trialling its CETO units. Has MoUs for trialling and electricity offtake. Plans to construct 5 MW demonstration project at Garden Island by end of 2011. Awarded \$12.5m grant from WA Government
Oceanlinx	Wave	Portland	VIC	Plans to trial demonstration – scale device
Tenax Energy	Tidal	Clarence Strait Port Phillip Heads Banks Strait	NT VIC TAS	Three large-scale (24–300 MW) project proposals. Secured tenure for NT project. Currently applying for government approvals for projects
Victorian Wave Partners	Wave	Portland	VIC	Joint venture between Ocean Power Technologies and Leighton Construction to develop a 19 MW plant. Awarded \$66m government grant under the Renewable Energy Demonstration Program (REDP)
Wave Rider Energy	Wave	Elliston	SA	200 kW pilot project planned for 2011

# Wind Power 22.9% of total clean energy generation

Wind power is the lowest cost form of large-scale renewable energy generation and Australia has some of the best wind resources in the world.



Source: Starfish Hill wind farm, Transfield Services Infrastructure Fund

# Wind

## Australian Wind Power Plants over 100 kW



	Plants Operating	Under Construction
NSW	7	1
SA	13	3
VIC	9	2
WA	14	0
TAS	6	1
QLD	2	0
AUSTRALIAN ANTARCTIC TERRITORY	1	0
ACT	0	0
NT	0	0
<b>Total Plants</b>	<b>52</b>	<b>7</b>

visit the interactive map online by [clicking here](#)

The amount of installed wind power has grown by an average of 30 per cent per year over the past decade.

In the past year wind power generated almost 5,000 GWh of electricity which was enough to power over 700,000 homes. Australia currently has 1052 wind turbines and 52 operating wind farms.

Acciona's Waubra Wind Farm north-west of Ballarat in Victoria is currently the largest in the country, with 128 turbines spread out over 173 square kilometres.

