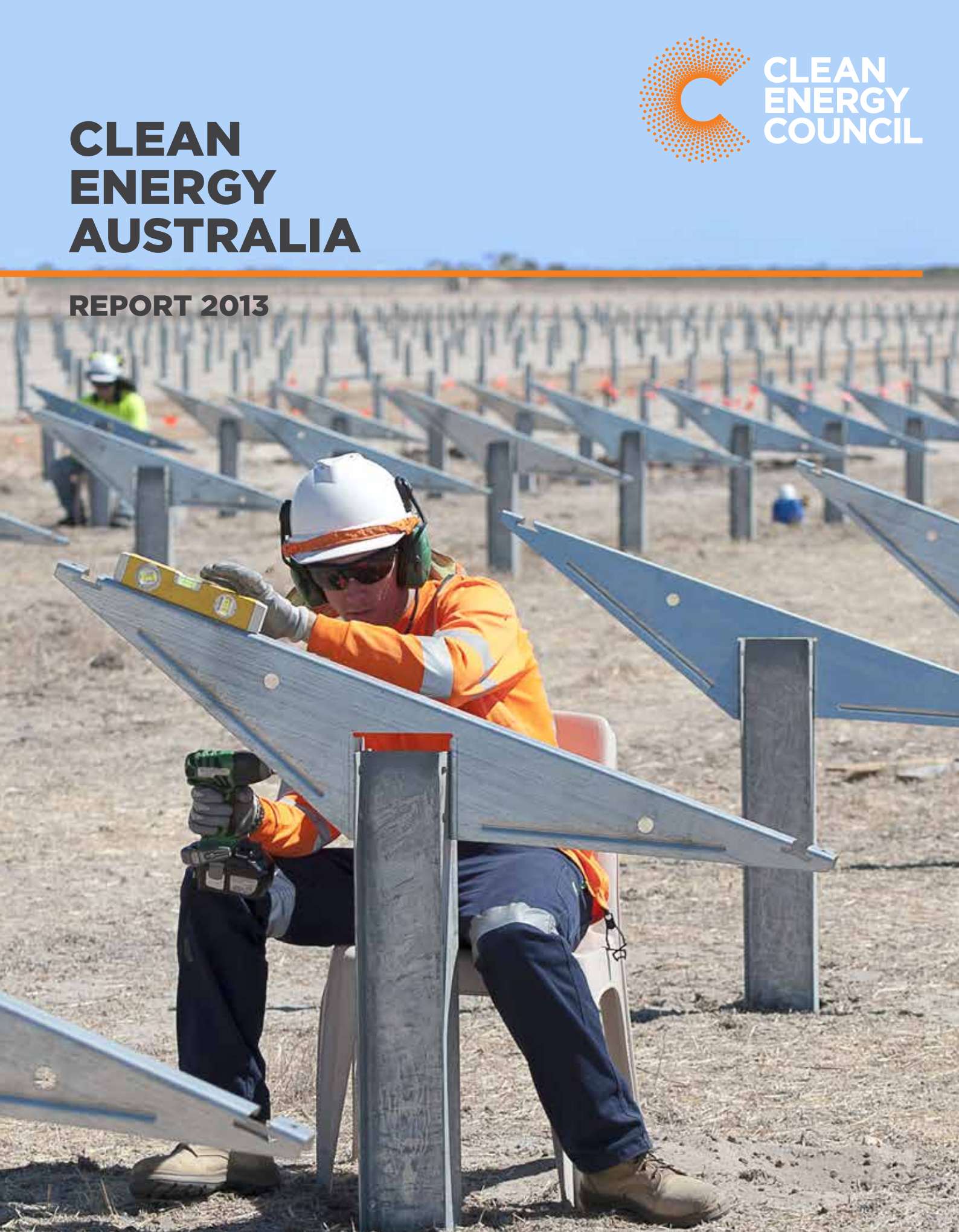
CLEAN ENERGY COUNCIL

CLEAN ENERGY AUSTRALIA

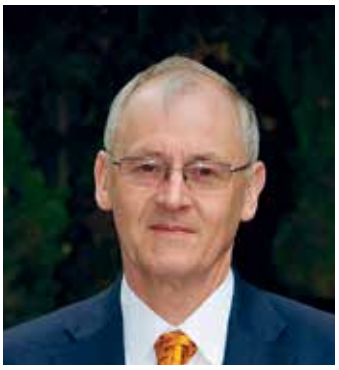
REPORT 2013



Front cover image: Greenough River Solar Farm, Western Australia.
Courtesy of First Solar.

TABLE OF CONTENTS

INTRODUCTION



David Green
Chief Executive,
Clean Energy Council

The 2013 Clean Energy Australia Report shows how renewable energy and energy efficiency is helping to build a stronger, cleaner economy. From jobs and investment in regional areas to solar panels, solar hot water and high efficiency appliances right across the country, clean energy contributed billions of dollars' worth of economic activity during the 2013 calendar year.

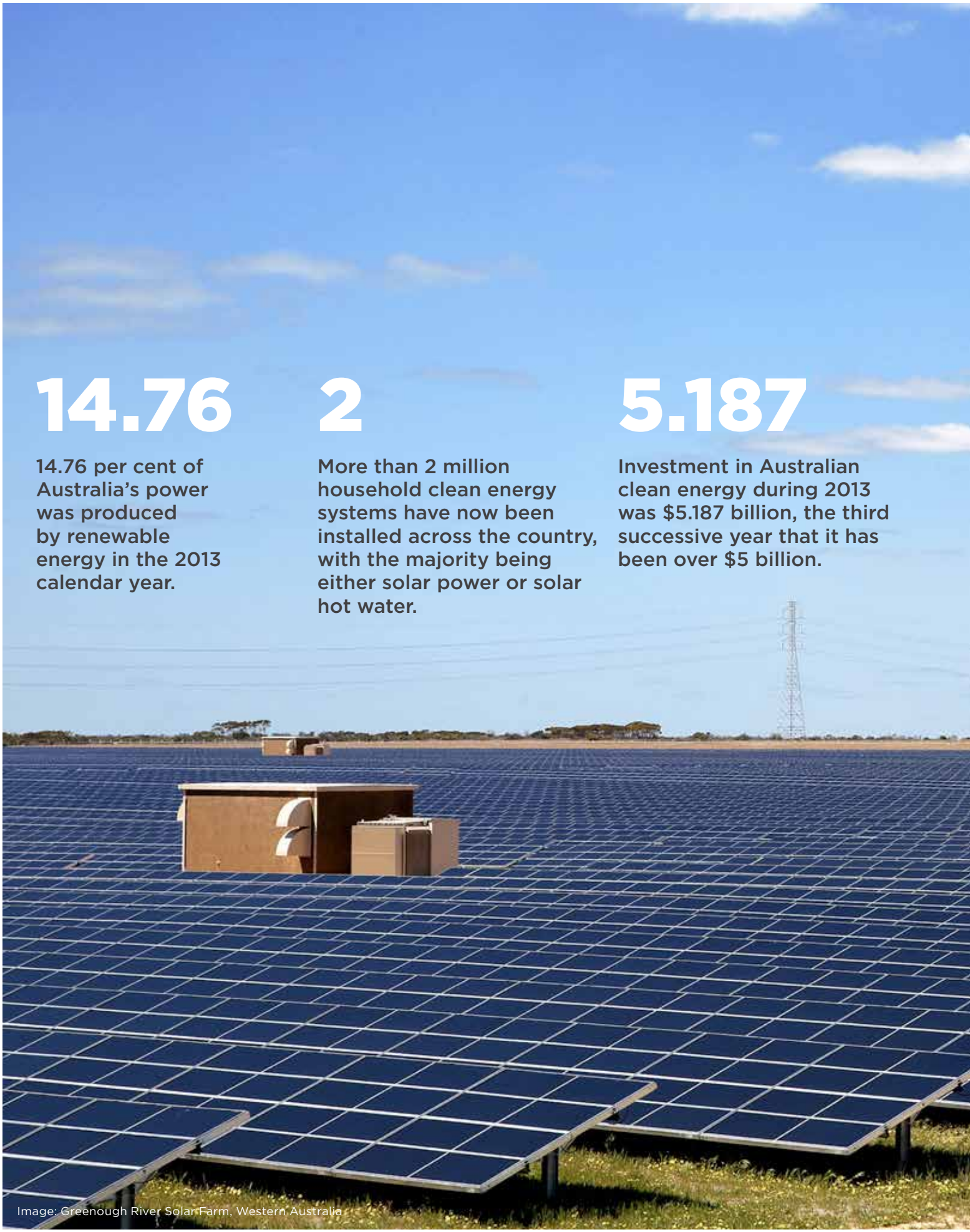
Even better news is that Australia's Renewable Energy Target can actually lead to lower power prices in the long run. While clean energy continues to generate jobs and investment in regional areas of the country, modelling completed for the Clean Energy Council by leading energy market experts ROAM Consulting found that power bills will actually be more than $500 million cheaper across all Australian households in 2020 with the Renewable Energy Target in place than if it was removed.

Beyond 2020 this figure is even higher, rising to a maximum of $140 cheaper per household, or a $1.4 billion total saving on power bills.

This is because fewer renewables such as wind and solar would mean more of our energy would have to come from gas-fired electricity, which is getting more expensive all the time. The Australian Industry Group (AiGroup), which represents many of the country's large manufacturers and other energy users, said in 2014 that the rising price of gas is emerging as possibly the biggest energy issue we face. AiGroup and others have projected that gas prices may triple this decade, causing major bill shock for some of our more energy-intensive industries.

The Clean Energy Australia report shows how the Renewable Energy Target has already achieved much; all it needs now is to be left alone to do the rest of its job. Key to this is a stable policy environment where investors can support clean energy projects with confidence that government won't move the goal posts. With the right policy settings for a stable investment environment, clean energy will help Australia's economy go from strength to strength.

Feature image: Musselroe Wind Farm, Tasmania.
Courtesy of Woolnorth Wind Farm Holdings and New Era Media



14.76

14.76 per cent of Australia's power was produced by renewable energy in the 2013 calendar year.

