



Clean Energy Council

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Introduction

Across the world we are changing the way our electricity is generated and delivered. The question is no longer whether we continue relying on emission-intensive 20th-century technology to keep the lights on. It is how fast we move to embrace clean energy such as solar, wind, hydro, bioenergy, marine and geothermal.

Globally clean energy continues to set record levels for investment. Bloomberg New Energy Finance estimates that a record US\$243 billion was invested in 2010, well ahead of traditional energy and up more than 30 per cent on the year before. In Australia more than \$5.2 billion was invested in renewable energy during the 2010–11 financial year, including approximately \$4 billion on household solar power alone. This is more than 60 per cent higher than during 2009–10.

A record US\$243 billion was invested globally in clean energy in 2010.



Image source: CSIRO National Solar Energy Centre in Newcastle

In the year to October 2011, just under 10 per cent of Australia's electricity came from renewable energy. This represents a large rise on previous years due to a resurgent hydro sector and more power generated by the country's wind farms.

Though we still have a long way to go, the introduction of a carbon price in mid-2012 and the associated government support for clean energy will provide the policy framework to attract both domestic and international investors to all forms of renewable energy and energy efficiency.

In time these initiatives will fundamentally change the nature of our electricity grid, unlocking billions of dollars in investment and providing employment for tens of thousands of Australians in the clean energy sector.

We have taken the first steps. Australia's national Renewable Energy Target will deliver 20% of the country's electricity from renewable sources by 2020.



Image source: Hydro Tasmania

Australian Renewable Energy Snapshot

Percentage of electricity generation from renewables

Australia's electricity generators produced over 300 terawatt-hours of electricity in the last year to the end of September 2011. The contribution of renewable energy rose to 9.6 per cent of the total electricity produced during this period, up from 8.7 per cent the year before.

Many of Australia's key hydro catchments experienced the best rainfall in years following a long period of drought and additional generation from new wind power lifted the renewable energy generation total higher than in previous years. Household solar power still contributes a modest proportion of Australia's renewable energy, but its record growth in 2010 and 2011 is starting to reduce demand across the country while making a significant contribution to the country's energy mix.

Renewable energy rose
to 9.6% of the total
electricity produced.

Figure 1. Estimated annual electricity generation

Source: Clean Energy Council Renewable Energy Database, ABARE 2011, REC Registry, AEMO, IMO, IES

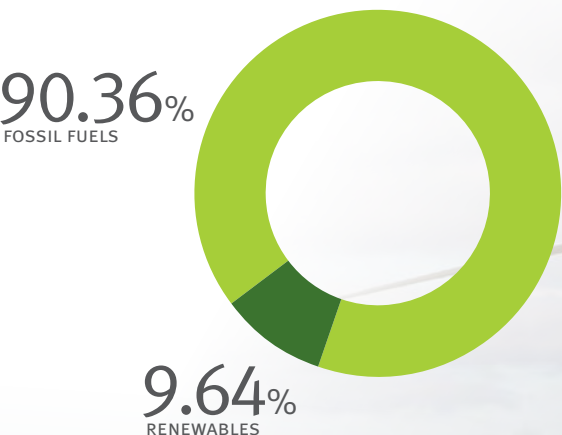


Table 1. Annual renewable electricity generation

Electricity generated between 1 October 2010 and 30 September 2011.
Source: Clean Energy Council Renewable Energy Database, ABARE 2011, REC Registry, AEMO, IMO, IES.
Due to rounding totals may not add up to 100%.

FUEL SOURCE	ESTIMATED ELECTRICITY GENERATION PER YEAR (GWh)	PERCENTAGE CONTRIBUTION	EQUIVALENT IN HOUSEHOLDS**
Hydro	19,685	67.2%	2,772,500
Wind	6432	21.9%	905,800
Bioenergy	2500	8.5%	352,100
Solar PV	680	2.3%	95,800
Solar Thermal	4.4	0.015%	620
Marine	0.75	0.003%	105
Geothermal	0.5	0.002%	70
Solar Water Heating*	2115	N/A	297,900
RENEWABLE TOTAL	29,302	100%	4,126,995

* As solar water heating does not produce electricity it has not been included in the total generation or equivalent in household figures.
** Based on average household energy use, ABS Figures do not include auxiliary load or transmission line losses.

“The renewable energy and energy efficiency sector will play a critical role in transforming the Australian economy. Australia has some of the best renewable energy resources in the world and the Australian Government is committed to working with the industry to ensure it can reach its full potential.”

Julia Gillard, Prime Minister of Australia



Image source: Gunning Wind Farm, Acciona Energy

Australian Renewable Energy Snapshot

The renewable energy generated during the 12 months to the end of September 2011 produced enough electricity to power the equivalent of more than 4 million average Australian households.

Hydro electricity accounted for two thirds of the renewable energy generated during this period, rising from its more modest contribution in recent years. Rainfall continues to be one of the strongest influences on the country's clean energy generation, followed by wind.

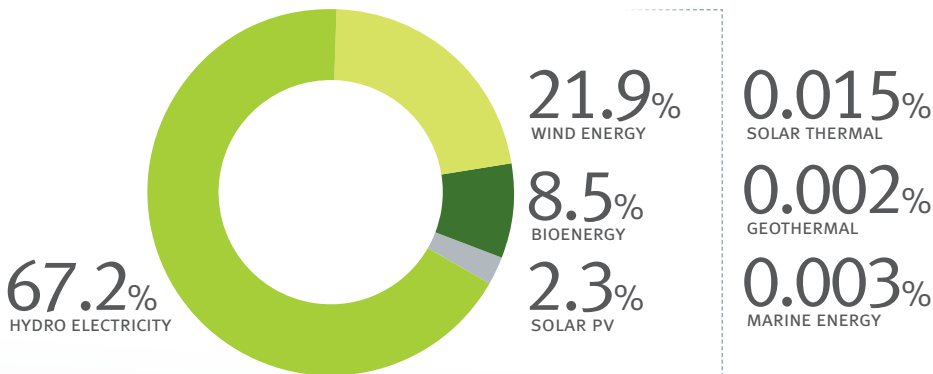
Although there was significantly more wind power generated compared to the year before, its relative contribution fell slightly (21.9%) due to the increased contribution by the hydro sector. Wind was followed by bioenergy (8.5%) and solar photovoltaic (PV) power (2.3%).



Image source: Hydro Tasmania

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

Source: Clean Energy Council Renewable Energy Database, ABARE 2011, REC Registry, AEMO, IMO, IES.
Due to rounding figures may not add up to 100%



Hydro electricity accounted for more than two thirds of the renewable energy generated in the 12 months to October 2011.

Renewable Energy Year in Review

Household clean energy technologies

The growth of solar power was one of the stories of 2011 following a record year in 2010, when 380 MW of solar power was installed. As at the end of August 2011, 1031 MW of solar power was installed across the country, representing more than half a million household systems. This is more than nine times the amount of solar power installed as at the end of 2009 and more than 35 times the total installed just three years ago in 2008. More than 230,000 of these systems were installed in the eight months from January to August 2011.

Nationally it is estimated that 8% of all suitable homes are fitted with a solar photovoltaic (PV) power system.¹

The large uptake of solar power has helped to drive down costs for consumers, create thousands of industry jobs and make this technology an everyday part of mainstream Australia. The cost of solar PV continues to fall rapidly and is expected to reach the cost of grid electricity towards the middle of the decade.

The growth of solar hot water has been more modest over the last couple of years. The generous government support available for solar PV systems has led many customers to choose PV over solar hot water, despite the excellent energy savings available from the latter technology. A national ban on the replacement of electric hot water systems from 2012 is expected to give the solar hot water industry a welcome boost.

¹ Clean Energy Council Review of the Australian solar PV industry, 2011

In the eight months to the end of August 2011, more than 230,000 solar power systems were installed across Australia.

Figure 3. Cumulative installed capacity of small-scale solar PV
2011 data based on first eight months of year only. Source: SunWiz 2011

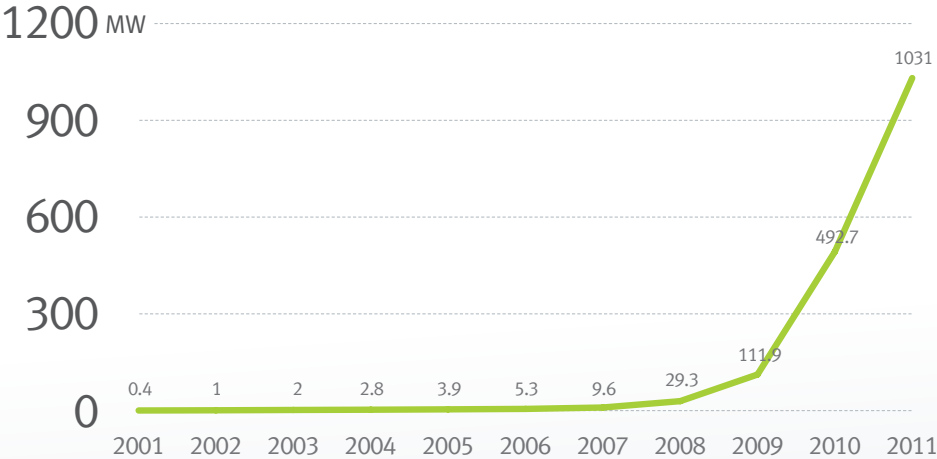


Table 2. Household clean energy systems Source: SunWiz 2011

FUEL SOURCE	INSTALLED CAPACITY (MW)	NUMBER OF SYSTEMS INSTALLED
Solar PV	1031 MW	513,585
Solar water heater /heat pumps	*1800 MW	704,459

*2009 data, IEA

Renewable Energy Year in Review

Large-scale renewable energy projects

There were modest gains for industrial-scale renewable energy over the last year, repeating the pattern from the year before. A dozen large-scale renewable energy power plants have become operational since October 2010, though most of the 400 MW in new generating capacity came from three wind farms and a hydro upgrade. Although this figure is higher than in 2010, it is still well down on the 993 MW of power that came online in 2009.

At the end of September 2011 there were 346 large-scale clean energy power plants (larger than 100 kW) operating in Australia.



Image source: Western Water's Recycled Water Plant, Melton Victoria



Image source: CSIRO National Solar Energy Centre in Newcastle

Policy and investment uncertainty continued to be major issues for clean energy companies in 2011, as was the case in the year before. Investors watched the the lively political debate over a carbon price apprehensively.

Although the Renewable Energy Target (RET) was split into a large and small-scale market at the beginning of the 2011 calendar year, the carryover of renewable energy certificates generated by household renewable energy continues to affect the large-scale market. As a result there has been a soft market for large-scale generation certificates (LGCs), an incentive that is designed to bridge the price gap between green and black electricity. Recovery of the LGC price is expected to begin. The industry is hopeful that the Federal Government's carbon price package will signal the beginning of a new era of policy stability to act as a catalyst for a wave of major investment in clean energy power plants.

Wind power is expected to be the dominant technology during the early years of the national 20 per cent RET. Wind is the lowest cost clean energy source that is ready to roll out on a large scale.

Table 3. Major projects delivered in last 12 months (since 1 October 2010)

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	YEAR	INSTALLED CAPACITY
Wind	Hallett 4 (Nth Brown Hill)	AGL	SA	2011	132.3 MW
Hydro	Tumut 3 Runner upgrade	Snowy Hydro	NSW	2011	Additional 100 MW
Wind	Gunning	Acciona Energy	NSW	2011	46.5 MW
Wind	Hepburn (Leonards Hill)	Hepburn Wind	VIC	2011	4.1 MW
Wind	Mt Barker	Mt Barker Power Company	WA	2011	2.4 MW
Solar PV	St Lucia Campus, University of QLD	University of Queensland	QLD	2011	1.2 MW
Solar PV	Ilparpa (Uterne)	Alice Springs Consortium	NT	2011	0.97 MW
Solar PV	Cararra Stadium (Gold Coast)	Carrara Stadium	QLD	2011	0.25 MW
Solar thermal	Mayfield	CSIRO	NSW	2011	0.2 MW
Wind	Waterloo	TRUenergy	SA	2010	111 MW
Landfill gas	Buttonderry	Landfill Management Services	NSW	2010	1.1 MW
Solar PV	Nullagine	Horizon Power	WA	2010	0.2 MW