# Wind Power

Figure 22. Cumulative installed wind capacity in Australia

Source: Clean Energy Council Renewable Energy Database

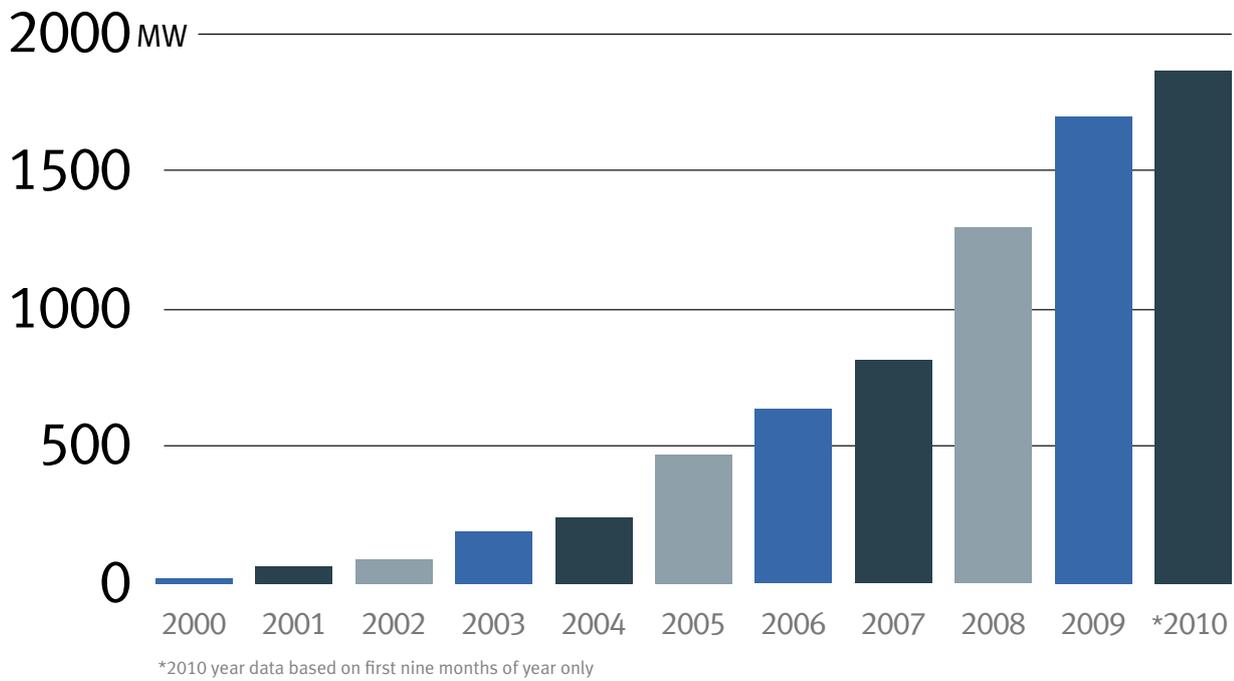


Table 18. Wind farms commissioned during 2010

OWNER	LOCATION	STATE	INSTALLED CAPACITY
AGL	Hallett 2	SA	71.4 MW
Pacific Hydro	Clements Gap	SA	56.7 MW
Infigen Energy	Lake Bonney Stage 3	SA	39 MW

## Wind Power

Table 19. Wind farms under construction

OWNER	LOCATION	STATE	EXPECTED COMMISSION YEAR	INSTALLED CAPACITY
AGL Meridian Energy	Macarthur	VIC	2013	420 MW
Roaring 40s	Musselroe	TAS	2013	168 MW
AGL	Hallett Stage 4 (Nth Brown Hill)	SA	2011	132 MW
Roaring 40s	Waterloo	SA	2010/2011	111 MW
Union Fenosa	Crookwell 2	NSW	2011	92 MW
AGL	Oaklands Hill	VIC	2011	67 MW
AGL	Hallett Stage 5 (Bluff Wind Farm)	SA	2012	53 MW
<b>Total capacity under construction</b>				<b>1043 MW</b>

Table 20. Total installed wind capacity by state

Source: Clean Energy Council Renewable Energy Database (only includes projects larger than 100 kW)

STATE	INSTALLED CAPACITY (MW)	NUMBER OF TURBINES	NUMBER OF PROJECTS	INSTALLED CAPACITY PENETRATION IN STATE (%)
SA	907	435	13	19.4
VIC	428	267	9	4.3
WA	202	142	14	1.2
NSW	187	116	7	1.0
TAS	143	68	6	4.7
QLD	12	22	2	0.1
NT	0	0	0	–
ACT	0	0	0	–
Australian Antarctic Territory	1	2	1	–
<b>Total</b>	<b>1880</b>	<b>1052</b>	<b>52</b>	