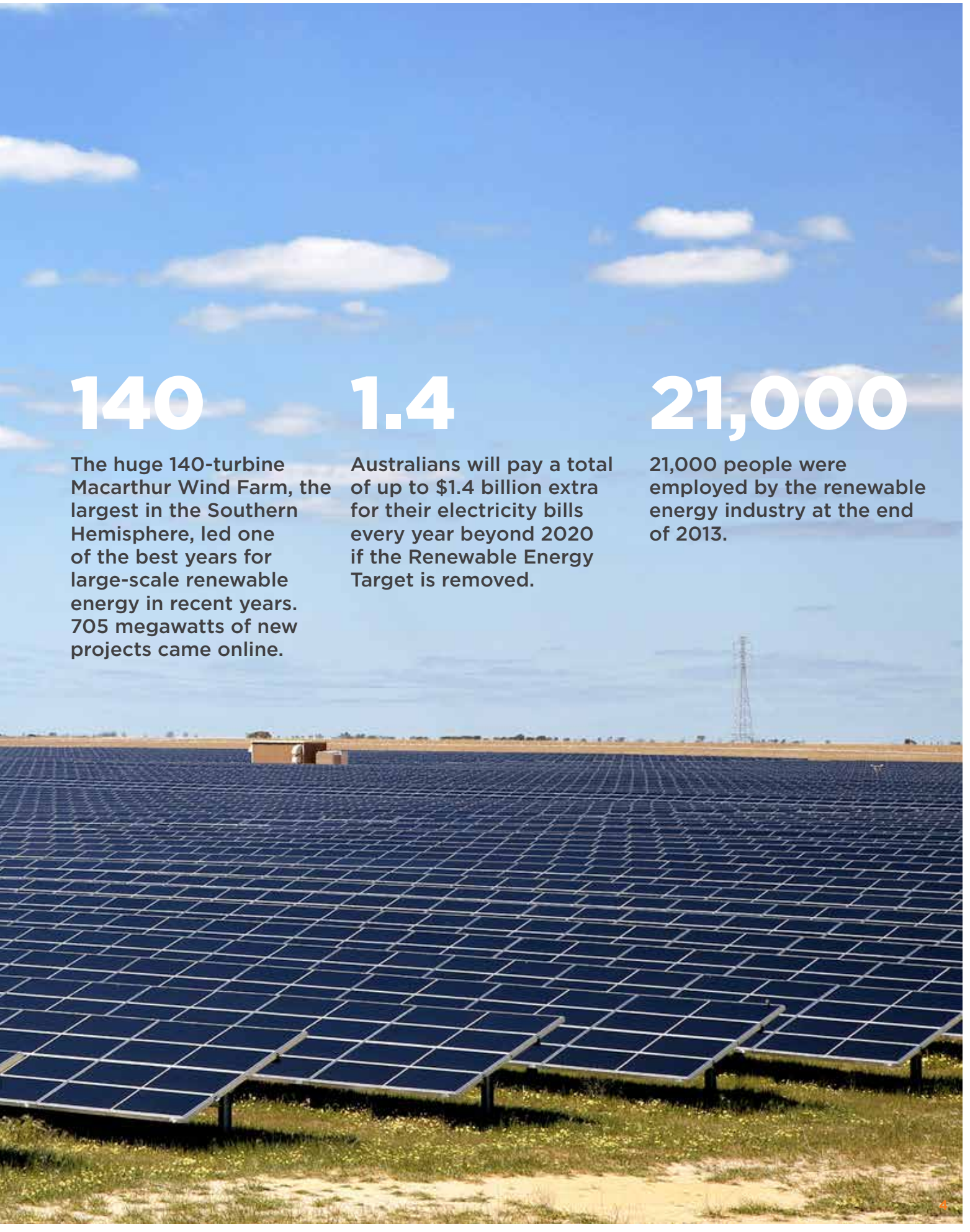
2

More than 2 million household clean energy systems have now been installed across the country, with the majority being either solar power or solar hot water.

5.187

Investment in Australian clean energy during 2013 was $5.187 billion, the third successive year that it has been over $5 billion.

Image: Greenough River Solar Farm, Western Australia



140

The huge 140-turbine Macarthur Wind Farm, the largest in the Southern Hemisphere, led one of the best years for large-scale renewable energy in recent years. 705 megawatts of new projects came online.

1.4

Australians will pay a total of up to $1.4 billion extra for their electricity bills every year beyond 2020 if the Renewable Energy Target is removed.

21,000

21,000 people were employed by the renewable energy industry at the end of 2013.

EXECUTIVE SUMMARY

Electricity use in Australia continued to decline in 2013, marking the fifth straight year that power demand from the grid has fallen. Increased use of energy efficiency and home clean energy systems contributed strongly to the result. As Australia restructures towards a service-based economy, overall we are using less electricity – but what we do use tends to result in periods of higher peak demand. This is likely to continue with the expected closure of major manufacturing operations in the coming years.

The use of clean energy, particularly wind farms and solar power, continues to grow.

AGL's $1 billion Macarthur Wind Farm in western Victoria – the Southern Hemisphere's largest – came online in the first half of the year. In March 2013, the one millionth solar power system was registered. The bulk of these were installed inside a period of just five years, by people from across the community.

Meanwhile, several large-scale solar projects have commenced construction, paving the way for a bigger contribution from this technology in the second half of the decade.

It was also another strong year for hydro. This can be attributed to several factors, including building up storages to take advantage of the carbon price and excellent rainfall in key catchments.

Due to the very large contribution made by hydro to the total clean energy generation figure in 2013, it is likely that we will see a decline in the percentage of power generated by renewable energy in 2014.

Despite a positive year, the legislated review of Australia's Renewable Energy Target in 2014 is creating uncertainty for the industry and eroding investor confidence.

As Bloomberg New Energy Finance explained in its 2014 market outlook: "Despite a promising 2013, wind investment is likely to stall as a result of the policy landscape while small-scale PV may begin to taper...The construction pipeline is now strong, but the spectre of the Federal Government's Renewable Energy Target review is likely to freeze new investment until the outcome is known[1]."

A study completed for the Clean Energy Council by ROAM Consulting found that future power prices will be lower with the Renewable Energy Target in place than if it was removed. The policy will help to protect Australian households from the sharply rising cost of gas, translating into a saving of more than half a billion dollars on power bills in 2020, compared to a scenario in which it was removed.[2]

1 Bloomberg New Energy Finance, 2014, P1, H1 2014 Energy Market Outlook
2 Roam Consulting, RET Policy Analysis, April 2014 http://www.cleanenergycouncil.org.au/policy-advocacy/renewable-energy-target/ret-policy-analysis.html

ABOUT THE CLEAN ENERGY COUNCIL

The Clean Energy Council is the peak business association for Australia's clean energy industry. We work with more than 550 solar, wind, bioenergy, hydro, energy efficiency, cogeneration, energy storage, geothermal and marine energy businesses, along with more than 4500 solar installers.

We are committed to accelerating the transformation of Australia's energy system to one that is smarter, cleaner and more consumer-focused.

We are working towards this goal with industry and government, building a competitive and sustainable market for both clean energy generation and the more efficient use of power in Australian homes and businesses.

The Clean Energy Council also works to continuously improve the integrity and effectiveness of the clean energy industry through guidelines and technical standards that enhance the safety and quality of clean energy technology – for example, through an accreditation scheme for solar installers.

In 2013, the Clean Energy Council launched a Solar PV Retailer Code of Conduct to provide consumers with greater assurance that they are buying from a company that is committed to excellence in the quality of its products and workmanship, as well as to customer service.

Image: Rooftop solar installation, Sydney

SNAPSHOT

Renewable energy provided 14.76 per cent of Australia's electricity in 2013, enough to power the equivalent of 4.9 million homes.

Hydro produced the most clean energy of any source during the year (55 per cent of the total), primarily through Hydro Tasmania's network of power plants and the Snowy Hydro Scheme in New South Wales. Tasmania's largest hydro plant at the Gordon Dam produced substantially higher levels of electricity during 2013 compared to previous years, helped by a wet period between July and November with repeated heavy rains and flooding.

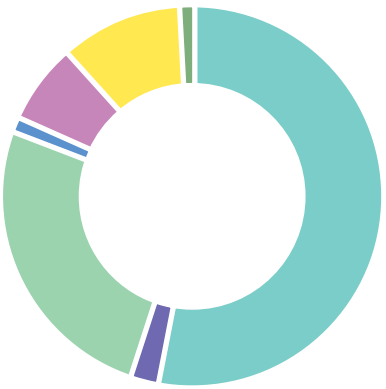
Clean energy generation from household solar (11 per cent of the total renewable energy contribution) and wind power (27 per cent) continued to increase. More than a million rooftop solar power systems provided substantial amounts of power across the network. The commissioning of the massive Macarthur Wind Farm in western Victoria led to a 20 per cent improvement in wind power generation compared to the year before.

While 2013 saw some exciting developments in large-scale solar and early stage technologies such as geothermal and marine energy, these have not yet reached the scale to make a noticeable contribution to Australia's overall energy generation.

Demand for power fell in all states except Tasmania, marking the fifth straight year that overall electricity use has declined in the power grid. The Australian Energy Market Operator[5] attributed the trend to an increase in rooftop solar power systems, increased energy efficiency measures and a behavioural response by customers to higher power prices. The Australian Energy Regulator also suggested weaker demand from the manufacturing sector led to reduced power use overall[6].

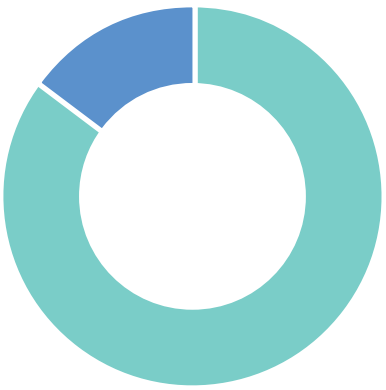
According to data from the Australian Energy Market Operator, generation from coal-fired power fell in both Queensland and Victoria during 2013[7]. Queensland experienced the country's largest reduction in coal-fired generation, as some power station units were closed either due to maintenance outages or mothballed because of lower demand for electricity.

ESTIMATED PERCENTAGE CONTRIBUTION OF EACH TECHNOLOGY TO RENEWABLE GENERATION[3]



Hydro	55%
Wind	27%
Solar PV	11%
Bioenergy	7%
Solar Thermal	0.079%
Marine	0.001%
Geothermal	0.001%

ANNUAL ELECTRICITY GENERATION 2013[4]



Renewables	14.76%
Fossil Fuels	85.24%

3 Clean Energy Council Renewable Energy Database, BREE 2013, REC Registry, AEMO, IMO, IES. Note some figures have been rounded.

4 The figure for total Australian electricity generation includes scheduled and non-scheduled large-scale renewable and fossil fuel generation from power plants that are included in the National Electricity Market (NEM) and the Western Australian Electricity Market (WEM) as well as non-market participants, small scale solar power systems, off-grid renewable and fossil fuel generation from the Northern Territory, WA and the states covered by the NEM. Total electricity generation in Australia was 235 TWh in 2013.