Image source: CSR

Renewable Energy Year in Review

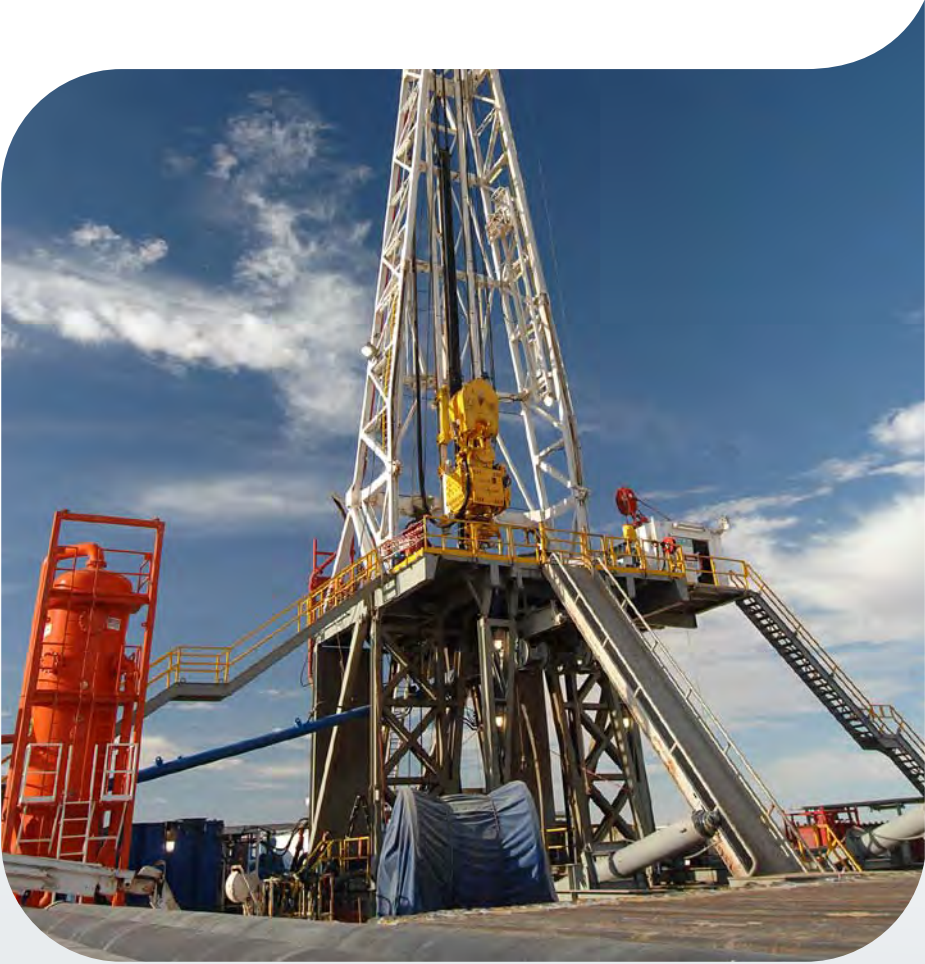


Image source: Geodynamics

The industry is expecting that the Federal Government’s carbon price package will signal the beginning of a new era of policy stability that will secure commitment to major clean energy projects.

Table 4. Total capacity of new renewable energy projects
1 October 2010 – 30 September 2011 – 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	296	5
Hydro	100	1
Large-scale solar photovoltaic & solar thermal	2.8	5
Landfill gas	1.1	1
TOTAL	399.9	12

Major projects under construction

There were 10 new clean energy projects under construction as at September 2011.

Together these power plants will add 1073 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 the largest of those underway. If completed in its current form it will be the largest wind farm in Australia.

Table 5. Major renewable energy projects under construction

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	YEAR TO BE COMPLETED	INSTALLED CAPACITY
Wind	Macarthur	AGL/Meridian Energy	VIC	2013	420 MW
Wind	Collgar	UBS ITT/REST	WA	2012	205 MW
Wind	Musselroe	Hydro Tasmania	TAS	2013	168 MW
Wind	Crookwell 2	Union Fenosa	NSW	2014	92 MW
Wind	Oaklands Hill	AGL	VIC	2012	67 MW
Wind	Hallett Stage 5 (Bluff Wind Farm)	AGL	SA	2011	53 MW
Wind	Woodlawn	Infigen Energy	NSW	2011	48 MW
Bioenergy	Victoria 2	Sucrogen	QLD	2011	19 MW
Landfill gas	Woodlawn Bioreactor	Veolia Environmental Services	NSW	2011	1.1 MW
Solar PV	Carnarvon	EMC Solar	WA	2011	0.3 MW
TOTAL CAPACITY UNDER CONSTRUCTION					1073.4 MW



Image source: Hydro Tasmania

Renewable Energy Jobs

Current employment

There were around 8000 full-time equivalent jobs in the Australian renewable energy industry in 2010.

The number of accredited solar PV installers across the country has increased by six times in the last three years to over 4000 (figure 6). Not all of these are full-time solar installers; many will alternate between mainstream electrical contracting and solar power installation.

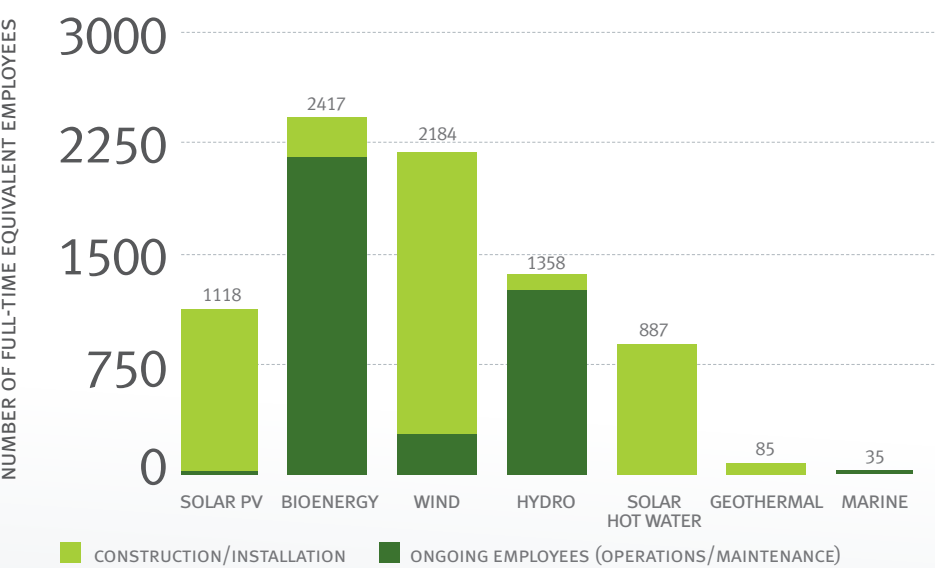
The employment figures listed below are those directly involved with the construction, installation, operations and maintenance activities associated with clean energy power generation. They do not include sales, administration, management and other staff associated with the ongoing running of a business. An example of the flow-on employment can be found in the solar hot water industry, which employs an estimated total of 6000 people across distribution, sales and installation but has a listed workforce of just under 900 people.



Image source: CSIRO National Solar Energy Centre in Newcastle

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

Source: SKM MMA, 2010



Employment by state

The highest number of employees in the renewable energy industry is in NSW.

The decades-old Snowy Mountains Hydro-electric Scheme remains one of Australia’s major producers of renewable energy and is a major employer as well. Bioenergy directly employs more than 680 people in NSW.

In Queensland, bioenergy such as bagasse generation from sugar cane waste provided the majority of the employment in the clean energy sector, while most jobs in Victoria and South Australia came from the wind sector. Most of Tasmania’s jobs were generated by its network of 27 hydro-electric power stations.

Figure 5. Full-time equivalent employees in the renewable energy industry – by state Source: SKM MMA, 2010

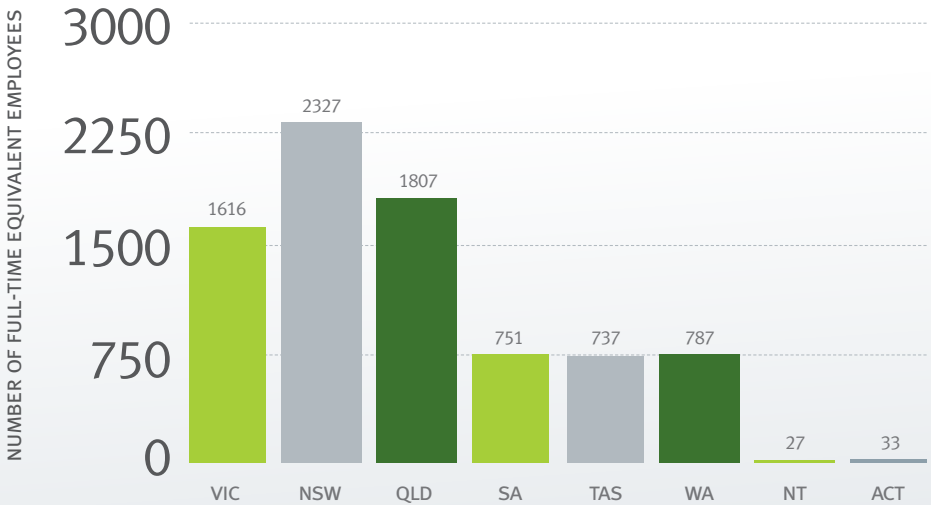
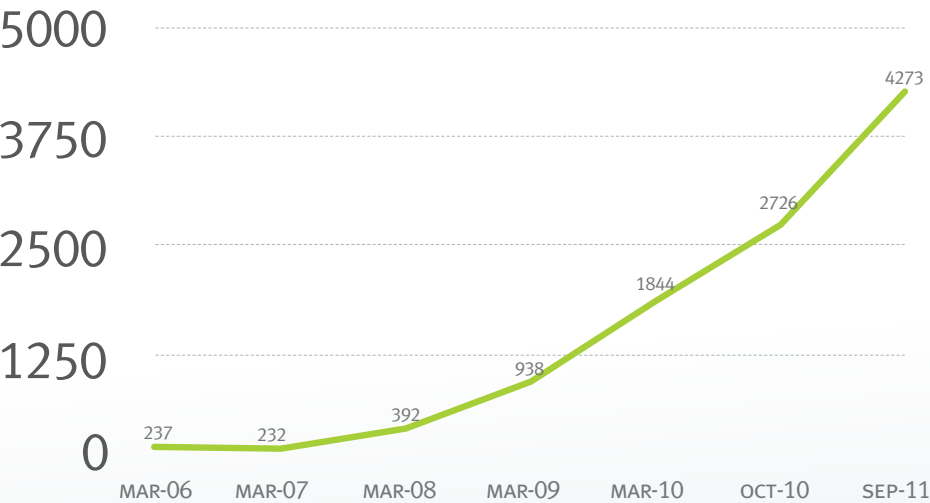


Figure 6. Total number of accredited installers and designers in Australia

Source: Clean Energy Council Accredited Installer Database



Projected employment

By 2030 it is expected that the number of new jobs created in the renewable energy industry will have grown to almost 32,000 with the largest increase being attributed to growth in the solar and wind sectors. Many of these jobs will be located in regional areas of the country. See appendix 1 for figures.

Investment

Table 6. New financial investment in large and small-scale clean energy in Australia, FY 2010 & 2011 (US\$m) Source: Bloomberg New Energy Finance

SECTOR	FY 09–10	FY10–11
Wind	1837.6	1158.1
Solar	1257.1	4014
Biomass & waste	128.1	0
Geothermal	10.6	87.7
Marine	12.5	4.3
Small hydro	27.1	0
TOTAL	3273.0	5264.1

Note: Includes estimates for small-scale PV investment (under 100 kW). Corporate and government R&D estimates are not included. There is no adjustment for re-invested equity. Estimates are included for undisclosed deal values.



“Investment in clean energy has eclipsed that of traditional energy over the last three years and this shows no signs of slowing down. Investors have started to see clean energy as a safe and lucrative sector to invest their capital.”

Nathan Fabian, Chief Executive, Investor Group on Climate Change

Australia's long coastline and proximity to both the tropics and the Southern Ocean mean that there is an enormous energy resource available if we can develop cost-effective technology to harness it.



Image source: Carnegie Wave Energy

Electricity Prices

Electricity prices in Australia have risen about 30 per cent over the last four years.

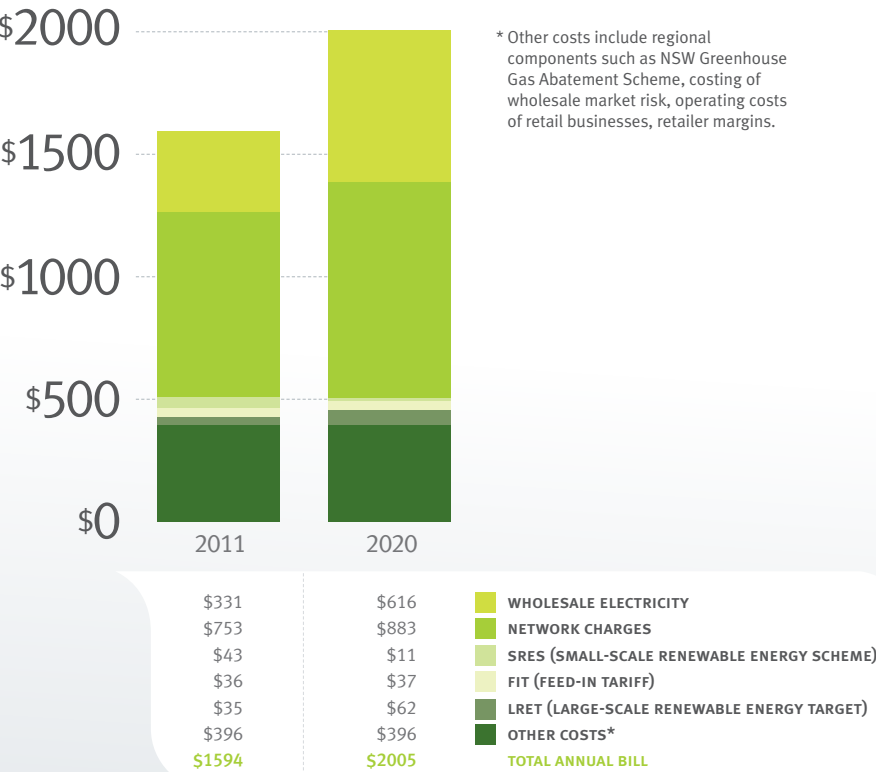
There are several factors behind the recent price rises. By far the largest is the need to replace and upgrade the ageing poles and wires of the national electricity grid, some of which have been in service for more than 40 years. Recent estimates suggest that more than \$130 billion will be necessary to upgrade the network over the next decade, growing to \$220 billion over 20 years.¹ Research indicates that these network costs will cause price rises of up to 66 per cent in NSW and Queensland by 2015.² Similar increases are likely in other states and territories.