# Wind Power

Figure 23. Percentage of installed wind capacity by state

Source: Clean Energy Council Renewable Energy Database

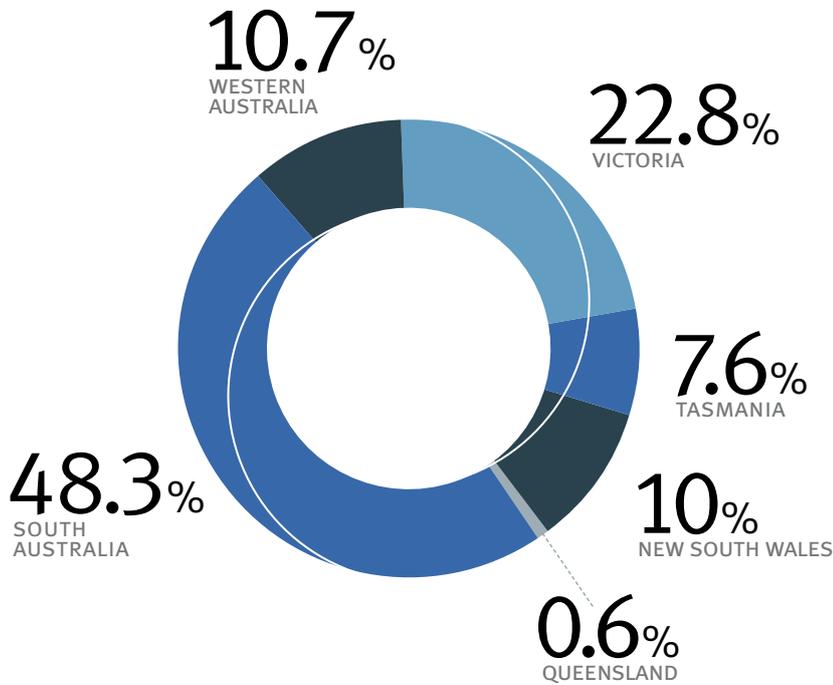


Table 21. Indicative development costs for Australian wind farms

Source: Review of the Australian Wind Industry for the Clean Energy Council, Garrad Hassan, 2010

COST ITEM	\$MAUD/MW	CONTRIBUTION TO CAPITAL COSTS
Turbine works	1.5–2.00	60–75%
Civil & electrical work up to the point of connection	0.35–0.6	10–25%
Grid connection	0.05–0.35	5–15%
Development & consultancy work, wind speed monitoring	0.15–0.42	5–15%
<b>Total</b>	<b>2.1–3.4</b>	<b>100%</b>

# Energy Efficiency

Australia is the world's 20th largest consumer of energy and 15th in terms of per capita energy use. Source: ABARE, 2010



Source: Lynton Crabb – [crabb.com.au](http://crabb.com.au)

# Energy Efficiency

Improving energy efficiency is a fast and cost effective way of reducing greenhouse gas emissions. Research by the Australian Bureau of Agricultural and Resource Economics (ABARE) estimated that energy efficiency could account for around 55 per cent of Australian emissions abatement to 2050.

Current Federal Government energy efficiency measures are expected to deliver more than 38 million tonnes of abatement in 2020 and state governments have also implemented numerous energy efficiency initiatives.

In October 2010 the Australian Government's Task Group on Energy Efficiency made recommendations regarding Australia's energy efficiency performance which included:

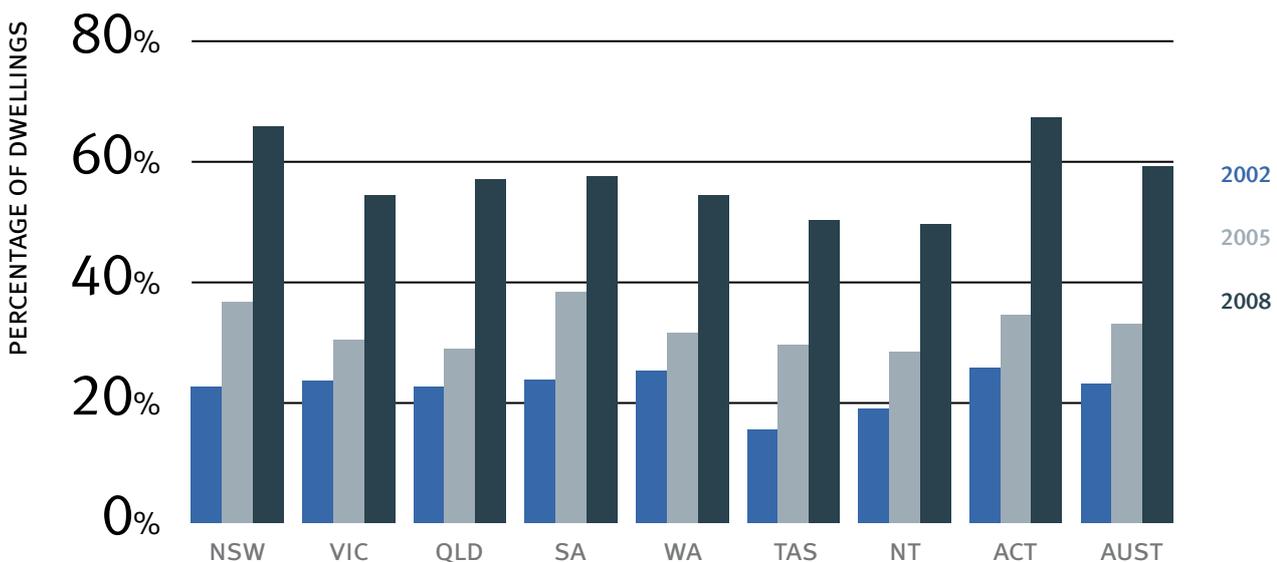
- setting a national energy efficiency target of improving Australia's primary energy intensity by 30 per cent by 2020
- establishing an energy savings initiative which would set an obligation on energy suppliers to constrain demand among their customers
- resetting the Government's framework for energy efficiency
- providing a stronger enabling environment for energy efficiency
- building an energy efficiency culture in Australia.