5 AEMO, 2013, Electricity Statement of Opportunities for the National Electricity Market 2013

6 Australian Energy Regulator, 2013, State of the Energy Market 2013

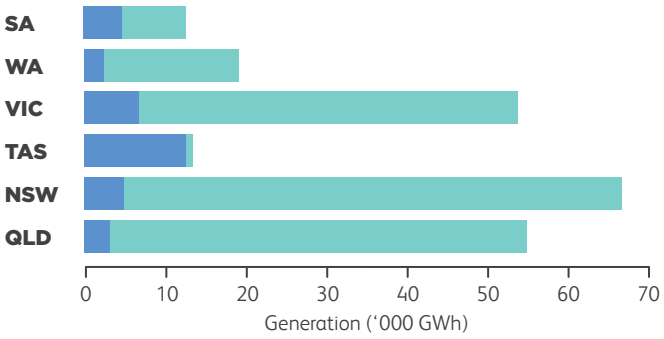
7 NEO Mobile database, 2013, Intelligent Energy Systems

ANNUAL RENEWABLE ELECTRICITY GENERATION[8]

ELECTRICITY GENERATED BETWEEN 1 JANUARY 2013 AND 31 DECEMBER 2013

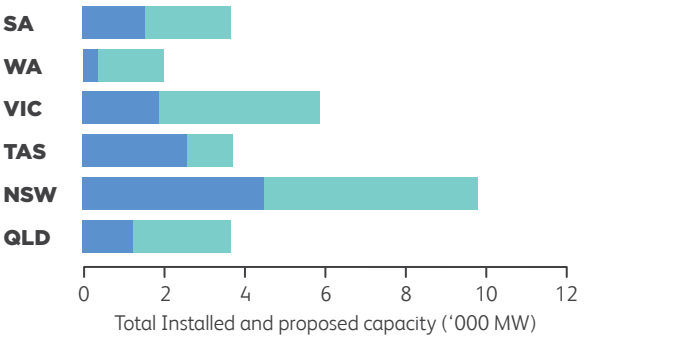
FUEL SOURCE	ELECTRICITY GENERATION – 2013 CALENDAR YEAR (GWH)[9]	PERCENTAGE OF RENEWABLE ENERGY GENERATION	EQUIVALENT IN HOUSEHOLDS[10]	PERCENTAGE OF TOTAL AUSTRALIAN ENERGY GENERATION
Hydro	19,243	55.4%	2,710,282	8.18%
Wind	9259	26.6%	1,304,085	3.93%
Solar power (PV)	3820	10.99%	538,028	1.62%
Bioenergy	2400	6.9%	338,028	1.02%
Solar thermal	27.4	0.079%	3856	0.01%
Geothermal	0.5	0.001%	70	0.0002%
Marine	0.2	0.001%	28	0.00008%
RENEWABLE TOTAL	**34,750**	**100%**	**4,894,377**	**14.76%**
Solar water heating[11]	2627.5			1.12%

FOSSIL FUEL AND RENEWABLE ENERGY GENERATION FOR EACH STATE[12]



Total generation includes NEM and WEM data and small-scale solar power only, so may differ from the total electricity generation figures.

CAPACITY OF INSTALLED AND PROPOSED RENEWABLE ENERGY PROJECTS - BY STATE[13]



8 Clean Energy Council Renewable Energy Database, BREE 2013, REC Registry, AEMO, IMO, IES. Note some figures have been rounded.
9 Figures do not include auxiliary load or transmission line losses
10 Electricity generated equivalent in households is calculated using 7.1 MWh national average household energy consumption
11 As solar water heating does not produce electricity it has not been included in the total generation or equivalent in household figures
12 Clean Energy Council Renewable Energy Database, BREE 2013, REC Registry, AEMO, IMO, IES.
13 Clean Energy Council Renewable Energy Database

2013 IN REVIEW

HOUSEHOLD CLEAN ENERGY

The millionth solar power system was installed in the first half of 2013, while in January 2014 the Clean Energy Regulator registered the two millionth household renewable energy system – the majority of which were solar power or solar hot water systems.

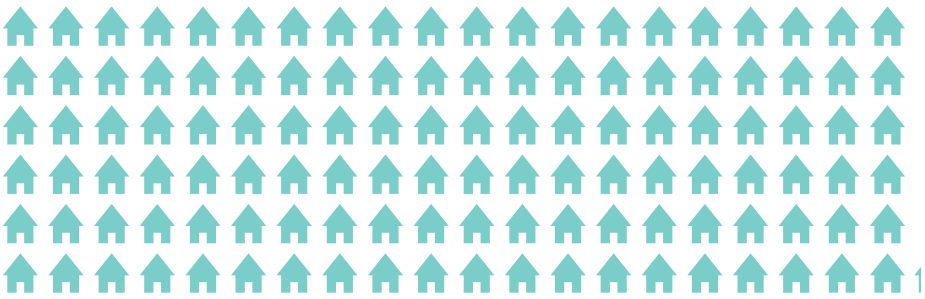
More than 213,200 solar power systems were installed in 2013[14]. This was a reduction of 38 per cent on the year before, although the average system size continues to increase. While the cost of solar power systems continued to decline, the boom-bust cycle created by the alternate introduction and sudden reduction of state solar incentives meant a quieter year for the industry. Strong indications are that, with continued support through the Federal Government's Small-scale Renewable Energy Scheme and a downward trend in the cost of systems, the solar sector will move forward sustainably following a period of consolidation.

By the end of 2013, almost 1.25 million homes and businesses had installed a solar power system, meaning that approximately 3.1 million Australians lived or worked at a property with solar panels on the roof.

Government data shows that the people installing solar were from all walks of life, including mortgage belt, retirement and regional areas. The leading postcode for solar power at the end of 2013 was Bundaberg in Queensland followed by Coodanup, near Mandurah in Western Australia.

As well as helping individuals reduce their power bills, solar power is helping relieve some of the strain on the power grid on hot days when power use goes into overdrive. During a heatwave affecting Victoria and South Australia in January 2014, solar power may have been the difference that stopped the electricity market setting a new record for peak power use[15].

The sale of solar water heating systems continued to decline in 2013 compared to previous years. Approximately 54,000 solar hot water systems and heat pumps were installed in 2013, a 23 per cent drop from the previous year and down more than 72 per cent on the industry's peak in 2009. The continued impact of reduced state and federal government rebates for solar hot water in recent years contributed to this decrease.

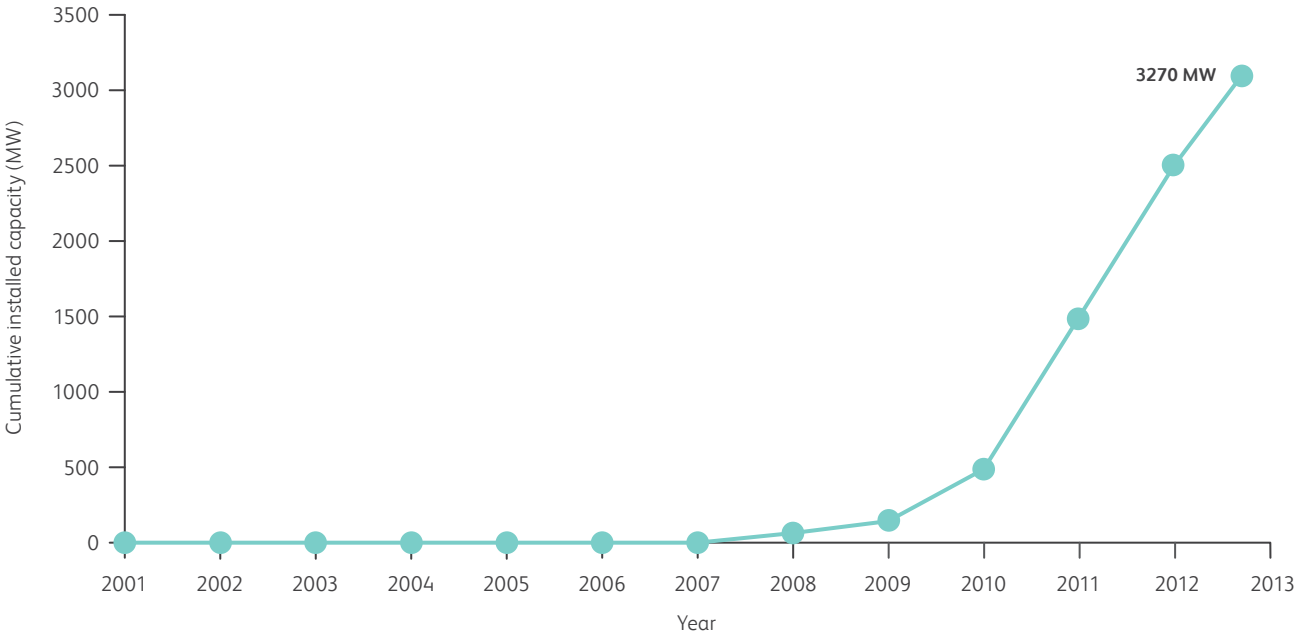


3.1

million Australians lived or worked at a property with solar panels installed at the end of 2013

14 SunWiz analysis of Clean Energy Regulator figures, February 2014
15 pitt&sherry, 2014, Carbon Emissions Index (Cedex) Electricity Update February 2014

INSTALLED CAPACITY OF SMALL-SCALE SOLAR POWER SYSTEMS – CUMULATIVE[16]



TOTAL HOUSEHOLD SOLAR POWER SYSTEMS AT END 2013[17]

FUEL SOURCE	INSTALLED CAPACITY (MW)	NUMBER OF SYSTEMS INSTALLED
Solar PV	3270	1,246,775

16, 17 SunWiz, 2014

2013 IN REVIEW

LARGE-SCALE CLEAN ENERGY

In 2013, new wind farms continued the trend of recent years by being the dominant form of new large-scale renewable energy built. Australia's Renewable Energy Target is designed to support the lowest cost form of renewable energy that can be rolled out on a large scale – a position currently held by wind energy.

AGL's 140-turbine Macarthur Wind Farm was by far the largest renewable energy plant that came online during 2013, adding 420 megawatts (MW) of new renewable energy capacity – more than half of the 705 MW large-scale total. Also notable was the 168-megawatt Musselroe Wind Farm in Tasmania, with the 55 MW Mumbida Wind Farm in Western Australia and a 38 MW bioenergy plant built by Mackay Sugar in Queensland rounding out third and fourth place respectively.