Other reasons for power price rises include the increasing cost to generate electricity with both coal and gas along with the increased use of energy-intensive appliances such as air-conditioners and flat-screen televisions, which increase peak demand for electricity and overall costs. According to analysis prepared for the Clean Energy Council by ROAM Consulting in 2011, the combined cost of both small and large-scale renewable energy comes to approximately \$78 per year for the average Australian household. This works out to \$1.50 per week. By 2020 the cost of renewable energy is expected to make up between 4 and 7 per cent of the average household power bill.³

¹ K Orchison, Coolibah Pty Ltd, Powering Australia, 2011, page 19. ² P Simshauser, T Nelson, T Doan, AGL, The Boomerang Paradox Part 1: how a nation's wealth is creating fuel poverty, The Electricity Journal, 24(1), 2001, pages 72-91. ³ J Riesz and J Gilmore, ROAM Consulting, The True Costs and Benefits of the Enhanced RET, 2011, page iii

Figure 7. Composition of the annual electricity retail bill of a typical NSW residential customer in 2011 and 2020

Assumes a -5% carbon price trajectory, medium growth in PV installations and network costs
Source: ROAM Consulting, Impact of renewable energy and carbon pricing policies on retail electricity prices, March 2011





“The evolution of Australia’s electricity network presents great opportunities and challenges. Change will be broad and far reaching.”

The transmission framework review being conducted by the Australian Energy Market Commission is critical to determine the changes required for Australia to meet the energy challenges of the 21st century. The work of the Clean Energy Council in addressing the challenges of network connection and extension remains critical.”

Kate Summers

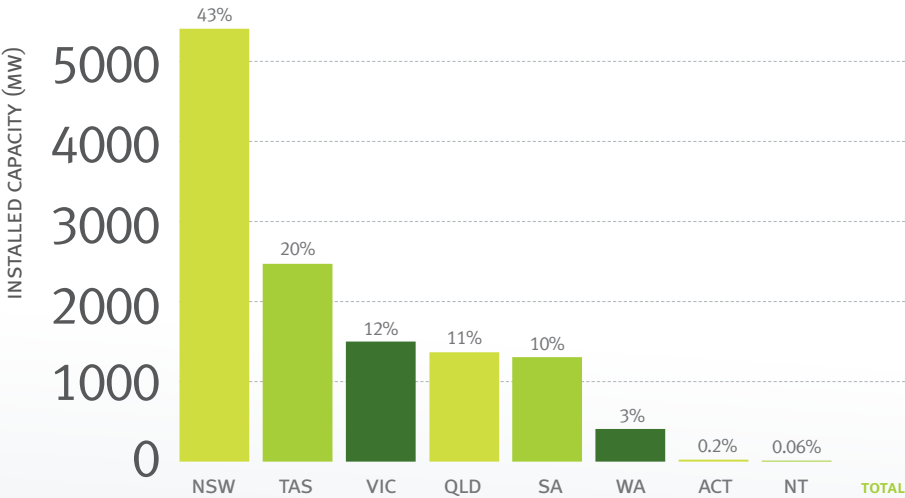
*Manager Electrical Performance and Grid Integration, Pacific Hydro
Chair, Clean Energy Council Grid Directorate*

State by State Snapshot

Installed capacity by state and renewable energy technology

Figure 8. Installed capacity of renewable energy projects by state

Source: Clean Energy Council Renewable Energy Database, SunWiz, 2011.
Due to rounding figures may not add up exactly



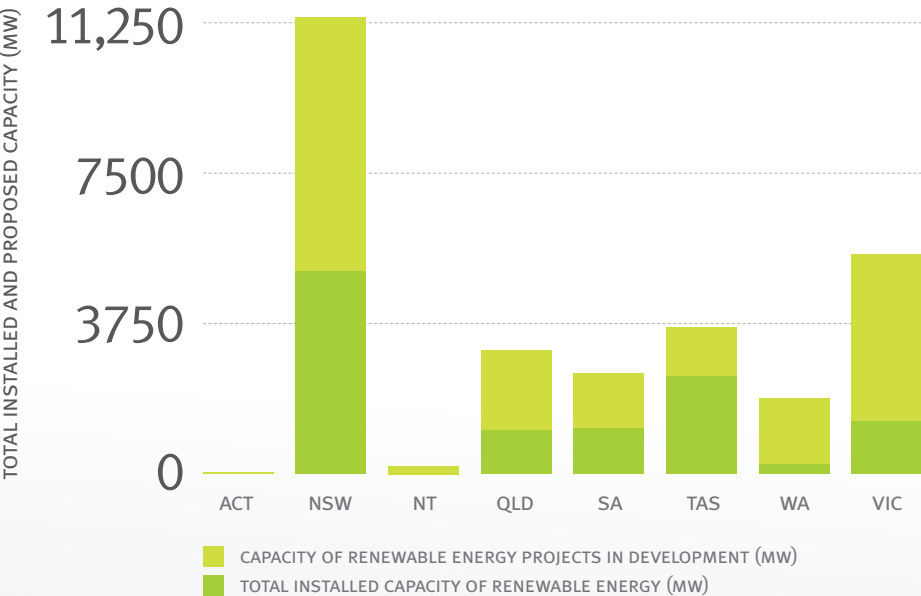
	NSW	TAS	VIC	QLD	SA	WA	ACT	NT	TOTAL
HYDRO	4677	2316	803	669	4.4	30	1.3	0	8501
WIND	234	142	432	12	1151	204	0	0	2175
BIOENERGY	166	5.1	113	429	20	33	4.4	1.1	773
*SOLAR PV	328	8.3	152	256	130	141	19.3	6.1	1041
SOLAR THERMAL	3.2	0	0	0	0	0	0	0	3.2
GEOTHERMAL	0	0	0	0.1	0	0	0	0	0.1
WAVE	0	0	0.2	0	0	0.1	0	0	0.3
TOTAL MW	5408	2471	1500	1366	1305	408	25	7	

*Includes small-scale Solar PV

Clean energy projects installed and in development

Figure 9. 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)



Approximately 16,000 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.

A summary of Australia's nine major **cleanenergytechnologies**





bioenergy

The current installed capacity of the sector in Australia amounts to 773 MW, or 6.2 per cent of Australia's total renewable generating capacity. A little under two thirds of the existing capacity is from the combustion of sugar cane waste, which is known as bagasse. The second largest contributor is landfill gas.

Bioenergy grew only marginally in 2011, as has been the case for several years now. Nine small projects came online during the last two years, as shown in the table to the right. The challenging financial environment, the soft price of renewable energy certificates, and the issues with connecting some types of bioenergy to the grid continued to have a negative impact on the development of new bioenergy plants.

8.5% of total clean energy generation

Table 7. Bioenergy plants commissioned and under construction in 2010 and 2011

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	YEAR	INSTALLED CAPACITY
Sewage gas	Werribee expansion	AGL	VIC	2010	2 MW
Food and agricultural wet waste	Bromelton	Quantum Power	QLD	2010	1.26 MW
Landfill gas	Woodlawn Bioreactor	Veolia Environmental Services	NSW	2010	1.1 MW
Food and agricultural wet waste	Leongatha	Quantum Power	VIC	2010	0.76 MW
Landfill gas	Birkdale	Landfill Management Services	QLD	2010	0.75 MW
Sewage gas	Melton	AGL	VIC	2010	0.2 MW
Landfill gas	Buttonderry	Landfill Management Services	NSW	2010	1.1 MW
Landfill gas	Woodlawn Bioreactor	Veolia Environmental Services	NSW	Under construction 2011	1.1 MW
Bagasse cogeneration	Victoria 2	Sucrogen	QLD	Under construction 2011	19 MW



“The bioenergy industry is growing slowly, but with an abundant biomass resource and the right policy setting there is potential for a far greater use of bioenergy to assist in Australia’s transition to a low-carbon economy.

Sugarcane still provides the bulk of the biomass for energy generation; however, we can expect to see some further expansion across a range of biomass fuels – particularly the capture of landfill gases – as the Federal Government’s clean energy legislation comes into effect. Australia is under-utilising its abundant bioenergy resources and must continue to work at maximising the opportunities for these important low-carbon technologies.”

Tim Sprey

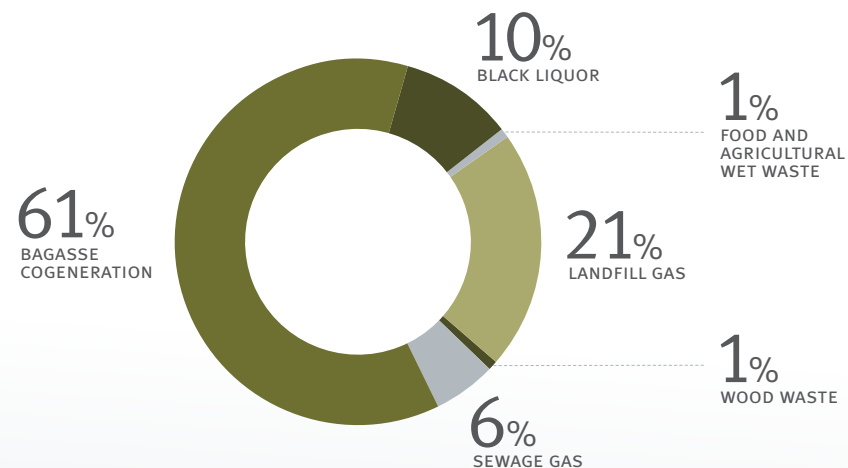
*Manager Corporate and Commercial Affairs, Energy Developments
Chair, Clean Energy Council Bioenergy Directorate*



bioenergy

Figure 10. Installed capacity for bioenergy sub sectors by percentage

Source: Clean Energy Council Renewable Energy Database



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



Image source: Visy Cogeneration Plant, Campbellfield Victoria



Image source: Western Water's Recycled Water Plant, Melton Victoria



Bioenergy plants over 100 kW

	PLANTS OPERATING	UNDER DEVELOPMENT
NSW	36	4
SA	8	0
VIC	25	2
WA	15	3
TAS	4	2
QLD	44	2
NT	1	0
ACT	3	1
TOTAL	136	14

Source: Clean Energy Council Renewable Energy Database



geothermal

Geothermal energy has the potential to play a major role in decarbonising Australia's electricity supply by providing reliable, emission-free power generation. Modelling by ROAM and SKM MMA for the Department of Treasury in 2011 found that geothermal energy could account for between 13 per cent and 23 percent of our total electricity needs in 2050.

Technical and financial challenges have seen the geothermal industry progress slowly in 2011 with just three projects having commenced deep drilling. As of 2011 only one commercial geothermal plant was operating in Australia, at Birdsville in Queensland.

0.002% of total clean energy generation

Table 8. Geothermal plants currently operating

Source: Clean Energy Council Renewable Energy Database

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

Table 9. Geothermal companies that have commenced deep drilling

Source: Clean Energy Council Renewable Energy Database

OWNER	LOCATION OF PLANT	STATE	PROPOSED CAPACITY	STATUS
Geodynamics	Innamincka (Cooper Basin)	SA	1 MW pilot plant by 2012 25 MW by 2013	Proof of concept completed. Has drilled five wells. Awarded A\$90 million from the Federal Government's Renewable Energy Demonstration Program.
Panax	Penola	SA	59 MW	Has drilled one well. Awarded A\$7 million from the Federal Government's Geothermal Drilling Program.
Petratherm	Paralana	SA	3.75 MW plant by 2012 Upscale to 30 MW	Has drilled two wells. Awarded A\$62.8 million from the Federal Government's Renewable Energy Demonstration Program and A\$7 million from Geothermal Drilling Program.



“Geothermal companies continue to explore and develop geothermal resources around Australia.”

Over the past year, the industry has seen the successful testing of projects, new collaborations and renewed government support. Australia’s geothermal resources have the potential to provide a baseload form of renewable energy. However, technical and financial hurdles continue to challenge developers. From here, it’s a matter of improving access to capital, both private and public, as well as exploring options for transmission connection.”

Terry Kallis

Managing Director, Petratherm

Participant on the Clean Energy Council Geothermal Working Group



geothermal

Image source: Geodynamics



One geothermal plant is currently operating and another three projects are under development in Australia.