Electricity consumption in the residential sector is a significant contributor to greenhouse gas emissions in Australia. Heating and cooling accounted for the greatest proportion of energy consumed in households, followed by water heating.

According to the Australian Bureau of Statistics, in 2007-08, 88 per cent of Australians reported that they had taken steps to limit their personal electricity use. Between 2005 and 2008, the proportion of households who used energy-saving lights increased from 33 per cent to 59 per cent.

Figure 24. Percentage of dwellings utilising energy-saving lights by state

Source: ABS, Environmental Issues: Energy Use and Conservation, Mar 2008



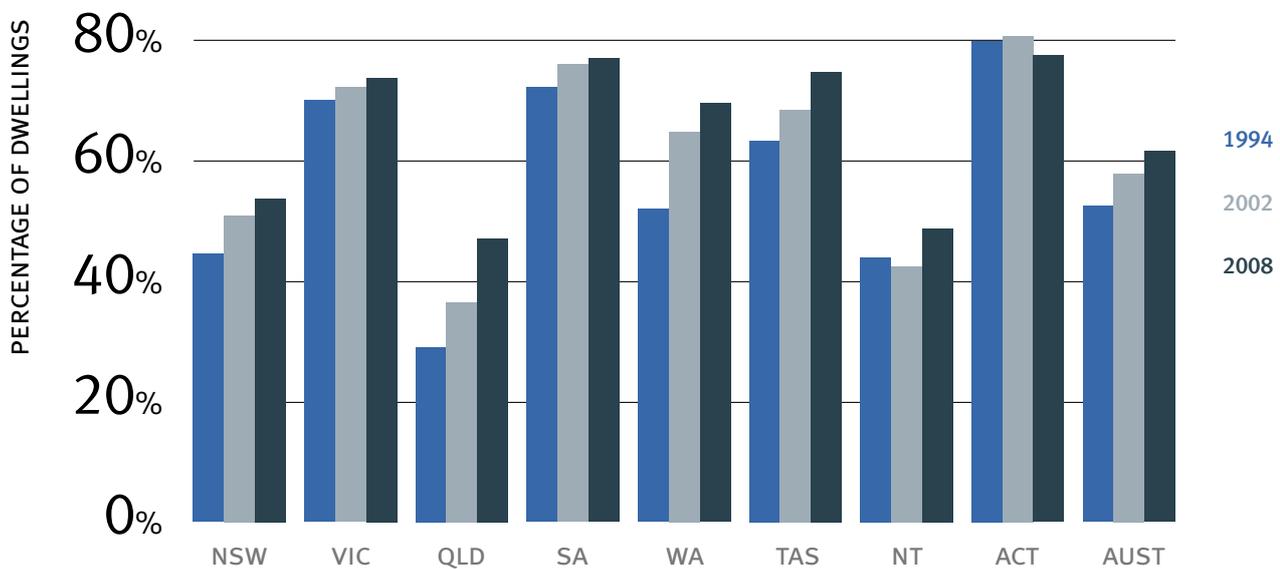
\* Excludes fluorescents. Includes people's own perception of energy-saving lights (e.g. low voltage halogen, etc)

# Energy Efficiency

In 2008 around 62% of Australian homes had roof insulation. Since the implementation of the Federal Government’s home insulation program in February 2009 an estimated 1.1 million additional roofs have been insulated.