A total of 18 projects came online in 2013, with the remainder made up of some smaller wind projects, solar power, bioenergy and a hydro upgrade. Seven gas-fired cogeneration and trigeneration plants were completed during the year, the largest being a 21 MW cogeneration facility constructed by AGL at the Qenos plastics manufacturing plant at Altona in Victoria, followed by an 8 MW trigeneration project at Qantas in Sydney.

Strong growth in the installation of commercial-scale solar power projects was a feature of 2013, and a number of large-scale solar projects reached commercial close and commenced construction late in the year.

A review of the Renewable Energy Target in 2014, underway at the time of writing, continues to make it challenging to secure funding for clean energy projects due to the potential for further moving of the regulatory goal posts.

Image: Macarthur Wind Farm, Victoria

2013 IN REVIEW

LARGE-SCALE RENEWABLE ENERGY PROJECTS DELIVERED IN 2013[18]

FUEL SOURCE	LOCATION	OWNER	STATE	INSTALLED CAPACITY
Wind	Macarthur	AGL Energy and Malakoff Corp BHD	VIC	420 MW
Wind	Musselroe	Woolnorth Wind Farm Holdings	TAS	168 MW
Wind	Mumbida	Verve Energy and Infrastructure Capital Group	WA	55 MW
Bioenergy	Racecourse	Mackay Sugar	QLD	38 MW
Hydro	Tungatinah Upgrade	Hydro Tasmania	TAS	Additional 6 MW
Wind	Karakin (Lancelin)	Blair Fox	WA	5 MW
Wind	West Hills Farm (Lancelin)	Blair Fox	WA	5 MW
Wind	Denmark Community Wind farm	Denmark Community Wind farm	WA	2.4 MW
Solar PV	Mildura Stage 1	Silex (Solar Systems)	VIC	1.5 MW
Solar PV	Darwin	Nightcliff Shopping Centre	NT	1.06 MW
Geothermal	Habanero (Innamincka)	Geodynamics	SA	1 MW
Bioenergy	Colignan	Australian Tartaric Products	VIC	0.6 MW
Solar PV	Port Melbourne	NEXTDC	VIC	0.4 MW
Solar PV	Griffith	Griffith University	NSW	0.38 MW
Solar PV	Griffith	De Bortoli Winery	NSW	0.23 MW
Solar PV	Ferngrove Winery	Ferngrove Wines	WA	0.23 MW
Solar PV	Bibara Lake	Australian Wool Testing Authority	WA	0.15 MW
Solar PV	Capital East Solar Farm	Infigen Energy	NSW	0.13 MW
			TOTAL	**705 MW**

TOTAL CAPACITY OF NEW RENEWABLE ENERGY PROJECTS COMPLETED IN 2013 – BY TECHNOLOGY[19]

FUEL SOURCE	INSTALLED CAPACITY	NUMBER OF PROJECTS
Wind	655 MW	6
Bioenergy	38.6 MW	2
Hydro	6 MW	1
Large-scale Solar PV	4.08 MW	8
Geothermal	1 MW	1
TOTAL	**705 MW**	**18**

COGENERATION AND TRIGENERATION PROJECTS DELIVERED IN 2013[20]

FUEL SOURCE	LOCATION	OWNER	STATE	INSTALLED CAPACITY
Cogeneration (natural gas)	Altona (Qenos Cogeneration Facility)	Qenos – constructed and operated by AGL Energy	VIC	21 MW
Trigeneration (natural gas)	Qantas Sydney	GridX	NSW	8 MW
Cogeneration (natural gas)	Geelong	Little Creatures Brewery	VIC	1.2 MW
Cogeneration (natural gas)	Clayton	Monash University	VIC	1 MW
Trigeneration (natural gas)	Castle Hill	Castle Hill RSL	NSW	0.38 MW
Cogeneration (natural gas)	Oasis Regional Aquatic Centre	Wagga Wagga Council	NSW	0.23 MW
Trigeneration (natural gas)	Maitland	Maitland City Bowls Sports & Recreation Centre	NSW	0.15 MW
Cogeneration (bioenergy)	Racecourse	Mackay Sugar	QLD	38 MW
Cogeneration (bioenergy)	Colignan	Australian Tartaric Products	VIC	0.6 MW
			TOTAL	**70.56 MW**

19 Clean Energy Council Renewable Energy Database
20 Clean Energy Council Renewable Energy Database (only includes projects larger than 100 kW)

2013 IN REVIEW

MAJOR RENEWABLE ENERGY PROJECTS UNDER CONSTRUCTION[21]

FUEL SOURCE	OWNER	LOCATION	STATE	EXPECTED COMMISSION YEAR	INSTALLED CAPACITY
Wind	Trustpower Australia	Snowtown 2	SA	2014	270 MW
	RES	Ararat	VIC	2015	247.5 MW
	ACCIONA	Mt Gellibrand	VIC	2015	189 MW
	Goldwind Australia	Gullen Range	NSW	2014	165.5 MW
	Union Fenosa	Ryan Corner	VIC	TBA	134 MW
	Meridian Energy	Mt Mercer	VIC	2015	131.2 MW
	Electricity Generating PCL	Boco Rock	NSW	2015	113 MW
	CBD Energy and Banco Santander	Taralga	NSW	2015	106.8 MW
	Mitsui & Co Ltd	Bald Hills (1 and 2)	VIC	2015	106.6 MW
	Union Fenosa	Crookwell 2	NSW	TBA	92 MW
	Pacific Hydro	Crowlands	VIC	TBA	84 MW
	ACCIONA	Mortlake South	VIC	2016	76.5 MW
	Union Fenosa	Hawkesdale	VIC	TBA	62 MW
	Pacific Hydro	Portland Stage 4	VIC	2015	47.2 MW
	Wind Farm Developments	Woolsthorpe	VIC	2015	40 MW
	Trustpower Australia	Salt Creek	VIC	2015	31.5 MW
Solar thermal	CS Energy	Kogan Creek	QLD	2014	44 MW
Solar PV	Fotowatio Renewable Ventures	Royalla	ACT	2014	20 MW
Wave	Oceanlinx	Port MacDonnell	SA	2014	1 MW
		TOTAL CAPACITY UNDER CONSTRUCTION			**1961 MW**

At the beginning of January 2014, 19 large-scale clean energy plants were under construction. The majority of these were wind farms, with Trustpower's Snowtown 2 wind farm the largest of those underway. Most of the other projects are split between Victoria and New South Wales. At the end of January it was announced that construction had begun on AGL and First Solar's $300 million Nyngan Solar Plant.

21 Clean Energy Council Renewable Energy Database

Images (clockwise from top left):
Capital East Solar Farm, New South Wales
Greenough River Solar Farm, Western Australia
Wave Energy Research Facility, Fremantle
Geothermal pilot plant
Solar panel installation
Macarthur Wind Farm, Victoria

EMPLOYMENT

RENEWABLE ENERGY JOBS

Approximately 21,000 people were directly employed by the renewable energy industry in a construction, installation, operations or maintenance role at the end of 2013.

While the number has grown significantly over the last decade, it is slightly down on the year before due to a contraction in the market for rooftop solar power – the source of more than half of the sector's employment. The drop in solar jobs was partly offset by higher employment in the wind industry.

The figures do not include the substantial flow-on employment and additional benefits for contractors, suppliers, accommodation providers and restaurants in the vicinity of large-scale renewable energy projects, particularly those under construction.

FULL-TIME EQUIVALENT JOBS IN THE RENEWABLE ENERGY INDUSTRY[22]

HYDRO **1373**

WIND **2722**

BIOENERGY **2532**

SOLAR PV **13053**

SOLAR THERMAL **140**

GEOTHERMAL **85**

MARINE **65**

SOLAR HOT WATER **1105**

Each figure represents 1000 jobs

Image: Workers on the solar water heater production line, Perth

INVESTMENT

The Australian market attracted $5.187 billion of new investment in clean energy in 2013, according to Bloomberg New Energy Finance (BNEF).

Investment has been above $5 billion per year since 2011. Although the 2013 figure was down $114 million on the year before as at February 2014, it may be boosted later in the year as more clean energy investment is reported on.

Investment in wind power almost doubled compared to 2012 and Hydro Tasmania also signed an agreement with China's Shenhua Clean Energy to develop $1.6 billion worth of wind power projects over the next decade.

Solar investment was $2.938 billion, a drop of 14 per cent – or $480 million – on the year before. This was largely as a result of state-based support mechanisms being wound back. However, systems are also being installed at a significantly lower cost than in the past, meaning more can be installed for less. This has led to lower levels of investment overall. System prices have fallen from about $6.60 per watt in 2010 to $2.70 in 2013, according to BNEF.

These lower system costs were also a factor affecting global investment in new clean energy, which BNEF estimates at US$254 billion, a reduction of 11 per cent on the year before.

Policy uncertainty due to the review of Australia's Renewable Energy Target in 2014 is likely to have a negative effect on investment during 2014.

NEW FINANCIAL INVESTMENT IN LARGE- AND SMALL-SCALE CLEAN ENERGY IN AUSTRALIA, 2012 AND 2013 CALENDAR YEARS (A$M)[23]

SECTOR	2012 (A$M)	2013 (A$M)
Wind	816.1	1468.9
Solar	3419.2	2938.7
Biomass & Waste	0.0	0.0
Geothermal	13.5	7.4
Small hydro	0.0	0.0
Marine	68.6	2.0
Energy smart technologies	984.0	770.2
TOTAL	**5301.4**	**5187.2**

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

ANNUAL CLEAN ENERGY INVESTMENT UNDER THE RENEWABLE ENERGY TARGET (REAL A$B)

Analysis by ROAM Consulting for the Clean Energy Council found that with the Renewable Energy Target operating as currently legislated, investment in large-scale clean energy generation will be $2 to $4 billion dollars per year out to the end of the decade.[24] The annual investment is shown below.