Image source: Petratherm



Geothermal plants over 100 kW

	PLANTS OPERATING	UNDER DEVELOPMENT
NSW	0	0
SA	0	3
VIC	0	0
WA	0	0
TAS	0	0
QLD	1	0
NT	0	0
ACT	0	0
TOTAL	1	3

Source: Clean Energy Council Renewable Energy Database

 Operating  Under Development



hydroelectricity

Australia's 124 operating hydro power stations produced enough electricity in the past year to power the equivalent of almost 2.8 million average homes. The estimated 19,685 GWh of power was 6.5 per cent of all electricity produced in Australia during this period.

Increased rain in key catchment areas reinvigorated the nation's hydro electricity generation sector and provided approximately two thirds of the renewable energy produced over the 12 months to 30 September 2011.

Most of Australia's suitable hydro electricity resources have already been developed. Work undertaken by hydro operators is generally in developing mini hydro power plants or in upgrading and refurbishing existing hydro power stations. The iconic Snowy River Hydro-electric Scheme and Tasmania's network of 27 hydro-electric projects provide the majority of the country's hydro power.

67% of total clean energy generation

Table 10. Hydro power plants commissioned in 2010 and 2011

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	YEAR	INSTALLED CAPACITY
Hydro	Tumut 3 Runner upgrade	Snowy Hydro	NSW	2011	Additional 100 MW
Hydro	Jounama	Snowy Hydro	NSW	2010	14 MW
Hydro	Poatina upgrade	Hydro Tasmania	TAS	2010	Additional 9 MW
Hydro	Sugarloaf	Melbourne Water	VIC	2010	4.7 MW
Hydro	Prospect Reservoir	Sydney Water	NSW	2010	3.5 MW
Hydro	Lake Margaret Lower	Hydro Tasmania	TAS	2010	3.2 MW
Hydro	North Head	Sydney Water	NSW	2010	1.2 MW
Hydro	Lostock	Delta Electricity	NSW	2011	0.22 MW
Hydro	Woronora	Sydney Water	NSW	2010	0.16 MW



“Compared with drought periods of the not too distant past, 2011 has seen good inflows for most of Australia’s hydropower assets.

Supported by long-term policy certainty in relation to clean energy, maintaining and improving renewable hydropower output is essential to sustaining Australia’s significant hydro base. Along with substantial modernisation programs, the Australian hydro industry is also playing a critical role in supporting the International Hydro Power Association’s sustainability guidelines and assessment protocols, which are making considerable progress to ensure best practice project development and deployment of renewable hydropower globally.”

Alex Beckitt

Manager, Strategic Policy, Hydro Tasmania

Chair, Clean Energy Council Hydro and International Directorates



hydroelectricity

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

Hydropower produces enough electricity for 2.8 million average Australian homes.



< Image source: AGL Energy

Image source: Hydro Tasmania



Hydro electricity plants over 100 kW

	PLANTS OPERATING	UNDER DEVELOPMENT
NSW	40	3
SA	2	0
VIC	32	0
WA	2	0
TAS	35	3
QLD	11	0
NT	0	0
ACT	2	1
TOTAL	124	7

Source: Clean Energy Council Renewable Energy Database



solarpv

The number of Australian households with solar panels has increased more than 35 times over the last three years.

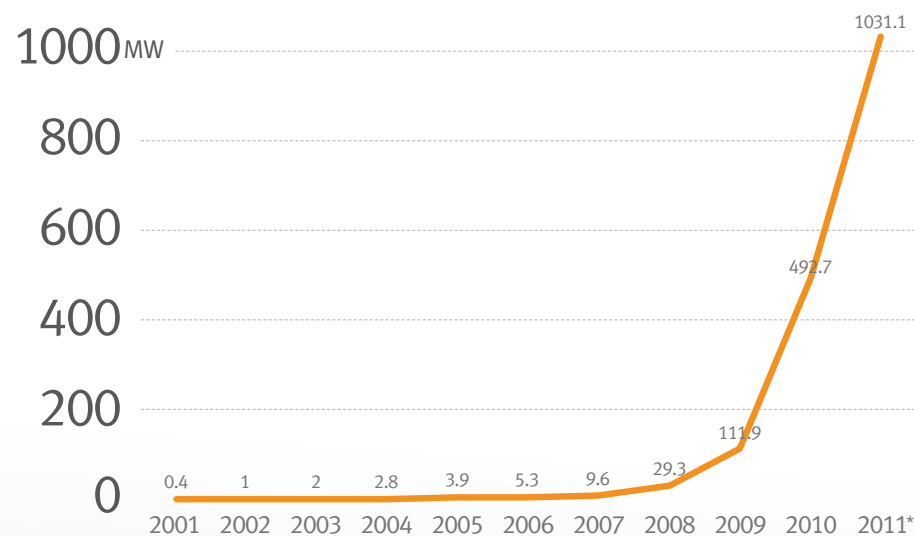
There were 513,585 solar PV systems installed at the end of August 2011. Approximately 430,000 of these were installed during the last two years. More than 6 per cent of Australian houses have now installed solar power and the number of accredited solar installers across the country has increased by six times in the last three years to more than 4000.

Data from the Office of the Renewable Energy Regulator released by the Clean Energy Council in February 2011 showed that Australians from all walks of life were embracing this technology, including those from so called mortgage belt and retirement suburbs across the country.

The cost of solar power continues to fall and many analysts expect it to meet the retail cost of mainstream electricity around the middle of the decade.

2.3% of total clean energy generation

Figure 11. Cumulative installed capacity of solar PV in Australia Source: SunWiz 2011



ACT	0.007	0.010	0.015	0.021	0.026	0.053	0.249	0.724	1.942	6.923	19.428
NSW	0.062	0.236	0.378	0.495	0.671	0.907	2.007	6.104	24.459	173.647	326.556
NT	0.004	0.006	0.006	0.006	0.007	0.009	0.012	0.410	0.919	2.362	2.963
QLD	0.061	0.110	0.178	0.280	0.387	0.488	1.057	5.096	29.109	119.173	254.546
SA	0.126	0.330	0.876	1.269	1.865	2.542	3.705	8.517	20.651	53.008	128.698
TAS	0.002	0.011	0.017	0.022	0.032	0.034	0.072	0.298	1.984	4.841	8.278
VIC	0.113	0.255	0.439	0.616	0.827	1.133	2.099	4.888	15.898	74.667	151.268
WA	0.034	0.055	0.081	0.095	0.116	0.143	0.410	3.282	16.916	58.103	139.313
TOTAL (MW)	0.409	1.013	1.989	2.804	3.931	5.307	9.609	29.319	111.877	492.723	1031.051

*2011 data based on first eight months of year only



“The solar power sector is now part of the mainstream business community. Opportunities exist, the business case is valid, the fundamentals are sound.”

The next chapter hopefully includes more policy certainty, less carbon pollution and no smoke and mirrors. Transparency and cooperation within the solar PV sector and the industry more broadly – including other clean energy technologies, network operators, retailers and regulators – will reaffirm ours as a viable industry that offers employment, security and sustainability.”

Diane Howard

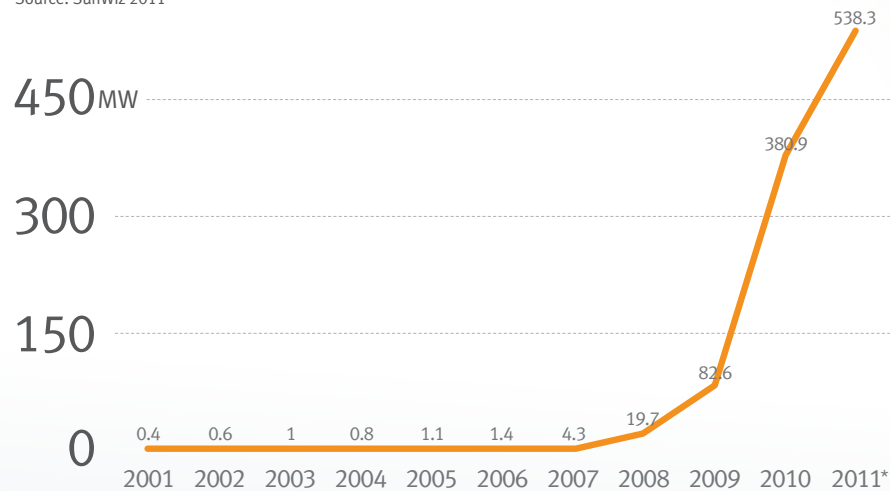
*Business Development Manager, Solar Power Specialists
Chair, Clean Energy Council Solar Photovoltaic Directorate*



solarpv

Figure 12. Annual capacity of solar PV installed in Australia (2001–2011)

Source: SunWiz 2011



ACT	0.01	0	0	0.01	0	0.03	0.2	0.48	1.22	4.98	12.51
NSW	0.06	0.17	0.14	0.12	0.18	0.24	1.1	4.1	18.36	149.19	152.91
NT	0	0	0	0	0	0	0	0.4	0.51	1.44	0.6
QLD	0.06	0.05	0.07	0.1	0.11	0.1	0.57	4.04	24.01	90.06	135.37
SA	0.13	0.2	0.55	0.39	0.6	0.68	1.16	4.81	12.13	32.36	75.69
TAS	0	0.01	0.01	0.01	0.01	0	0.04	0.23	1.69	2.86	3.44
VIC	0.11	0.14	0.18	0.18	0.21	0.31	0.97	2.79	11.01	58.77	76.6
WA	0.03	0.02	0.03	0.01	0.02	0.03	0.27	2.87	13.63	41.19	81.21
TOTAL (MW)	0.41	0.6	0.98	0.81	1.13	1.38	4.3	19.71	82.56	380.85	538.33

*2011 data based on first eight months of year only



Table 12. Percentage of solar PV capacity by state

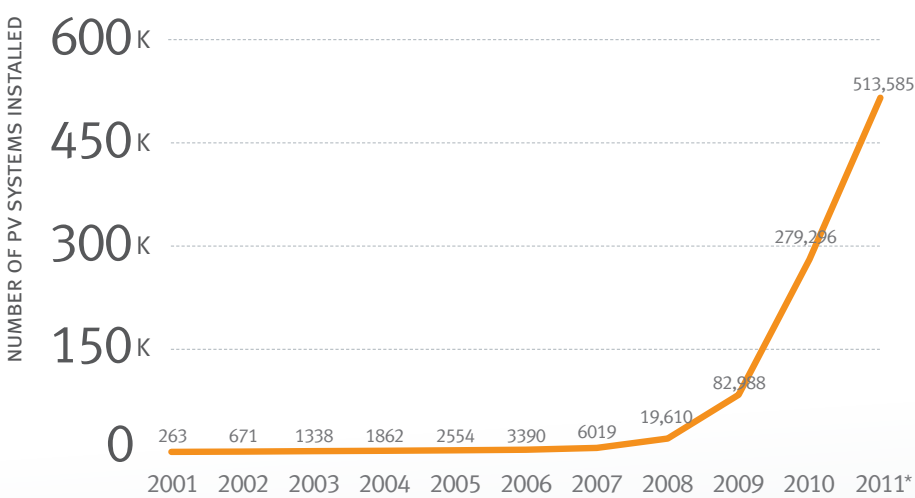
Source: SunWiz 2011

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

ACT	NSW	NT	QLD	SA	TAS	VIC	WA
2%	32%	0.3%	25%	12%	1%	15%	14%

Figure 13. Cumulative number of solar PV system installations in Australia

Source: SunWiz 2011



The number of Australian households with solar panels has increased more than 35 times over the last three years.