Figure 25. Dwellings with insulation by state

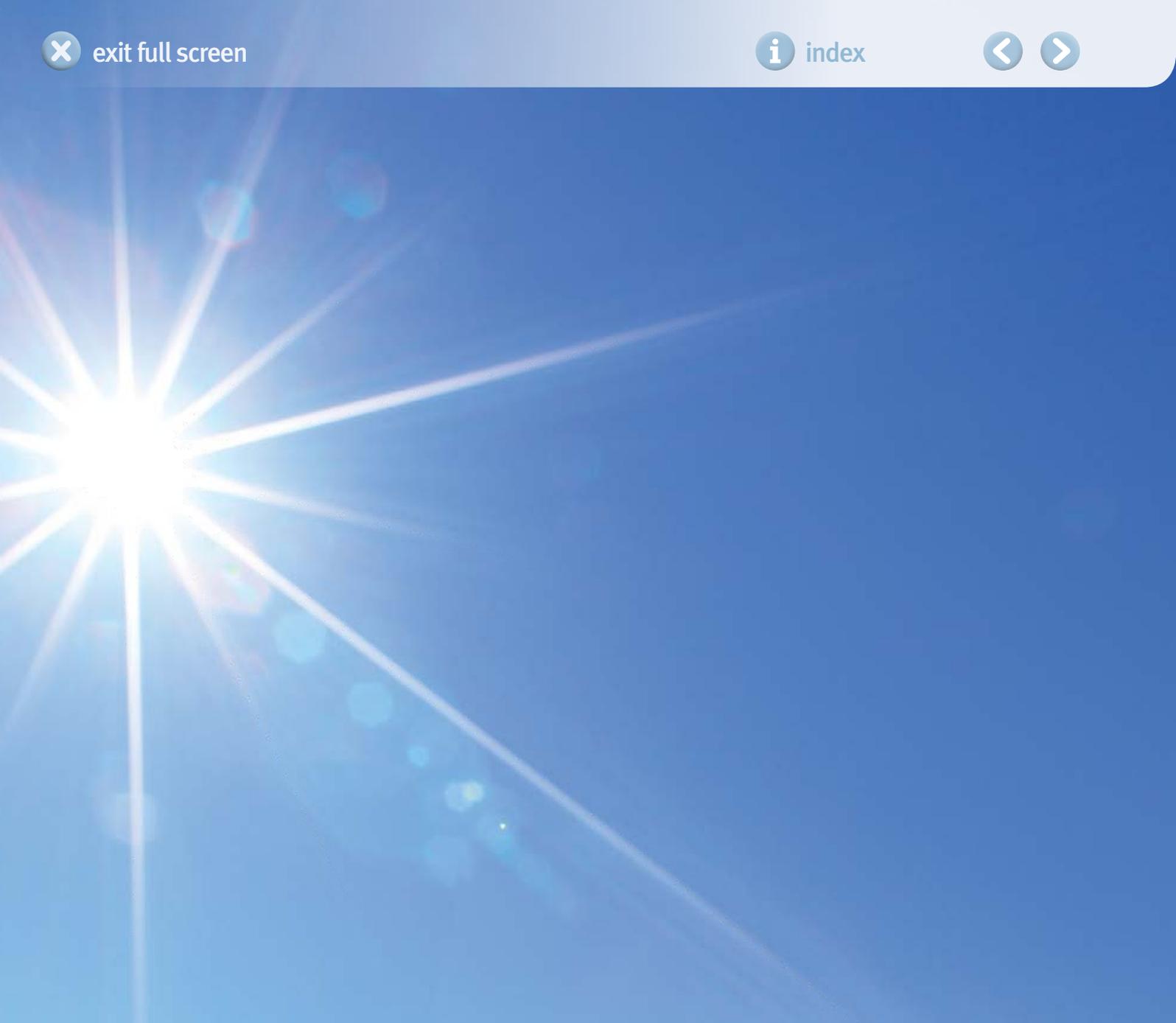
Source: ABS, Environmental Issues: Energy Use and Conservation, Mar 2008



Household appliances account for about 30 per cent of total energy consumption. Whitegoods such as refrigerators and freezers are the largest contributors to household energy use, consuming 34 per cent of all energy used by household appliances.