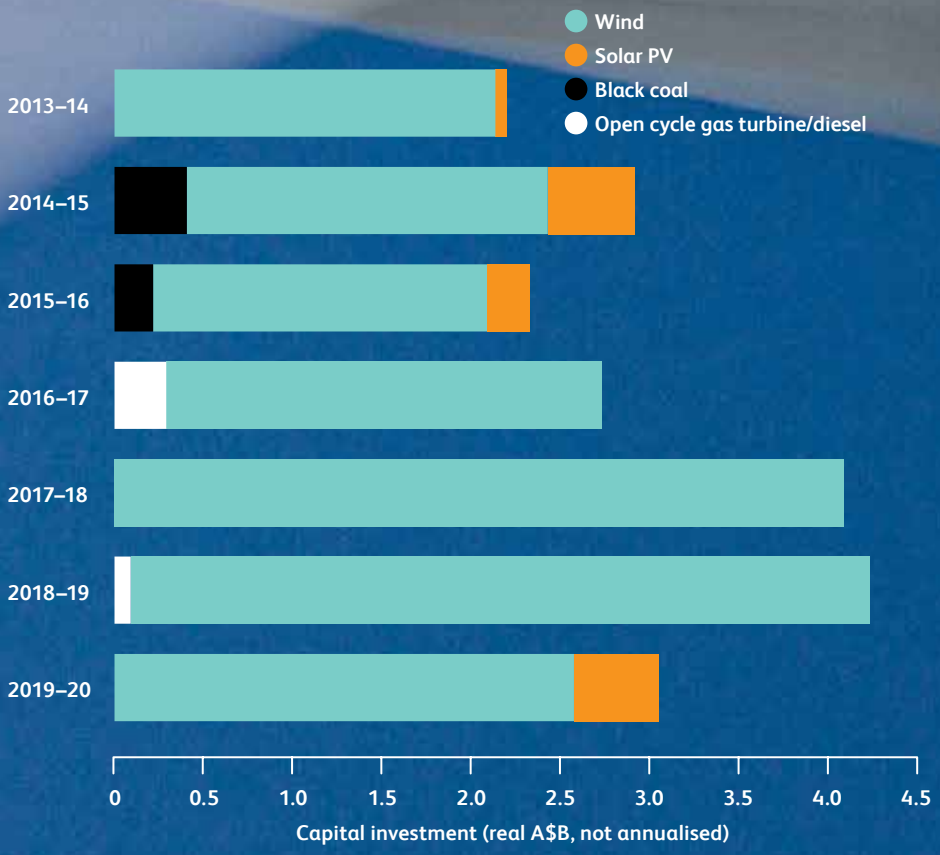


Image: Detail of turbine, Musselroe Wind Farm, Tasmania

24 ROAM Consulting, 2014, Renewable Energy Target policy analysis

ELECTRICITY PRICES

Domestic power bills have been rising substantially across the country since 2007, with the largest contributing factor being upgrades to the poles and wires of power networks.

The Australian Electricity Market Commission[24] (AEMC) predicts that power price rises will ease significantly in most states between 2013 and the middle of the decade. But community, political and media concern continues to escalate over household and business power bills.

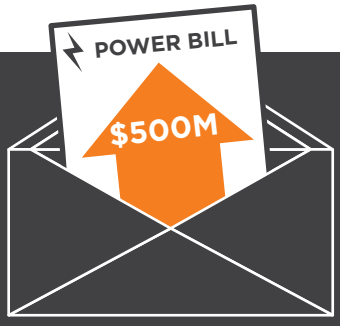
Australia's Renewable Energy Target contributes only a small amount to the average power bill. According to analysis by the AEMC, the NSW Independent Pricing and Regulatory Tribunal[25] (IPART) and the Queensland Competition Authority[26] (QCA), the policy contributed between 3 and 5 per cent to the average household power bill in 2013.

While opponents of the Renewable Energy Target suggest that reducing it will provide a saving on power prices, it is not that simple. Reducing the target means more of our electricity will ultimately come from gas-fired power, which is set to rise dramatically in cost over the course of the decade.

A 2013 report by IPART showed that while electricity prices have stabilised, gas prices increased by 9 per cent on 1 July 2013.[27] A recent price determination by the QCA showed that increased wholesale prices, primarily due to the fuel cost of gas, was the leading driver of projected electricity price costs. A 2012 report released by the Australian Industry Group concluded that: "East coast gas prices will rise, potentially to as much as triple the current $3-$4 per gigajoule; this increase would be several times larger than the costs related to carbon pricing."[28]

The Bureau of Resource and Energy Economics predicts wind and solar power in particular will continue to fall in price over the coming decades.[29]

Current provisions under the Renewable Energy Target provide a 90 per cent exemption for the most energy-intensive trade-exposed industries and a 60 per cent exemption for many other businesses to minimise costs for these industries.



Future power prices will be lower with Australia's Renewable Energy Target in place than they would be if it was removed, according to analysis by energy market experts ROAM Consulting. The policy is helping to hold electricity prices lower over the long term by minimising the use of increasingly costly gas for power generation.

Removing the Renewable Energy Target means households would pay more than half a billion dollars a year extra for electricity in 2020, and up to $1.4 billion more each year beyond that.

Roam Consulting, RET Policy Analysis, April 2014 http://www.cleanenergycouncil.org.au/policy-advocacy/renewable-energy-target/ret-policy-analysis.html

24 AEMC Residential Electricity Price Trends, December 2013 http://www.aemc.gov.au/market-reviews/completed/retail-electricity-pricetrends-2013.html

25 IPART Report - Review of regulated retail prices and charges for electricity 2013 to 2016 - June 2013 http://www.ipart.nsw.gov.au/Home/Industries/Electricity/Reviews/Retail_Pricing/Review_of_regulated_electricity_retail_prices_2013_to_2016

26 Queensland Competition Authority Final Determination Regulated Retail Electricity Prices 2013-14 http://www.qca.org.au/files/ER-QCAFinalDeterm-RREP201314-0513.pdf

27 IPART Draft Report - Review of regulated retail prices for electricity 2013 to 2016 - April 2013 http://www.ipart.nsw.gov.au/Home/Industries/Electricity/Reviews/Retail_Pricing/Review_of_regulated_electricity_retail_prices_2013_to_2016/23_Apr_2013_-_Draft_Report_-_Review_of_regulated_retail_prices_for_electricity_2013_to_2016/Draft_Report_-_Review_of_regulated_retail_prices_for_electricity_2013_to_2016_-_April_2013

28 Large scale export of East Coast Australia natural gas: unintended consequences http://www.aigroup.com.au/portal/binary/com.epicentric.contentmanagement.servlet.ContentDeliveryServlet/LIVE_CONTENT/Publications/Reports/2012/Gas_report_FINAL.pdf

29 BREE, 2013, Australian Energy Technology Assessment 2013 Model Update, http://www.bree.gov.au/publications/australian-energy-technology-assessments

ELECTRICITY PRICES – KEY STATISTICS

9%

INCREASE IN GAS PRICES ON 1 JULY 2013 IN NSW

3% – 5%

CONTRIBUTION THE RENEWABLE ENERGY TARGET MADE TO THE AVERAGE HOUSEHOLD POWER BILL IN 2013

300%

POTENTIAL INCREASE IN EAST COAST GAS PRICES

90%

EXEMPTION FROM THE RET FOR THE MOST ENERGY INTENSIVE TRADE EXPOSED INDUSTRIES

DEMAND FOR ELECTRICITY

Electricity use in Australia declined for the fifth consecutive year in 2013, according to the Australian Energy Market Operator (AEMO). Power consumption fell in all states covered by the National Electricity Market (NEM), with the exception of Tasmania.

A combination of factors contributed, including a decline in manufacturing activity, improvements in energy efficiency, public concern about rising power prices, and the continued uptake of residential solar power systems and solar hot water systems.

Reduced power demand is leading to lower returns for existing coal and gas generators, which are competing for a share of a gradually diminishing market.

MANAGING PEAK ELECTRICITY DEMAND

The growth in 'peak demand' – the small number of times each year when very high volumes of electricity are used – is a major factor that has helped drive up power bills. Peak demand periods typically occur on the hottest few days in summer, as shown by a heatwave in mid-January 2014 when temperatures peaked above 40 degrees Celsius in both Victoria and South Australia for four days straight.

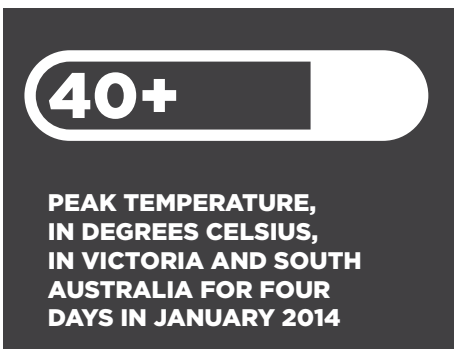
In the whole of 2012, peak demand occurred for a total period of less than 40 hours, but the cost of ensuring the power system can meet peak demand continues to add disproportionate costs.

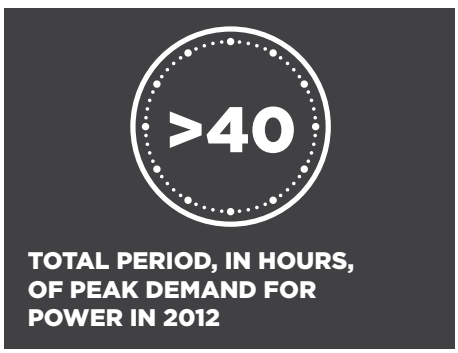
Energy policy experts generally agree that building additional power plants specifically to meet the small number of peak demand periods each year is the most expensive way to deal with the issue.

A variety of trial projects are underway across the country to investigate the benefits and costs of smart grids and different smart energy technologies to help manage the problem.

Substantial scope exists for different types of power demand management to make a major contribution to peak demand for the benefit of electricity consumers. These can include remotely cycling air-conditioners on and off, a more widespread use of energy storage, and a system that charges different rates for power use during peak periods.