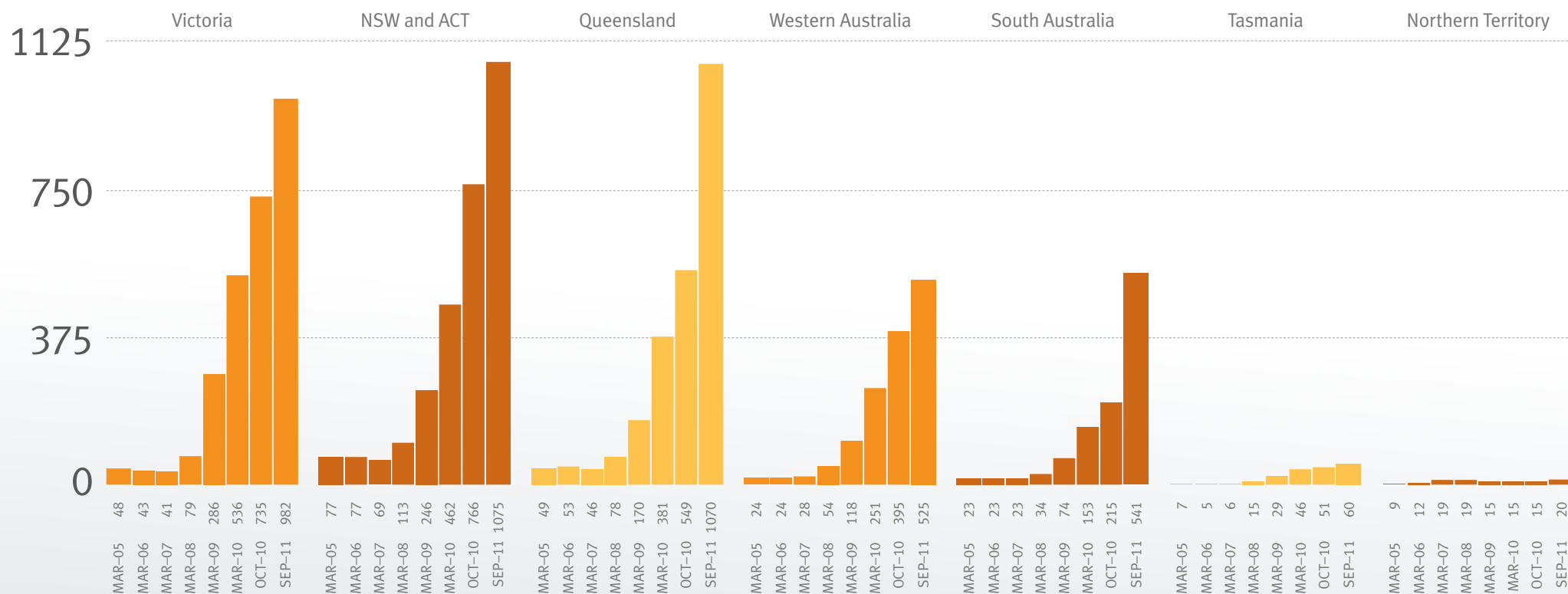
Table 13. Annual number of solar PV system installations in Australia

Source: SunWiz 2011

YEAR INSTALLED	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	NATIONAL TOTAL
2001	5	40	2	35	84	1	73	23	263
2002	2	136	1	29	122	6	100	12	408
2003	3	111	0	44	357	4	134	14	667
2004	3	74	0	58	245	4	130	10	524
2005	3	105	1	65	355	8	139	16	692
2006	13	145	1	57	403	1	198	18	836
2007	102	670	2	348	719	26	606	156	2629
2008	277	2822	82	2867	3437	149	1945	2012	13591
2009	803	14026	225	18377	8592	1454	8735	11166	63378
2010	2305	69073	612	48301	16552	1866	35376	22223	196308
*2011	4988	64630	184	61363	32829	1548	34235	34512	234289
GRAND TOTAL	8504	151832	1110	131544	63695	5067	81671	70162	513585

*2011 data based on first eight months of year only

Figure 14. Number of accredited solar panel installers and designers in Australia – by state Source: Clean Energy Council Accredited Installer Database, 2011



Australians from all walks of life are embracing solar PV, including those from so called mortgage belt and retirement suburbs across the country.





largescalesolar

Australia has the highest average solar radiation per square metre of any continent in the world. The International Energy Agency (IEA) forecasts that concentrated solar power could provide Australia with 40 per cent of its energy by 2050.

Source: Technology Roadmap: Concentrating Solar Power, IEA 2010

Large-scale solar projects of up to 500 MW are being constructed in places like Spain, Germany and the United States. This year Torresol Energy's 19 MW Gemasolar plant in Spain's Andalusia region was the first to produce 24-hour baseload power due to improved storage technology.

Australia's large-scale solar industry is still in its infancy, despite having access to some of the world's best solar resources. The Federal Government announced the successful applicants to the first round of its \$1.5 billion Solar Flagships program in June 2011. The program will deliver the first truly large-scale projects in Australia, building valuable local expertise that will help in the development of future projects.



Image source: The University of Queensland

Table 14. Examples of existing commercial solar plants

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	YEAR	INSTALLED CAPACITY
Solar thermal concentrator	Liddell	Areva/Macquarie Generation	NSW	2009	3 MW
Solar PV	St Lucia Campus	University of QLD/ Ingenero	QLD	2011	1.2 MW
Solar PV	Adelaide Showgrounds	First Solar	SA	2009	1 MW
Solar PV	Uterne	Alice Springs Consortium	NT	2011	0.97 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	Gold Coast	Carrara Stadium	QLD	2011	0.25 MW
Solar PV	Alice Springs	Alice Springs Airport	NT	2010	0.24 MW
Solar PV	Carnarvon	EMC Solar	WA	2011 under construction	0.3 MW



“The past year has seen solid progress in the evolution of solar thermal as a credible and viable source of large-scale renewable power generation.

The capability of solar thermal to deliver firm, dispatchable power is an essential attribute if we are to transform our electricity supply. Facilitated by a range of public policies, particularly in the United States and Spain, we have witnessed a number of new technology solar power projects advanced in 2010–11.

In Australia, new policy measures linked to the recent clean energy legislation set the stage for our country to participate in the deployment and improvement of solar thermal generation. For the coming year, it will be critical that at least one project of large scale be financed for deployment by 2015. This will enable large-scale solar power to finally be considered as an integral component of the Australian generation portfolio for 2020 and beyond.”

Andrew Dyer

Director, BrightSource Energy Australia

Participant on the Clean Energy Council Solar Thermal Directorate



largescalesolar

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

Table 15. Projects successful under Solar Flagships Program

Source: Clean Energy Council Renewable Energy Database

OWNER	TECHNOLOGY	NAME/LOCATION	EXPECTED COMMISSION YEAR	PROPOSED CAPACITY
Areva, Wind Prospect CWP & CS Energy	Solar thermal compact linear fresnel	Solar Dawn Project, Chincilla, QLD	2015	250 MW
BP Solar, Pacific Hydro & Fotowatio Renewable Ventures	Single axis tracking solar PV	Moree Solar Farm, Moree, NSW	2015	150 MW

The nation's largest solar photovoltaic plant is a 1.2 MW facility at the University of Queensland's St Lucia campus.



Image source: Horizon Power



Image source: Alice Springs Airport, Ingenero



Large-scale solar plants over 100 kW

	PLANTS OPERATING	UNDER DEVELOPMENT
NSW	6	9
SA	4	0
VIC	5	0
WA	2	2
TAS	0	0
QLD	3	2
NT	7	0
ACT	0	0
TOTAL	27	13

Source: Clean Energy Council Renewable Energy Database



Solar PV



Solar thermal



solarhotwater

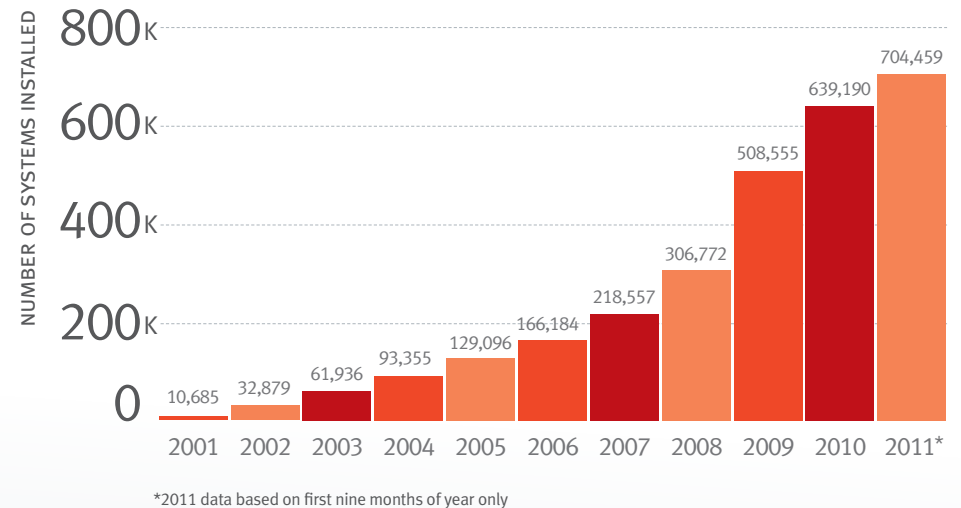
The greenhouse gas emissions associated with the electricity required to produce hot water is the single largest source of household emissions, accounting for almost a quarter of household emissions.

Source: Clean Energy Council Solar Hot Water and Heat Pump Study, Mito Energy, 2011

The phrase 'solar water heating' refers to either a stand-alone solar hot water system or a heat pump, which heats water using energy from the ambient air. The installation of a solar water heating system can save the average household hundreds of dollars on their electricity bill each year compared to an electric hot water system. It will also save 2.4 to 3 tonnes of annual carbon emissions.

The energy saved from solar water heating is equivalent to 7.2% of the clean energy generated in Australia.

Figure 15. Cumulative solar water heater installations in Australia Source: SunWiz 2011



Federal Government rebates introduced early in 2009 led to a spike in sales in that year. The rebate was reduced in February 2010, leading to a drop in the annual installation figures for the last two years.

Many consumers have installed solar power rather than solar hot water due to generous government incentives and aggressive marketing campaigns, despite the excellent value for money offered by solar water heating systems.



“It has been a challenging year for the solar water heater market, with cuts to federal and state rebates, falling Small-scale Technology Certificate (STC) prices and consumer confusion arising from cuts to solar PV feed-in tariffs all impacting on the uptake of solar water heating.

These issues, coupled with uncertain political and economic times, have combined to see the market drop by around 20 per cent year on year. The coming year offers the industry an opportunity to reacquaint consumers with the benefits of solar hot water, particularly as an effective way of tackling their rising energy bills.”

Gareth Jennings

Manager, Corporate Affairs, Rheem

Chair, Clean Energy Council Solar Hot Water/Heat Pump Directorate



solarhotwater

Federal Government rebates introduced early in 2009 led to a spike in sales in that year.

The rebate was reduced in February 2010, leading to a drop in the annual installation figures for the last two years.

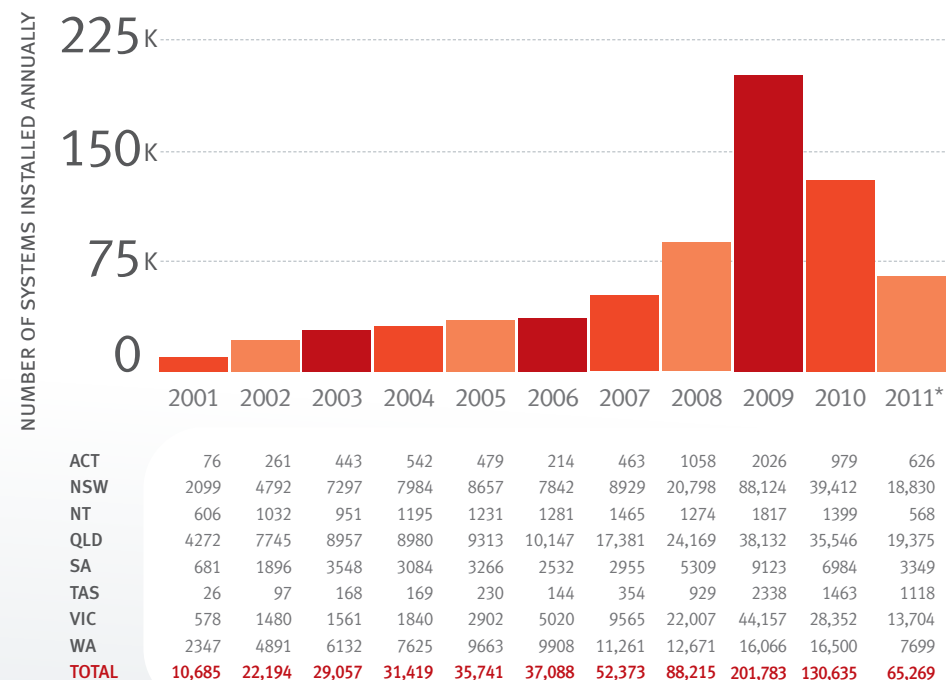
Many consumers have installed solar power rather than solar hot water due to generous government incentives and aggressive marketing campaigns, despite the excellent value for money offered by solar water heating systems.



Image source: Rheem Australia

Figure 16. Annual installations of solar water heaters by state

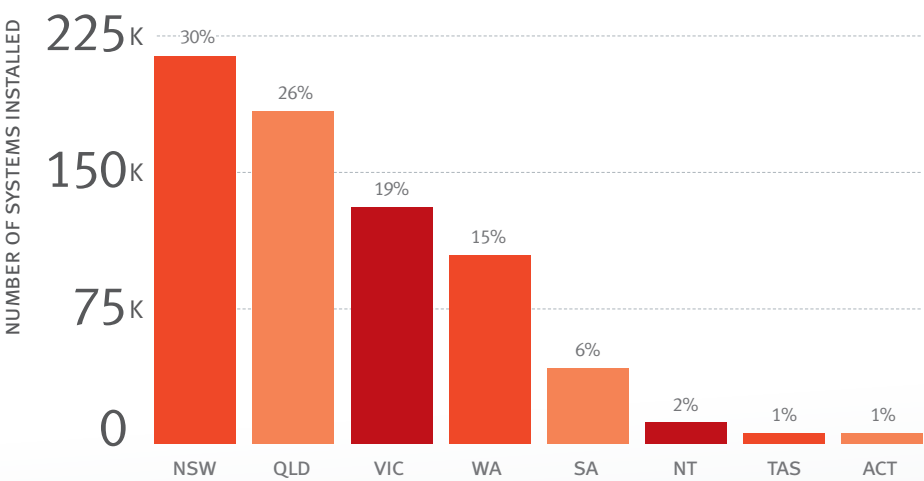
Source: SunWiz 2011



*2011 data based on first nine months of year only

Figure 17. Current total number of solar water heating systems installed by state

Source: SunWiz 2011



Solar water heating systems can save the average household hundreds of dollars on their electricity bill each year.