The commercial and industrial sectors are enormous consumers of energy and improvements in their energy efficiency make a major contribution to greater national energy efficiency.

During 2008-09, 88% of large businesses took measures to reduce their energy consumption and 54% of small businesses participated in energy reduction measures.



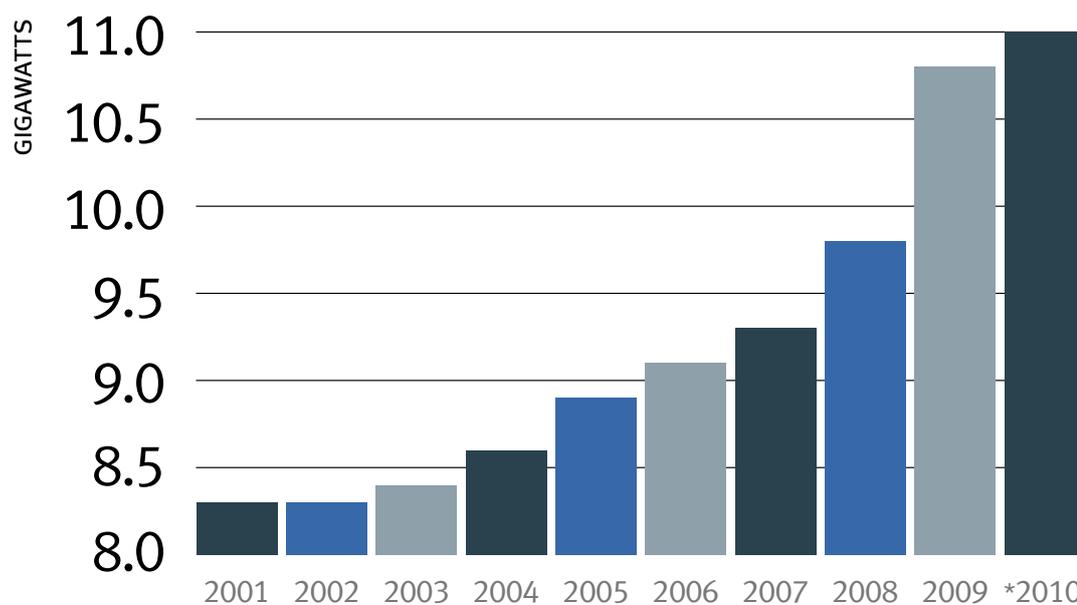
# Appendix

# Appendix

## Installed capacity figures

Figure 26. Cumulative installed renewable energy capacity in Australia (by commissioning year)