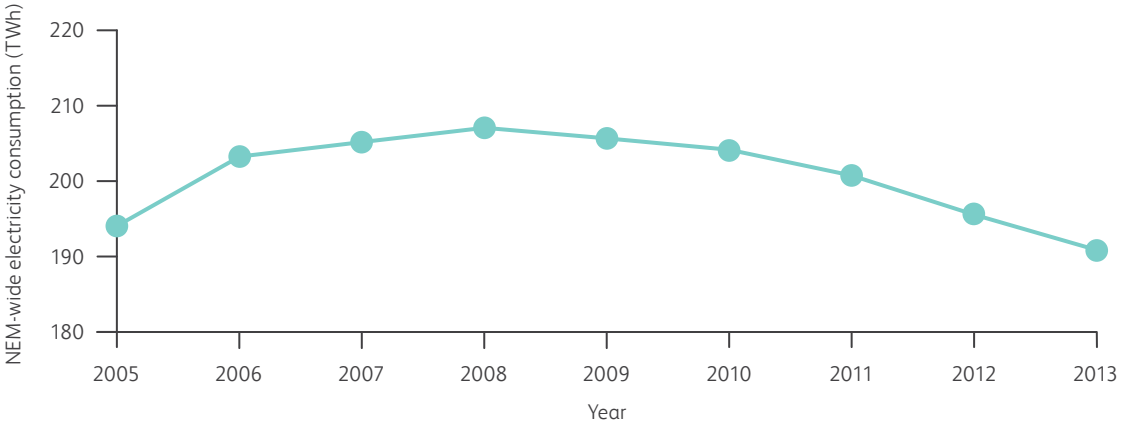
The increasing uptake of solar panels is playing a role in managing peak demand on hot summer days, and the technology's growing contribution was evident during the 2014 heatwave. The Energy Supply Association of Australia acknowledged that rooftop solar's contribution was probably what stopped Victoria from hitting a new record for network power use on a single day.[30]



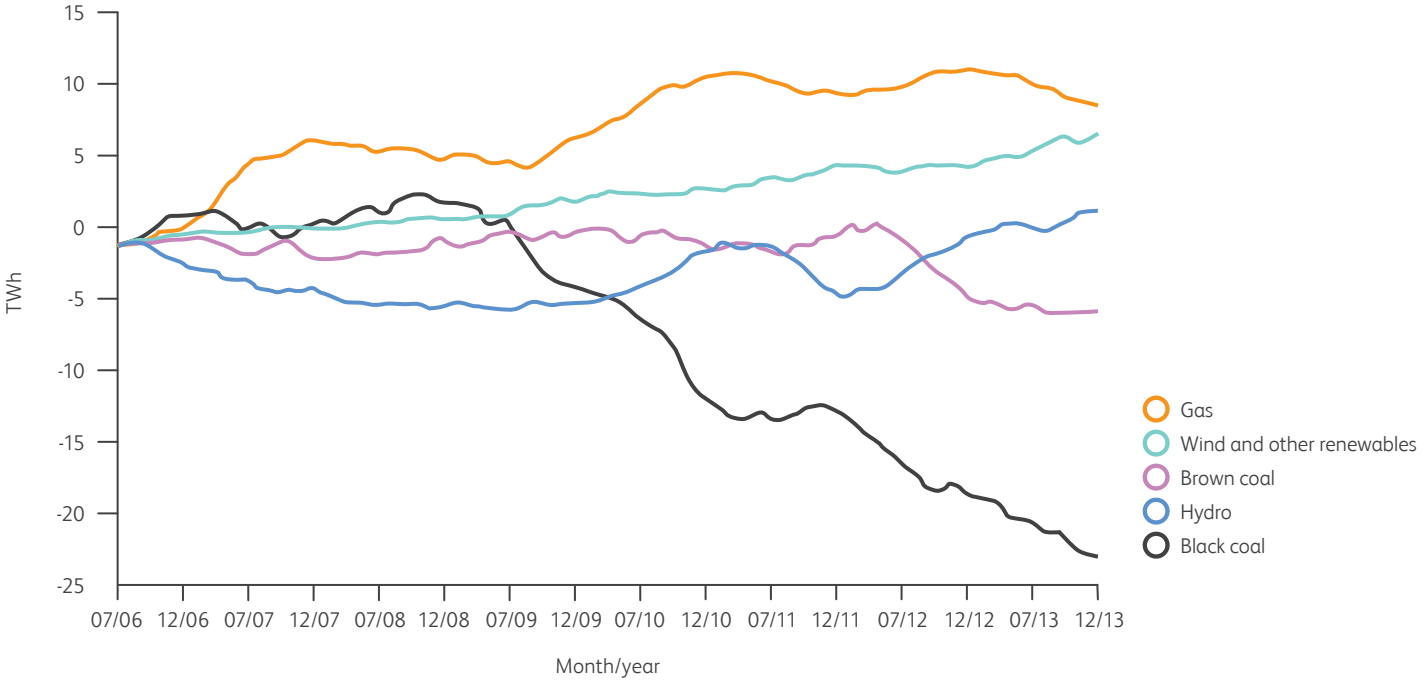


30 Threat to energy support now shifts to bush fires and storms, ESAA media release, 17 January 2014. http://www.esaa.com.au/media/threat_to_energy_supply_shifts_to_bush_fires_and_storms_1

TOTAL NEM ELECTRICITY CONSUMPTION 2005-2013[31]



CHANGING ENERGY USE IN THE NATIONAL ELECTRICITY MARKET[32]



31 AEMO data Source: Graph courtesy of greenmarkets.com.au – taken from http://reneweconomy.com.au/2014/power-consumption-falls-as-renewables-make-up-12-of-australia-market-2013

32 pitt&sherry, 2013, Carbon Emissions Index (Cedex) Electricity Update, http://www.pittsh.com.au/cedex

ENERGY EFFICIENCY

Recent decisions by major manufacturers to wind down their Australian operations underline the importance of increasing the energy productivity of local industry to enable it to perform better against international competitors – particularly in light of stark electricity price rises from 2007 to 2012.

Energy productivity is a measure of energy efficiency. The less energy it takes to produce particular goods and services, the higher the level of energy productivity. Boosting our energy productivity will increase the economic competitiveness of our commercial and industrial sectors, particularly as Australia has low energy productivity compared to many of our trading partners.[33]

Energy efficiency programs work by making new and replacement appliances, equipment and buildings more efficient in the way they use energy. The New South Wales Government estimates that energy efficiency activities such as choosing high efficiency appliances, removing old inefficient spare fridges and carrying out home energy efficiency retrofits can save a household about $450 a year on its electricity bills.[34]

Evidence suggests[35,36,37] that consumers are concerned by rising energy costs and are willing to take action to use less energy. However, better and more accessible information is required to allow consumers to make smart choices about how to use power more efficiently – and reduce their bills in the process.

A report by ClimateWorks[38] found that the emissions intensity of Australia's electricity generation decreased by 8 per cent from 2008-09 to 2012-13, due to reductions in coal generation and improved energy efficiency throughout the economy. The energy intensity of Australia's buildings decreased by 3 per cent between 2002-03 and 2010-11, led by better building operations, improved energy efficiency standards, more efficient appliances and the use of distributed energy.[39]

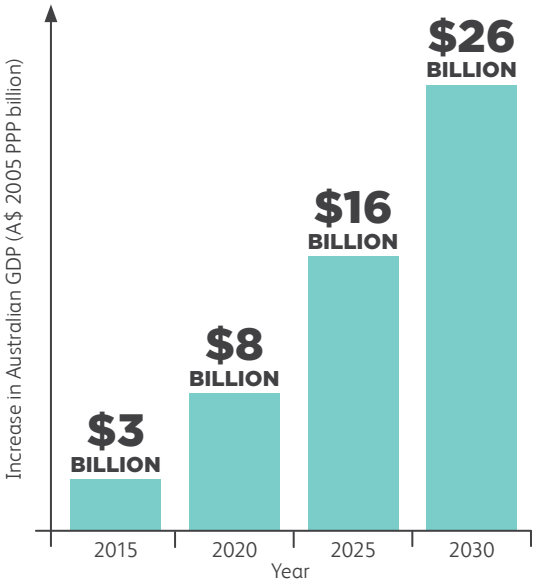
Improvements in energy efficiency requirements in households through the National Construction Code, minimum standards on appliances, and other policies have helped to decrease heating and cooling energy consumption of new homes by 17 per cent since 2010.

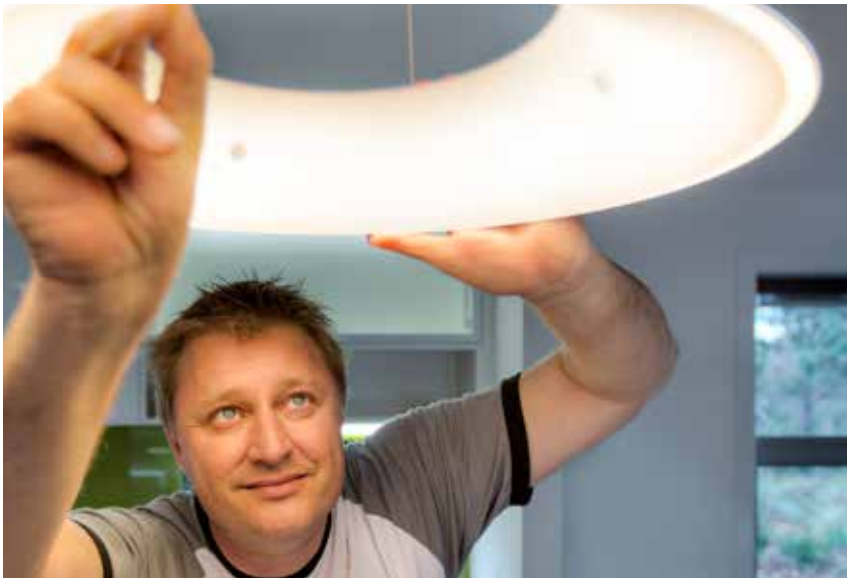
TYPICAL DISTRIBUTION OF ENERGY USE IN AN AUSTRALIAN HOUSEHOLD[40]

Space heating	34%	Cooking	5%
Hot water	22%	Space cooling	4%
Lighting	8%	TV	4%
Refrigeration	7%	Kitchen	2%
Standby	5%	Pools	2%
Other	5%	IT	2%

33 Report of the Prime Minister's Task Group on Energy Efficiency, July 2010 http://ee.ret.gov.au/sites/default/files/documents/03_2013/report---prime---minister---task---group---energy---efficiency.pdf
34 NSW Government, Unlocking Energy Savings in NSW: Enhancing the NSW Energy Savings Scheme, Rule change consultation paper, 2013, http://www.energy.nsw.gov.au/__data/assets/pdf_file/0020/479000/ess-consultation-paper.pdf
35 Auspoll survey for the Clean Energy Council, June 2011;
36 Energy shock: pressure mounts for efficiency action, AiGroup, July 2012
37 CHOICE online survey of Australian household energy decision makers, June 2012
38 ClimateWorks, July 2013, Tracking Progress Towards a Low Carbon Economy http://www.climateworksaustralia.org/project/current/tracking-progress-towards-low-carbon-economy
39 ibid
40 Energy Efficient Strategies (EES), 2013, Beyond Zero Emissions Zero Carbon Plan - Residential Plan, prepared for Beyond Zero emissions, results presented at the Australian Alliance to Save Energy (A2SE) conference, Sydney, NSW

FOR AUSTRALIA, A 1% INCREASE IN ENERGY EFFICIENCY WOULD BOOST 2030 GDP PER CAPITA BY 2.26%, OR $1200 PER PERSON, AND TOTAL GDP BY $26 BILLION[41]





17% **DECREASE IN HEATING AND COOLING ENERGY CONSUMPTION OF NEW HOMES SINCE 2010.**

All images: 8-star energy efficiency house, New South Wales

41 Climate Institute, 2013, Boosting Australia's Energy Productivity

ENERGY EFFICIENCY

STATE-BASED ENERGY EFFICIENCY PROGRAMS

The Energy Savings Scheme in New South Wales, the Energy Saver Incentive in Victoria and the Residential Energy Efficiency Scheme in South Australia were all introduced in 2009. Each has been effective at encouraging more efficient energy use and reducing power bills.