Image source: Solahart



Around 80 per cent of Australia’s population lives within 50 km of the coast, placing wave and tidal energy resources close to the area of highest electricity demand.

Australia’s long coastline and proximity to both the tropics and the Southern Ocean mean that there is an enormous energy resource available if we can develop cost-effective technology to harness it.

In 2011 more than 15 companies have been actively investigating wave and tidal energy projects in Australia. Wave resources are mostly being explored along the southern and western coastlines, while the northern coastline is the focus for those exploring tidal resources.

0.003% of total clean energy generation

In 2010 the CSIRO found that the levelised cost of electricity produced from potential wave energy systems could be reduced to around A\$100 per MWh, by achieving efficiencies and improvements in operations and maintenance.

Source: J Hayward and P Osman, CSIRO, The potential of wave energy, 2010, page 3

Table 16. Wave and tidal power facilities currently operating

Source: Clean Energy Council Renewable Energy Database

OWNER	TECHNOLOGY TYPE	LOCATION	STATE	INSTALLED CAPACITY
Atlantis Resources	Tidal	San Remo	VIC	0.15 MW
Carnegie Wave Energy	Wave	Fremantle	WA	0.1 MW

The largest grid-connected wave power plant in Australia was operated by Oceanlinx in Port Kembla. This 0.5 MW demonstration-scale wave power facility operated between February and March 2010.



“Throughout 2011, marine energy companies around Australia have been working on testing their technology.

While the past year saw a number of key developments in the industry, including successful commercial-scale testing as well as the development of award-winning technology, the resource remains under-utilised. Accessing government support for early-stage development remains a priority, while addressing regulatory barriers will be another focus for the year ahead. With some of the best marine energy resources in the world, Australia needs to begin to exploit its natural advantage.”

Greg Allen

Chief Operating Officer, Carnegie Wave Energy

Participant on the Clean Energy Council Marine Energy Working Group



Image source: Oceanlinx

Table 17. Wave and tidal power companies investigating marine energy

Source: Clean Energy Council Renewable Energy Database

OWNER	TYPE	LOCATION	STATE	STATUS OF PLANT
Advanced Wave Power	Wave	Moreton Bay	QLD	Has deployed and tested one array
AquaGen Technologies	Wave	Lorne	VIC	1.5 kW unit installed at Lorne Pier
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	TAS	250 kW pilot project planned
		Port Fairy	VIC	
		Flinders Island	TAS	
Carnegie Wave Energy	Wave	Limestone Coast	SA	Has been trialling its CETO units. Construction expected to commence on 5 MW demonstration project at Garden Island in 2012. Awarded \$12.5m grant from WA Government
		Portland	VIC	
		Warrnambool	VIC	
		Phillip Island	VIC	
		Garden Island	WA	
		Eden	NSW	
Oceanlinx	Wave	Portland	VIC	Developing 1 MW and 2.5 MW prototypes
Protean Energy	Wave	Geraldton	WA	Has plans to install test unit in 2012
Tenax Energy	Tidal	Clarence Strait	NT	Three large-scale projects (24–300 MW) project proposals. Secured tenure for NT project. Currently applying for government approvals for projects
		Port Phillip Heads	VIC	
		Banks Strait	TAS	
Tidal Energy Australia	Tidal	Derby	WA	Has plans to develop a 100 MW project
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 2012



Image source: Carnegie Wave Energy



Marine energy plants over 100 kW

	PLANTS OPERATING	UNDER DEVELOPMENT
NSW	0	0
SA	0	0
VIC	1	3
WA	1	2
TAS	0	3
QLD	0	0
NT	0	1
ACT	0	0
TOTAL	2	9

 Operating

 Under development



windenergy

In the past year wind power generated over 6400 GWh of electricity, which was enough to power over 900,000 homes.

Australia currently has 1188 wind turbines and 57 operating wind farms, including one small wind farm located in the Australian Antarctic Territory. The amount of wind power in Australia has grown by an average of 35 per cent per year over the past five years, and the efficiency and power output of turbines are evolving quickly.

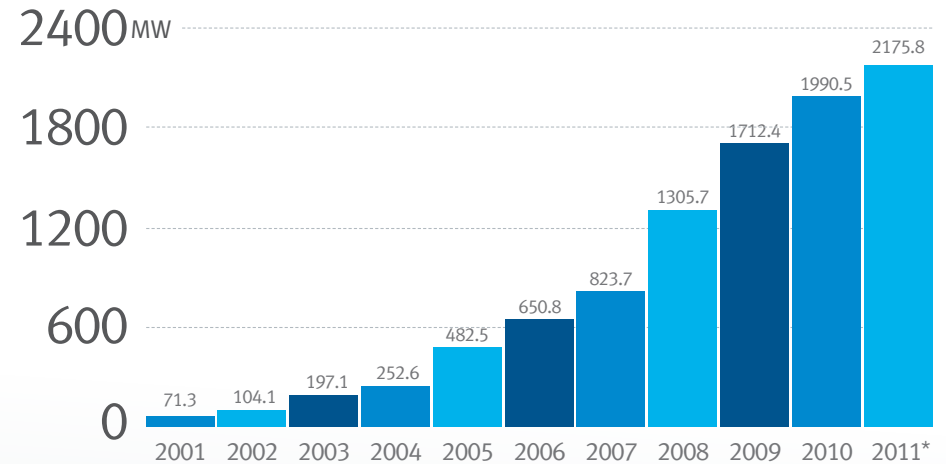
A report prepared by Garrad Hassan for the Clean Energy Council in 2011 predicted that there would be approximately 6.9 GW of wind power built under the Renewable Energy Target by 2020. This would be delivered from approximately 2000–2500 wind turbines, depending on their size and power output.

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.

22% of total clean energy generation

Figure 18. Cumulative installed wind capacity in Australia

Source: Clean Energy Council Renewable Energy Database



*2011 data based on first nine months of year only



“It has been a mixed year for wind energy but an important one for the industry.”

In South Australia, which is home to more than half of the country’s wind capacity, we have seen the role wind energy has played in keeping wholesale prices low and reducing the state’s greenhouse gas emissions. It is a success story that we need to share more widely. The wind industry has come together this year like never before, and is working to ensure communities are engaged and informed about the benefits wind projects can bring, particularly to regional Australia.”

Ken McAlpine

*Director, Policy and Government Relations, Asia Pacific, Vestas
Chair, Clean Energy Council Wind Directorate*



windenergy

Table 18. Wind farms commissioned in last 12 months (since 1 October 2010)

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	YEAR	INSTALLED CAPACITY
Wind	Hallett 4 (Nth Brown Hill)	AGL	SA	2011	132.3 MW
Wind	Gunning	Acciona Energy	NSW	2011	46.5 MW
Wind	Hepburn (Leonards Hill)	Hepburn Wind	VIC	2011	4.1 MW
Wind	Mt Barker	Mt Barker Power Company	WA	2011	2.4 MW
Wind	Waterloo	TRUenergy	SA	2010	111 MW



Image source: REpower Australia

Table 19. Wind farms under construction

Source: Clean Energy Council Renewable Energy Database

FUEL SOURCE	LOCATION	OWNER	STATE	EXPECTED COMMISSION YEAR	INSTALLED CAPACITY
Wind	Macarthur	AGL/Meridian Energy	VIC	2013	420 MW
Wind	Collgar	UBS ITT/REST	WA	2012	205 MW
Wind	Musselroe	Hydro Tasmania	TAS	2013	168 MW
Wind	Crookwell 2	Union Fenosa	NSW	2014	92 MW
Wind	Oaklands Hill	AGL	VIC	2012	67 MW
Wind	Hallett Stage 5 (Bluff Wind Farm)	AGL	SA	2011	53 MW
Wind	Woodlawn	Infigen Energy	NSW	2011	48 MW

TOTAL CAPACITY UNDER CONSTRUCTION 1053 MW

In the 2010–11 financial year investment in wind power totalled \$1.16 billion.

South Australia has the highest wind farm capacity in the country with over half of Australia's installed wind capacity.

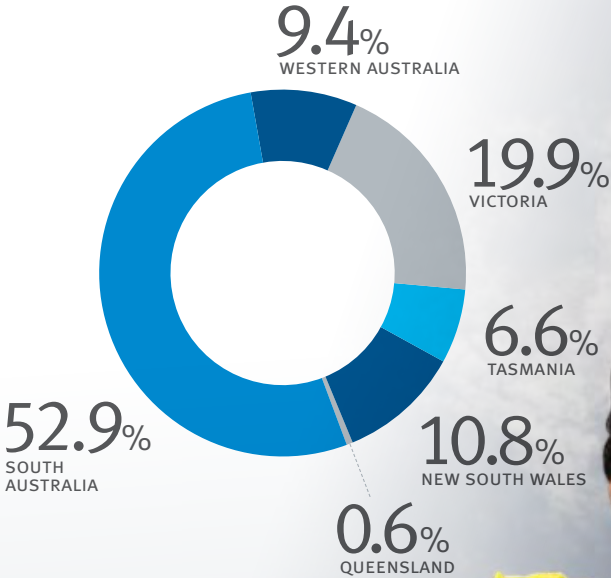
Table 20. Total installed wind capacity by state

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

STATE	INSTALLED CAPACITY	NUMBER OF TURBINES	NUMBER OF PROJECTS	INSTALLED CAPACITY PENETRATION IN STATE (%)
SA	1151	535	15	23.1
VIC	432	269	10	4.4
WA	204	145	15	1.2
NSW	234	147	8	1.2
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	–
TOTAL	2177	1188	57	

Figure 19. Percentage of installed wind capacity by state

Source: Clean Energy Council Renewable Energy Database





windenergy

South Australia has reduced its carbon emissions by 18 per cent over the last five years and most of this can be attributed to wind power, which now produces more than 20 per cent of the state's electricity.

The price of electricity produced from wind energy currently is around A\$90–120 per MWh. Average prices for turbine supply contracts are believed to have fallen by a substantial amount over the past year, possibly in the order of 20 per cent.

Source: Review of the Australian Wind Industry for the Clean Energy Council, Garrad Hassan, 2011

Table 21. Indicative development costs for Australian wind farms

Source: Review of the Australian Wind Industry for the Clean Energy Council, Garrad Hassan, 2011

COST ITEM	A\$ M/mw	CONTRIBUTION TO CAPITAL COSTS
Turbine works	1.1–2	60–75%
Civil & electrical work up to the point of connection	0.35–0.6	10–25%
Grid connection	0.05–.35	5–15%
Development & consultancy work, wind speed monitoring	0.15–42	5–15%
TOTAL	1.7–3.4	100%



Image source: REpower Australia





Wind energy plants over 100 kW

	PLANTS OPERATING	UNDER CONSTRUCTION
NSW	8	2
SA	15	1
VIC	10	2
WA	15	1
TAS	6	1
QLD	2	0
NT	0	0
ACT	0	0
TOTAL	56	7



energyefficiency

Australia's emissions per capita are nearly twice those of many other OECD (Organisation for Economic Co-operation and Development) countries. Of the OECD countries, Australia has the third highest per capita carbon dioxide emissions. Australia emitted 18.75 tonnes of carbon dioxide for every Australian, compared with an OECD country average of 10.97 tonnes per person. Source: IEA, 2009

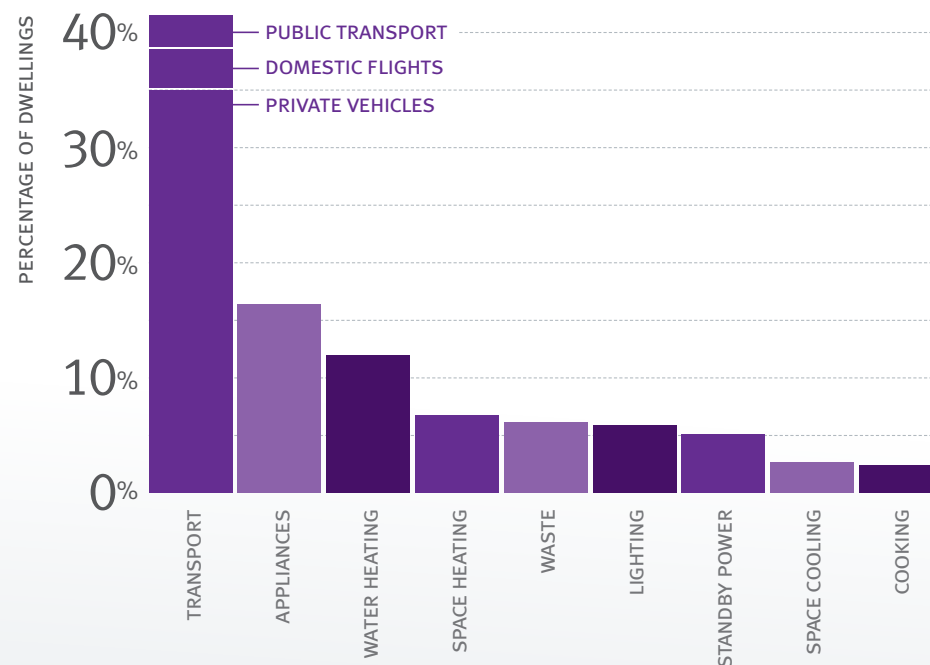
Households are ultimately responsible for around 21 per cent of Australia's annual carbon pollution – more than the pollution from either agriculture or deforestation.