Source: Clean Energy Council Renewable Energy Database



\*2010 year data based on first nine months of year only

## Percentage contribution of each renewable energy source to installed capacity

Table 22. Installed capacity of renewable energy by fuel type

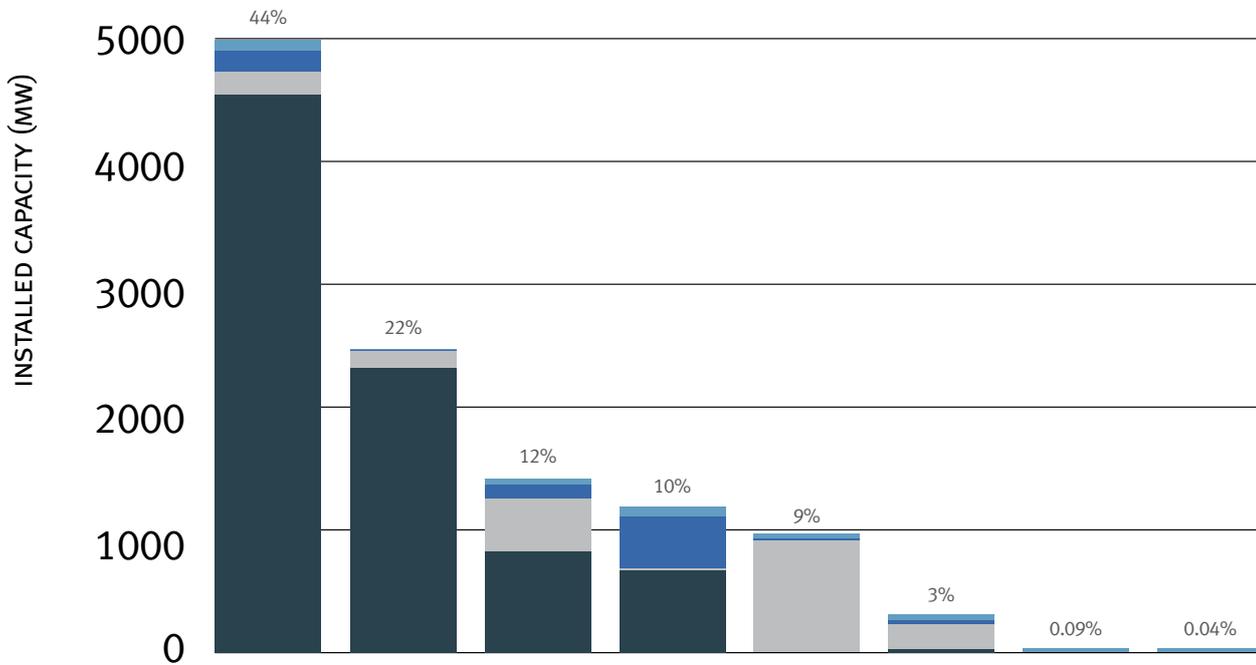
Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	TOTAL INSTALLED CAPACITY (MW)	NUMBER OF PROJECTS THAT ARE GREATER THAN 100 kW IN SIZE	PERCENTAGE OF INSTALLED CAPACITY
Hydro	8390	122	74%
Wind	1880	52	17%
<b>Biomass:</b>			
– Bagasse Cogeneration	474	29	4.2%
– Black Liquor	77	3	0.7%
– Food and Agricultural Wet Waste	7	5	0.06%
– Landfill Gas	162	70	1.4%
– Sewage Gas	41	24	0.36%
– Wood Waste	6	2	0.05%
<b>Bioenergy Sub-Total</b>	<b>767</b>	<b>133</b>	<b>6.8%</b>
Solar PV Solar Thermal	*310	21	2.73%
Marine	0.75	3	0.007%
Geothermal	0.1	1	0.001%
<b>Renewable Total</b>	<b>11,347</b>	<b>332</b>	<b>100%</b>

\* This figure includes large-scale solar and small generation units

# Appendix

Figure 27. Installed capacity of renewable energy projects by state



FUEL SOURCE	NSW	TAS	VIC	QLD	SA	WA	ACT	NT
Hydro	4544	2316	828	669	3	30	1	0
Wind	187	143	428	12	907	201	0	0
Bioenergy	164	5	113	428	19	33	4	1
Solar PV	93	4	48	75	37	43	5	3
Solar Thermal	3	0	0	0	0	0	0	0
Geothermal	0	0	0	0.1	0	0	0	0
Wave	0.5	0	0	0	0	0	0	0
<b>Total MW</b>	<b>4992</b>	<b>2468</b>	<b>1417</b>	<b>1184</b>	<b>966</b>	<b>307</b>	<b>10</b>	<b>4</b>

The Clean Energy Council is the peak body representing Australia's clean energy sector. It is a not-for-profit industry association made up of more than 450 member companies operating in the fields of renewable energy and energy efficiency.

The CEC's primary role is to develop and advocate effective policy to accelerate the development and deployment of all clean energy technologies.

Member companies represent clean energy technologies such as wind, hydro, wave and tidal, solar, solar hot water, bioenergy, geothermal and cogeneration.

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