Navigating a patchwork of different state-based schemes can be challenging for businesses which operate across multiple states. A National Energy Savings Initiative would help streamline compliance and reporting processes as well as reduce the cost of administering individual state programs.

Smart meters make it easier for customers to access real-time information on their energy use and take action to change it. The Victorian Government had completed more than 90 per cent of its smart meter roll-out by the end of February 2014, reaching 2.5 million homes and businesses across the state. Smart meters are giving Victorians access to more detailed information about their power use, along with flexible pricing options that could help some households save money over the long term.

ALMOST

4

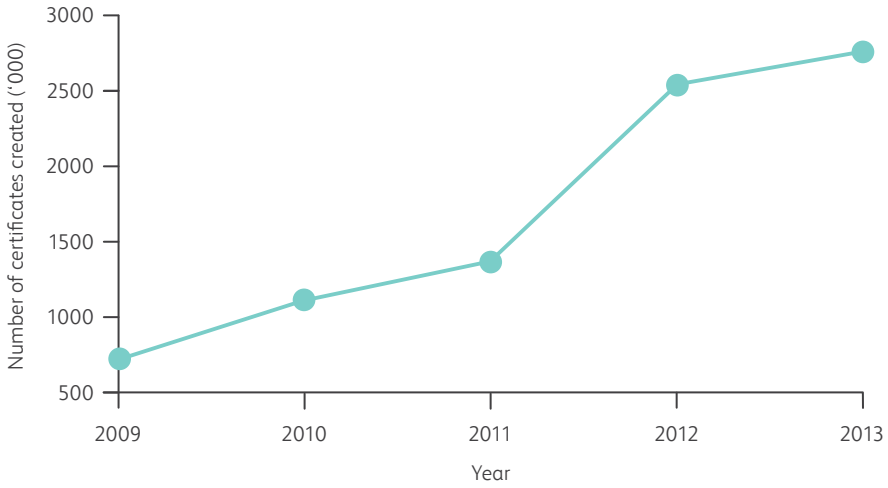
MILLION TONNES OF EMISSIONS SAVED UNDER THE NEW SOUTH WALES ENERGY SAVINGS SCHEME

NEW SOUTH WALES ENERGY SAVINGS SCHEME

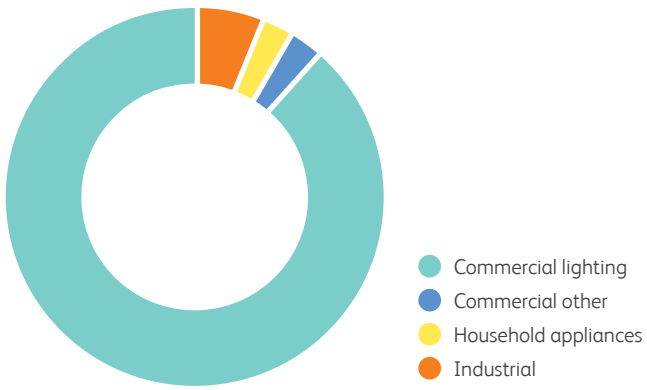
The New South Wales Energy Savings Scheme reduces electricity consumption in the state by creating financial incentives to invest in energy savings activities. These include everything from installing more efficient lighting or industrial equipment to retrofitting commercial buildings and buying whitegoods with a higher star rating. Upgrades to commercial lighting have delivered the largest savings under the program to date.

When households or businesses invest in reducing their energy use under the program, energy savings certificates (ESCs) are created. So far the program has also saved almost 4 million tonnes of emissions at a low cost. The amount of energy saved continues to increase each year and at the end of 2013, 112 businesses were accredited to provide services under the scheme.

NSW ENERGY SAVINGS CERTIFICATES CREATED BY YEAR[42]



BREAKDOWN OF ENERGY SAVINGS CERTIFICATES (ESCS) FOR 2013[43]



ENERGY EFFICIENCY

VICTORIAN ENERGY SAVER INCENTIVE

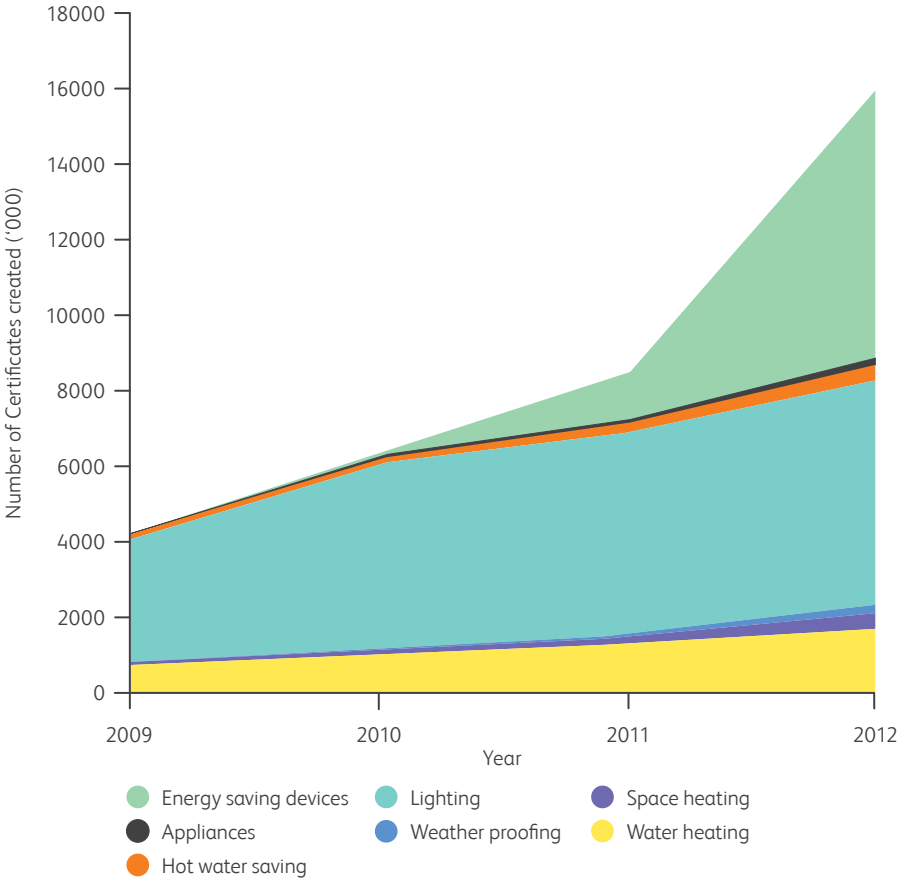
The Victorian Energy Saver Incentive, also known as the Victorian Energy Efficiency Target (VEET), has so far helped reduce energy costs for around 1.3 million households and businesses through approximately 2.5 million installations.

The Victorian program has created an industry sector that is highly diverse, ranging from businesses that install energy efficiency products or provide consulting services through to energy retailers and manufacturers.[44] There were 134 businesses accredited to provide services under the scheme at the end of 2013, supporting approximately 2500 jobs.

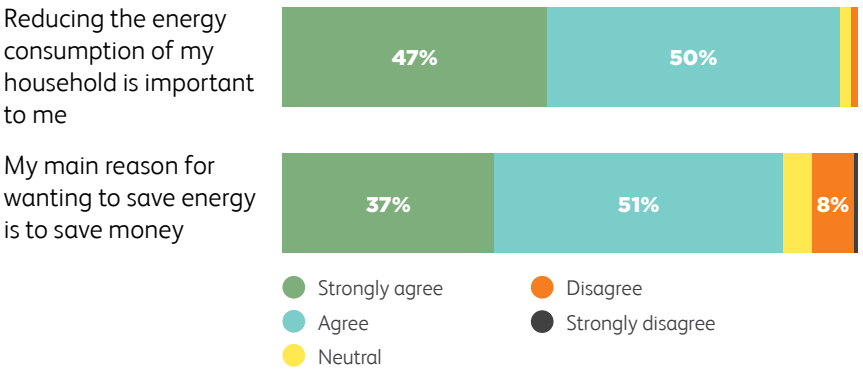
As with the New South Wales scheme, lighting has provided the largest energy savings, although hot water saving and water heating improvements have also been successful at reducing energy use.

The Victorian Government announced in May 2014 that the program would be phased out at the end of 2015.

BREAKDOWN OF VICTORIAN ENERGY SAVINGS CERTIFICATES BY YEAR AND TECHNOLOGY[45]



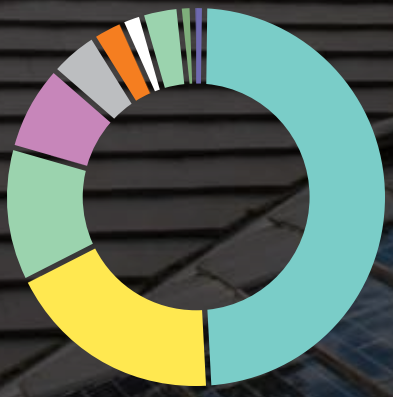
A survey conducted by the Essential Services Commission in 2013[46] on Victorian residents who had received an installation through VEET found:



44 Energy Saver Incentive Scheme: Phase 1 Evaluation Survey, September 2011, http://www.dpi.vic.gov.au/energy/environment-and-community/energy-efficiency/energy-saver-incentive-scheme/esi-scheme-phase-1-evaluation-survey

45, 46 Victorian Government ESC Public Forum, 8 November 2013, available: https://www.veet.vic.gov.au/Public/Pub.aspx

2013 VEET CERTIFICATES BY ACTIVITY



Standby power controllers	50%
Lighting	18.4%
Space conditioning	12.2%
Shower roses	7.3%
Water heating	4.6%
Commercial lighting	2.6%
Fridge/freezer	2.3%
Space heating	2.1%
In home displays	0.5%
High efficiency TV and clothes dryer	0.1%

Image: 8-star energy efficiency house, New South Wales

ENERGY EFFICIENCY

CASE STUDY
MARK GROUP

Mark Group was established in the United Kingdom in 1974 and has since grown to employ more than 2000 employees in the UK, the United States, Australia and New Zealand.

The business's Australian operations now employs more than 140 people directly and provides work to about 60 sub-contractors.

Mark Group's Australian Chairman Rob Grant established the local arm of the company in October 2009, recognising the potential for growth in the Australian market.

"We now operate in every mainland state and have grown to be one of the largest solar power installers in the country," Mr Grant said.