Improving energy efficiency is a 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.

Water heating is the single largest source of greenhouse gas emissions from Australian homes, with heating and cooling together representing the greatest proportion of household energy use.

Figure 20. Sources of household emissions in Australia

Source: Department of Climate Change and Energy Efficiency (DCCEE) calculation based on 2007 household emissions





“The important role energy efficiency will play in curbing demand, delaying network investment and reducing energy bills is now well understood.

This year, we are a step closer towards the development of a National Energy Savings Initiative that could provide an opportunity to streamline and consolidate government incentives and regulations. We’ve also seen progress in the way energy is used in commercial buildings, with the disclosure of the energy performance now mandatory. This could soon be on the horizon for the residential sector, to ensure both homeowners, landlords and tenants know the energy performance of the house they intend to buy or lease.

Research conducted by Auspoll for the Clean Energy Council will help us to better understand the drivers for consumers to undertake energy efficiency measures in their own homes.”

Martin Jones

*General Manager, Government Relations, CSR
Chair, Clean Energy Council Energy Efficiency Directorate*



energyefficiency

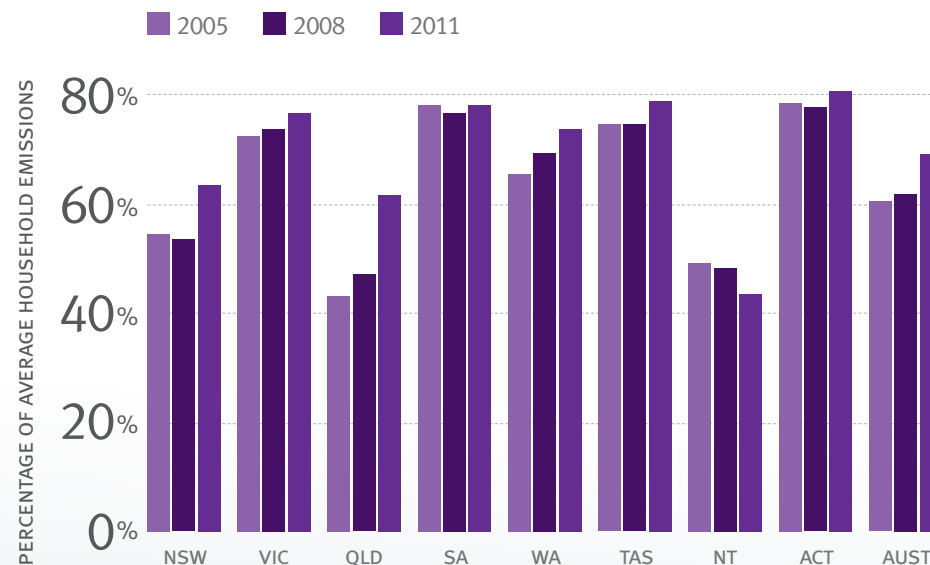
Whitegoods such as refrigerators and freezers are major contributors to household energy use, consuming 34 per cent of all energy used by household appliances.

The Australian Bureau of statistics (ABS) found that energy star ratings were considered by around half of all households when purchasing or replacing refrigerators (51%), separate freezers (42%), dishwashers (52%), washing machines (49%) and clothes dryers (53%).

According to the ABS in 2011, 69 per cent of Australian households have some form of insulation. The proportion of Australian households with insulation increased from 61 per cent in 2008 to 69 per cent in 2011. The states showing the largest increase were Queensland and New South Wales (15 and 10 percentage points respectively). An estimated 70 per cent of Australian households indicated that their main reason for installing insulation was to 'achieve comfort' although more than one in ten (11%) did so because of the rebate offered.

Figure 21. Dwellings with insulation by state and territory in 2005, 2008 and 2011

Source: ABS Environmental Issues: Energy Use and Conservation, March 2011



Surveys show that Australians are keen to take action to limit their electricity use.

Community attitudes to energy efficiency

Auspoll conducted a nationwide survey of 1000 participants for the Clean Energy Council in June 2011. The aim was to specifically consider what the key factors were affecting community appetite for energy efficiency. The survey found that rising electricity prices were the primary reason influencing consumers to change their electricity consumption.

The key findings from the Auspoll research were:

- 95% of people were concerned or very concerned about rising energy costs.
- 89% were willing to take action to use less energy.
- 73% wanted more information on how they could save energy.
- 57% knew little or nothing about government programs available.
- 50% knew little or nothing about key aspects of their energy use.
- 74% support energy retailers being responsible for ensuring households use their energy more efficiently.
- 88% said if a carbon tax is introduced, the community should be supported and able to save on their bills.

Figure 22. Are people willing to take action to use less energy in their households? Source: Auspoll survey findings



■ YES ■ NO

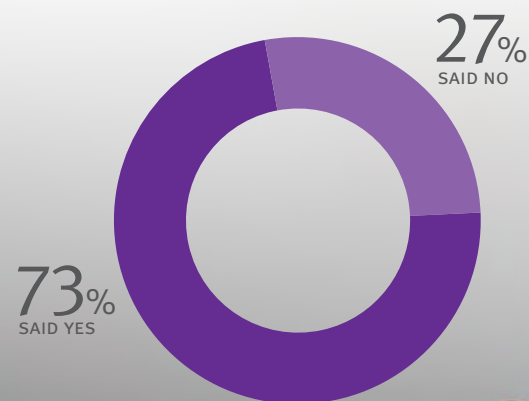




energyefficiency

Figure 23. People wanting more information on how they can save energy in their households

Source: Auspoll survey findings



73% of people wanted more information on how to save energy in their households.

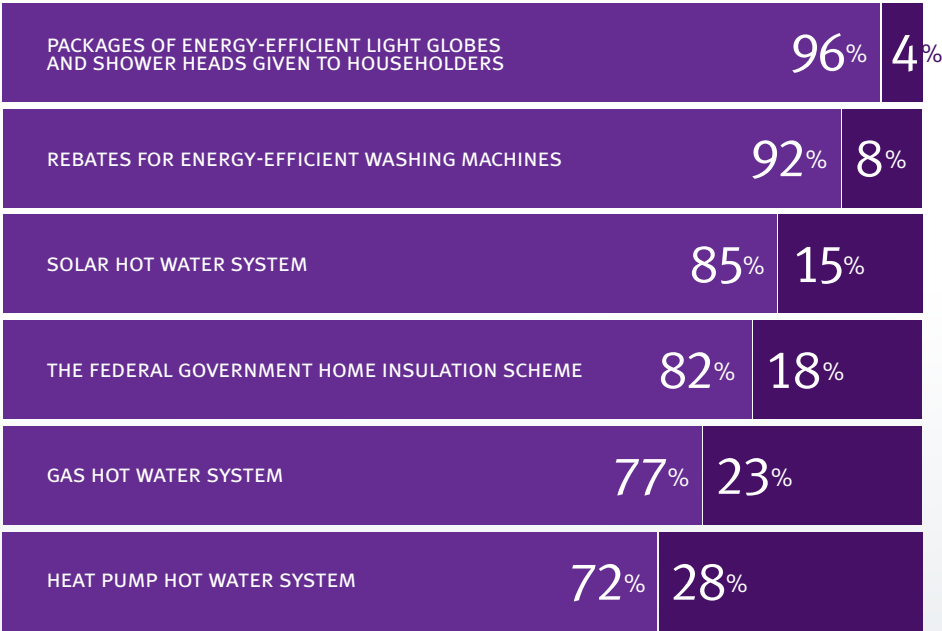


Image source: Lynton Crabb – crabb.com.au

An overwhelming majority of people were glad they participated in each of the government’s energy efficiency programs

Figure 24. Participant satisfaction in government energy efficiency program

Source: Auspoll survey findings



■ I'M GLAD I PARTICIPATED IN THIS PROGRAM
■ I WISH I HADN'T PARTICIPATED IN THIS PROGRAM



Image source: Lynton Crabb – crabb.com.au

The commercial and industrial sectors are very large consumers of energy. Energy efficiency investments can help companies in these sectors to increase their competitiveness by reducing costs from energy use.

The ABS found that during 2008–09, 88% of large businesses took measures to reduce their energy consumption and 54% of small businesses participated in energy reduction measures.

appendixes

Appendix 1

Installed capacity figures

Figure 25. Cumulative installed renewable energy capacity in Australia (by commissioning year)

Only includes projects larger than 100 kW. Source: Clean Energy Council Renewable Energy Database

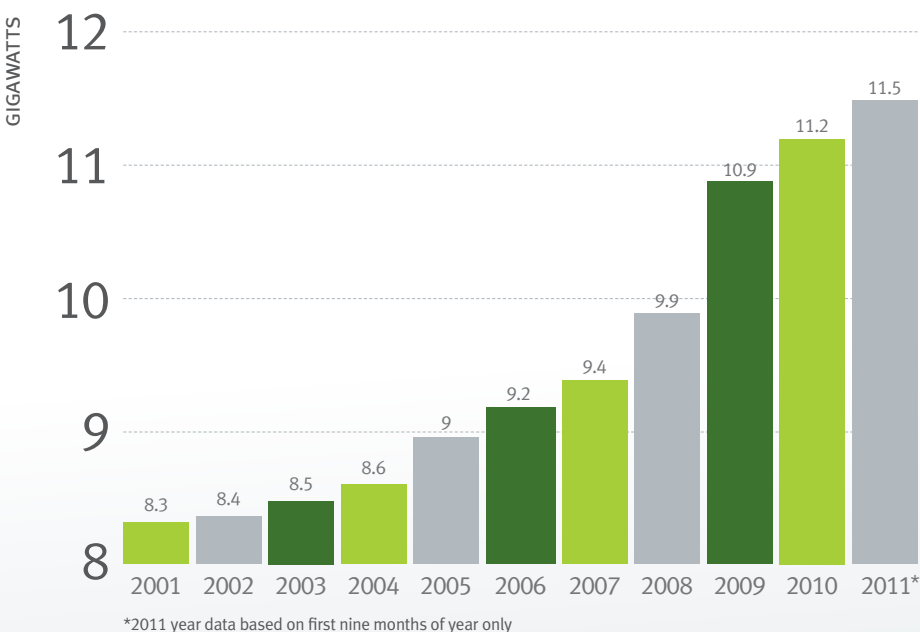


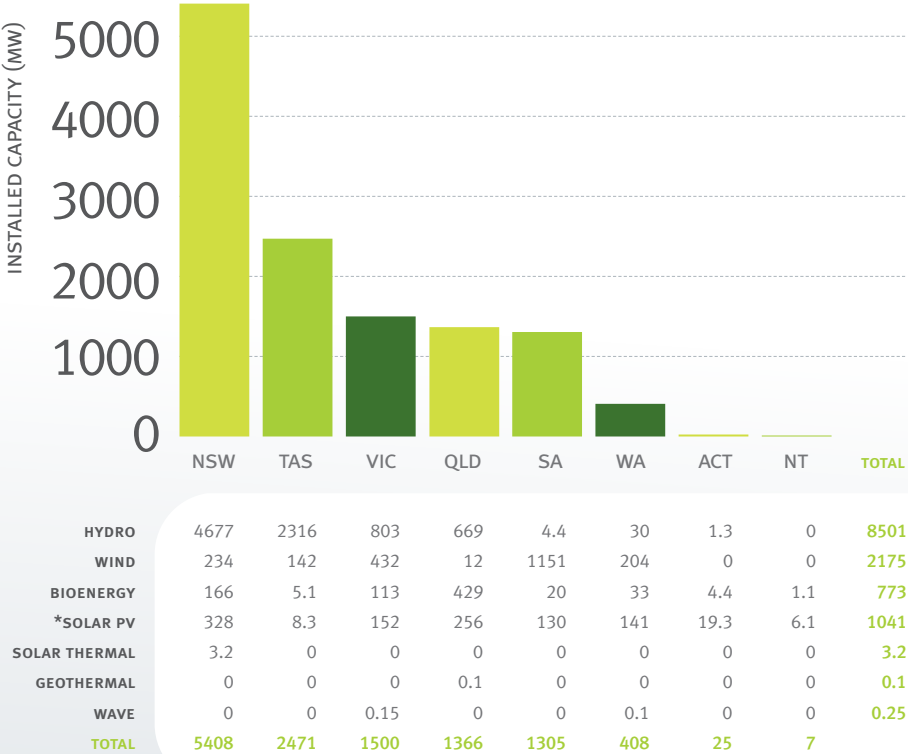
Image source: Geodynamics

Appendix 1

Installed capacity by state and renewable energy technology

Figure 26. Installed capacity of renewable energy projects by state (MW)

Source: Clean Energy Council Renewable Energy Database, SunWiz, 2011.
Due to rounding figures may not add up exactly.



*Includes small-scale solar PV

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.
Due to rounding totals may not add up to 100 per cent

FUEL SOURCE	INSTALLED CAPACITY (MW)	NUMBER OF PROJECTS	PERCENTAGE
Hydro	8501	124	68%
Wind	2175	56	17%
Bagasse cogeneration	474	29	3.8%
Black liquor	77	3	0.6%
Food and agricultural wet waste	8	5	0.06%
Landfill gas	165	72	1.3%
Sewage gas	43	25	0.34%
Wood waste	6	2	0.05%
Bioenergy sub-total	773	136	6.2%
Solar PV & solar thermal	*1044	27	8.36%
Marine	0.3	2	0.002%
Geothermal	0.1	1	0.001%
TOTAL	12493.4	346	100%

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

2030 employment

Figure 27. Estimated numbers of new jobs created in the renewable energy industry by 2030

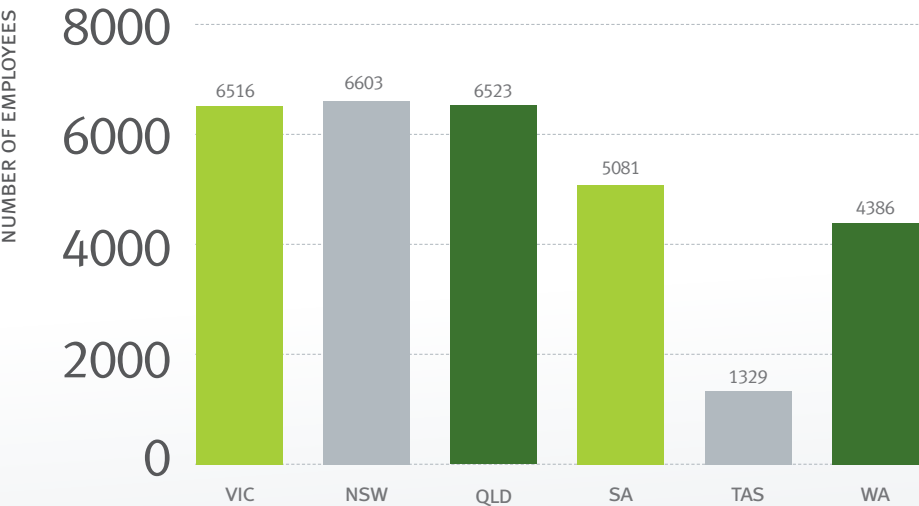
Source: The Climate Institute, Clean Energy Jobs in Regional Australia, February 2011



2030 employment – by state

Figure 28. Estimated numbers of new jobs created in the renewable energy industry by 2030 – by state

Source: The Climate Institute, Clean Energy Jobs in Regional Australia, February 2011



Appendix 2: Government initiatives

Summary and major energy policies

Australian Capital Territory

Installed capacity: 25 MW

Percentage of nationwide renewable installed capacity: 0.2%

Number of projects (>100 kW): 5

Technologies: Bioenergy, hydro, solar PV, solar hot water

Policy support for clean energy:

- Target of zero net greenhouse gas emissions by 2060
- Developing Sustainable Energy Policy 2010–2020 to deliver this
- Energy Audit Program
- Greenhouse Gas Reduction Scheme (GGAS)
- Energy Wise Program

New South Wales

Installed capacity: 5408 MW

Percentage of nationwide renewable installed capacity: 43%

Number of projects (>100 kW): 91

Technologies: Wave, solar thermal, solar PV, bioenergy, wind, hydro, solar hot water

Policy support for clean energy:

- Renewable Energy Action Plan (in development)
- NSW Wind Renewable Energy Precincts
- Greenhouse Gas Reduction Scheme (GGAS)
- State Government's \$700 million Climate Change Fund, established in July 2007. Programs include:
 - \$170 million NSW Home Saver Rebates providing rebates for hot water systems, hot water circulators, rainwater tanks and dual-flush toilets
 - \$30 million Public Facilities program
 - \$20 million School Energy Efficiency program
 - \$20 million Rainwater Tanks in Schools program
 - \$150 million program under the Energy Efficiency Strategy

Northern Territory

Installed capacity: 7 MW

Percentage of nationwide renewable installed capacity: 0.06%

Number of projects (>100 kW): 8

Technologies: Solar PV, bioenergy, solar hot water

Policy support for clean energy: Energy Smart Rebate Program

Queensland

Installed capacity: 1366 MW

Percentage of nationwide renewable installed capacity: 11%

Number of projects (>100kW): 60

Technologies: Geothermal, bioenergy, wind, hydro, solar PV, solar hot water

Policy support for clean energy:

- Renewable Energy Plan established in 2009 to increase deployment of renewable energy initiatives and accelerate growth of this sector
- \$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
- Solar Scheme Bonus
- Solar Hot Water Rebate

South Australia

Installed capacity: 1305 MW

Percentage of nationwide renewable installed capacity: 10%

Number of projects (>100 kW): 29

Technologies: Bioenergy, wind, hydro, solar PV, solar hot water

Policy support for clean energy:

- Renewable energy target (RET) aims for 33% of electricity to be produced by renewable energy by 2020
- Established Renewables SA to advise on policy and promote renewable energy
- \$20 million Renewable Energy Fund
- Payroll tax rebate for construction of renewable energy plant
- Residential Energy Efficiency Scheme – provides incentives to help households reduce energy use
- Feed-in tariff for small-scale solar PV

Tasmania

Installed capacity: 2471 MW

Percentage of nationwide renewable installed capacity: 20%

Number of projects (>100 kW): 46

Technologies: Bioenergy, wind, hydro, solar PV, solar hot water

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

Summary and major energy policies

Victoria

Installed capacity: 1500 MW

Percentage of nationwide renewable installed capacity: 12%

Number of projects (>100 kW): 73

Technologies: Solar PV, bioenergy, wind, hydro, solar hot water

Policy support for clean energy:

- \$72 million Energy Technology Innovation Strategy to support the development of large-scale, pre-commercial demonstrations of sustainable energy technologies
- Energy Saver Incentive – provides incentives to help households reduce energy use
- Victorian Solar in Schools Initiative – \$5 million over four years to support 500 schools and community buildings to install solar panels
- Sustainability Fund – competitive grants program to support projects to tackle climate change and help Victoria reduce its environmental impact
- Sun feed-in tariff for small-scale wind, hydro, biomass, solar PV
- Solar Hot Water Rebate
- Victorian Energy Efficiency Target (VEET)

Western Australia

Installed capacity: 408 MW

Percentage of nationwide renewable installed capacity: 3%

Number of projects (>100 kW): 34

Technologies: Bioenergy, wind, hydro, solar PV, solar hot water

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

Policy support for clean energy:

- \$30 million Low Emissions Energy Development Fund
- WA Solar Schools Program – Rebate Scheme to support WA schools to install solar panels
- Solar Hot Water Rebate

Australia's decision to introduce a price on carbon means new clean energy jobs.

Appendix 2: Government initiatives

New policy initiatives include:

Enhanced Renewable Energy Target

The Renewable Energy Target (RET) is designed to deliver 20 per cent of Australia's electricity supply from renewable sources by 2020. The RET legislation has been in place since it was introduced by the Howard government in 2001. It was expanded in 2009 and enhanced in June 2010 to establish two separate markets – the Large-scale Renewable Energy Target (LRET) and the Small-scale Renewable Energy Scheme (SRES). These new markets began operating on 1 January 2011. Both markets provide an incentive to bridge the gap between the price of green energy and the price of black energy.

Carbon price

A carbon price will be the foundation of a national strategy to limit carbon pollution and address climate change. It is broadly recognised that putting a price on carbon pollution will reduce the level of pollution at the lowest cost. A price on carbon pollution will create a powerful incentive for businesses across the economy to invest in clean technology and find more efficient ways of operating.

The carbon pricing mechanism will start with a fixed price on carbon that will operate like a tax on Australia's 500 biggest polluters, which will then transition to an emissions trading scheme. From 1 July 2012, a fixed carbon price will start at \$23 a tonne, for three years. From 1 July 2015, the carbon price will be set by the market. Households and small businesses will have no direct obligations under the carbon price.

A price on carbon pollution will provide the government with a stream of income that can be used to help Australia move to a low carbon economy. The Federal Government has announced that at least 50 per cent of the revenue it receives will be used to assist households to adjust to the impacts of a carbon price. The rest of the revenue will be spent on supporting jobs and investing in clean energy programs.

Clean Energy Finance Corporation – \$10 billion

The government has announced the formation of the \$10 billion Clean Energy Finance Corporation (CEFC) as part of its carbon price package. The independent, commercially oriented CEFC will use income generated from a carbon price as loans for clean energy initiatives. It is aimed particularly at early stage clean energy technologies such as geothermal, marine energy and large-scale solar power.

The RET is designed to deliver 20% of Australia's electricity supply from renewable sources by 2020.

Australian Renewable Energy Agency – \$3.2 billion

The Australian Renewable Energy Agency (ARENA) will be established under the Department of Resources, Energy and Tourism. This agency will incorporate the existing Australian Centre for Renewable Energy and the Australian Solar Institute. ARENA will provide \$3.2 billion of early stage grants and financing assistance to promote the research and development, demonstration, commercialisation and deployment of renewable energy projects.

ARENA will consolidate a range of new and existing programs and funding including the Connecting Renewables Initiative, Solar Flagships Program, Emerging Renewables Program, Renewable Energy Venture Capital Fund and the Geothermal Drilling Program.

Clean Technology Innovation Program – \$200 million

Innovation will be supported by the \$200 million Clean Technology Innovation Program, which is part of the Clean Technology Program. This will provide grants to support research and development, proof-of-concept and early-stage commercialisation in renewable energy, low-pollution technology and energy efficiency. These grants will be in addition to the broader research and development tax concession and will be provided on a co-contribution basis with applicants.

Remote Indigenous Energy Program – \$40 million

The Remote Indigenous Energy Program will provide additional financial support to install renewable energy generation systems in around 55 remote Indigenous communities over the life of the program.

Low Carbon Communities – \$330 million

The government's Low Carbon Communities program will be expanded to provide funding through competitive grants to local councils and communities to improve energy efficiency in council and community-use buildings and facilities, and to assist low-income households. Funding for the program will be increased from \$80 million to \$330 million.

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.

Carbon Farming Initiative – \$250 million

The Carbon Farming Initiative was passed by Parliament in August 2011 and will commence from December 2011. The initiative is a carbon offsets scheme that allows farmers, forest growers and landholders to create credits for reducing their carbon pollution for which they can generate income.

Energy efficiency

As part of the National Strategy on Energy Efficiency, the Council of Australian Governments (COAG) agreed in July 2009 to phase in mandatory disclosure of residential buildings' energy, greenhouse gas and water performance at the time of sale or lease, commencing with energy efficiency. The options for this initiative are currently under public consultation. Other initiatives include:

Expansion of the Energy Efficiency Opportunities Program – \$3.9 million

The government will expand the existing Energy Efficiency Opportunities program, which encourages large energy users to improve their energy efficiency. Changes to the scheme include:

- extend base funding to 30 June 2017
- expand the program to include energy transmission and distribution networks, major greenfield and expansion projects
- enhance assessment and verification requirements
- establish a voluntary scheme for medium-sized energy users.

Tax breaks for green buildings – \$1 billion

From 1 July 2012, businesses that undertake capital works to improve the energy efficiency of their existing buildings will be able to apply for a one-off bonus tax deduction.



About Clean Energy Council

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 almost 600 member companies operating in the fields of renewable energy and energy efficiency.

The Clean Energy Council'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, marine, solar, solar hot water, bioenergy, geothermal and cogeneration.

visit cleanenergycouncil.org.au

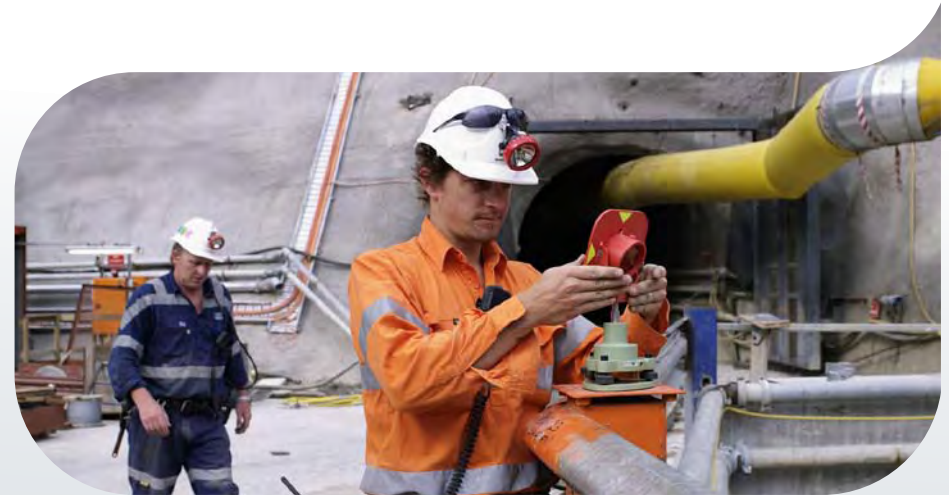


Image source: AGL Energy



In Australia more than \$5.2 billion was invested in renewable energy during the 2010–11 financial year.

Image source: Horizon Power

Prepared by the Clean Energy Council, November 2011

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