"Many new employees are unskilled and long-term unemployed and we provide a comprehensive training program to teach them valuable skills in installing renewable energy and energy efficiency products.

"We have a fully equipped training centre at Macquarie Park in NSW, where all employees are trained in best practice installation and work safety.

"Our growth plans indicate a doubling of employment in the next two years," he said.

CASE STUDY
GYPROCK MANUFACTURING PLANT

Gyprock, a plasterboard, cornice and plastering manufacturer located in Brisbane, engaged CSR Bradford Energy Solutions to recommend ways to reduce its power bills and emissions.

Gyprock's electricity bills were about $50,000 a month. A comprehensive site assessment at the plant identified two main areas that could deliver permanent savings – the lighting in the manufacturing hall and warehouse; and power losses due to inefficient distribution of energy.

Overall, 283 metal halide lamps were replaced with low energy induction lamps, ensuring that the lower energy lamps would both meet Australian Standards and provide a safe and comfortable work environment. The lighting switch resulted in savings of more than $28,500 per year.

A power factor correction was also installed, delivering a monthly saving of $1800. The project was successful in attracting grants from the federal Clean Technology Investment Program and an Energex Demand Management Grant.

PROJECT SUMMARY

REPLACEMENT OF LIGHTING
$28,570 per year

POWER FACTOR CORRECTION
$21,600 per year

TOTAL SAVINGS
$50,170 per year

CARBON EMISSIONS
Cut by 190 tonnes

TOTAL PROJECT COST
$228,000

CLEAN TECHNOLOGY INVESTMENT PROGRAM GRANT
$65,000

ENERGEX DEMAND MANAGEMENT GRANT
$48,500

TOTAL PAYBACK
4.5 years

PAYBACK WITH GRANTS
2.3 years

ENERGY STORAGE

One technology with significant potential to transform our entire energy system is energy storage. Currently very little of the power we produce can be stored, meaning that power must be generated constantly to meet the demands of a modern society.

Whether at a household, commercial or industrial scale, the widespread use of electricity storage has major implications for the power system as we know it. Companies in Australia and internationally are working on new technologies with the potential to drive down the cost of storing energy.

Storage could help us deal more effectively with challenges such as peak demand, as well as maximising the efficiency of our power generation and reducing the use of expensive fuels such as diesel for remote operations and communities that are located off the power grid.

COMPANIES INVESTIGATING STORAGE[47]

OWNER	TECHNOLOGY TYPE	LOCATION OF PLANT	STATE	STATUS OF PLANT
Horizon Power	Flywheel storage system	Marble Bar, Nullagine	WA	2 x 500 kW storage system installed to support solar power stations
Ergon Energy	Battery	Magnetic Island	QLD	Modular 5 kW batteries storage trial to support solar
Hydro Tasmania/ Ecoult	Battery	King Island	TAS	CSIRO-developed UltraBattery being trialled as part of Hydro Tasmania's King Island Renewable Energy Integration Project in Bass Strait
Ausgrid/ Energy Australia	Battery	Newcastle Scone Newington	NSW	5 kW battery storage devices at volunteer properties across five sites

CASE STUDY
SJW MUSHROOMS, SUNSHINE COAST, QUEENSLAND

One enterprising mushroom farmer is doing things a bit differently, using the heat of the Queensland sun to provide a cool environment to grow mushrooms.

SJW Mushrooms owner Steven Willemse invested over $100,000 in a 60 kilowatt solar power system with a battery back-up, which was installed by MaxiSolar.

His inspiration came during a four-day blackout in January 2013 following Cyclone Oswald, when the enterprise lost $20,000 in stock. As well as providing some peace of mind about the farm's energy security, the solar system will help protect the business from rising power bills.

The batteries are used to power the cooling of the mushroom sheds during the evening or as back-up in the event of a blackout.

Mr Willemse expects the solar power system to have paid for itself within five years.

47 Marchment Hill Consulting, 2012, Energy Storage in Australia

COGENERATION/ TRIGENERATION

A cogeneration system both generates power and makes use of the heat that is produced during the process. For this reason the technology is sometimes called combined heat and power. Trigeneration takes this a step further by converting some of the heat into cooling.

Both cogeneration and trigeneration are extremely efficient technologies. Cogeneration can be up to 80 per cent more energy-efficient than conventional energy sources, producing around 60 per cent lower carbon emissions.

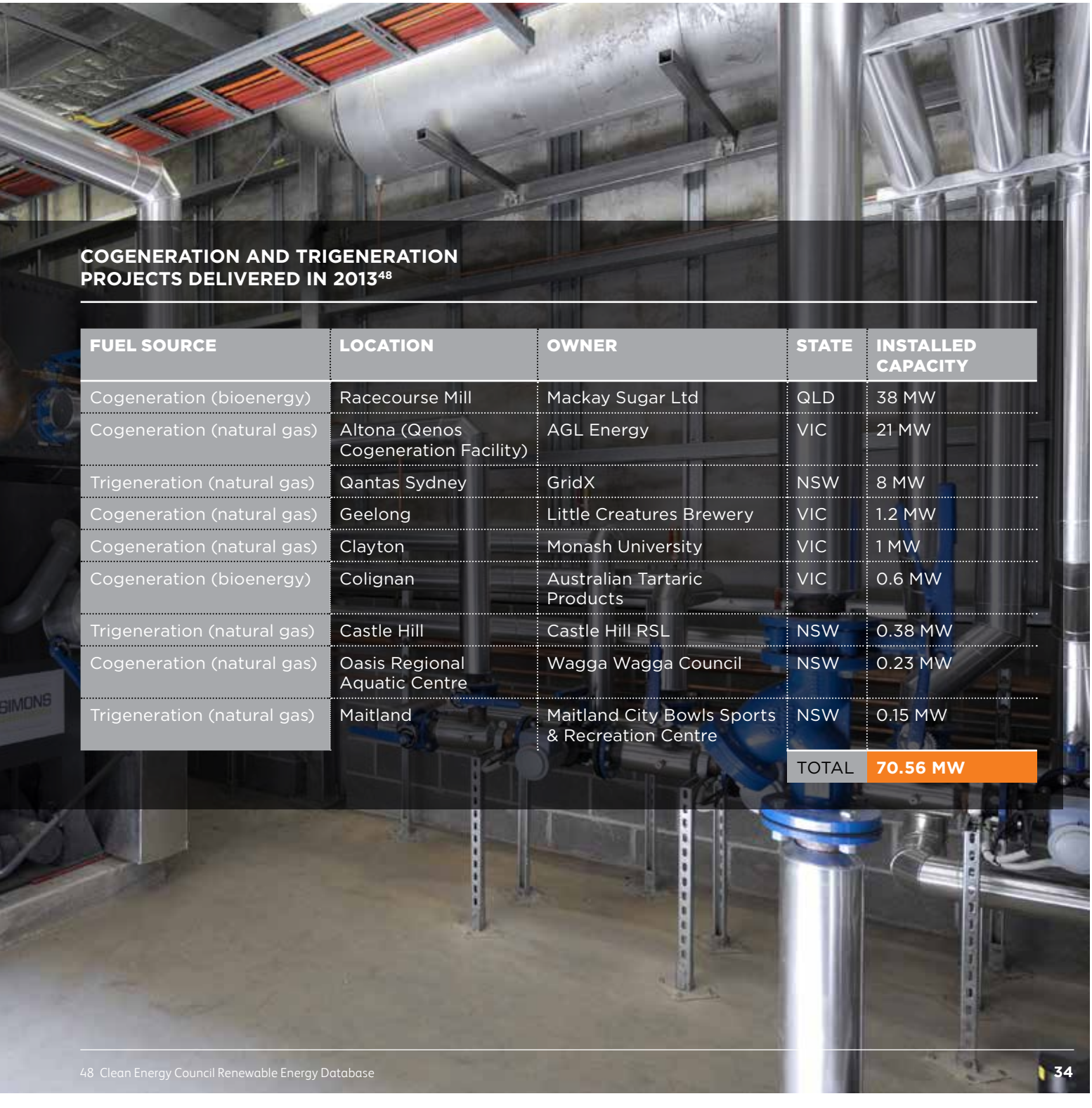
Cogeneration and trigeneration can use a variety of fuels, including biogas, biomass, natural gas, coal and petroleum products. The majority of facilities in Australia use either natural gas or biomass such as sugar cane waste. While they are mature technologies, the broader use of cogeneration and trigeneration is being held back by overly complex grid connection processes and sometimes heavy regulatory burdens, as well as the ongoing increase in natural gas prices.

There are many examples of cogeneration and trigeneration plants on properties such as:

- Hospitals and health facilities
- Hotels, cinemas and hospitality venues
- Industrial, manufacturing, commercial and retail facilities
- Educational facilities, universities and TAFEs
- Public utilities such as RailCorp and Sydney Water.

Australia has approximately 3305 megawatts (MW) of cogeneration installed, with another 18 MW of trigeneration. The largest trigeneration plant is the GridX 8 MW power plant installed at the Qantas headquarters in Sydney, which came online in 2013 and will supply the facility with electricity, heating and cooling while cutting emissions by approximately 14,000 tonnes per year.

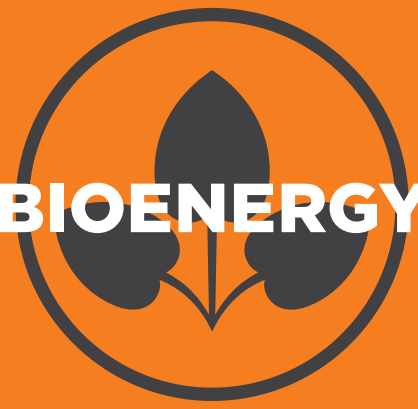
Castle Hill RSL trigeneration project, NSW



COGENERATION AND TRIGENERATION PROJECTS DELIVERED IN 2013[48]

FUEL SOURCE	LOCATION	OWNER	STATE	INSTALLED CAPACITY
Cogeneration (bioenergy)	Racecourse Mill	Mackay Sugar Ltd	QLD	38 MW
Cogeneration (natural gas)	Altona (Qenos Cogeneration Facility)	AGL Energy	VIC	21 MW
Trigeneration (natural gas)	Qantas Sydney	GridX	NSW	8 MW
Cogeneration (natural gas)	Geelong	Little Creatures Brewery	VIC	1.2 MW
Cogeneration (natural gas)	Clayton	Monash University	VIC	1 MW
Cogeneration (bioenergy)	Colignan	Australian Tartaric Products	VIC	0.6 MW
Trigeneration (natural gas)	Castle Hill	Castle Hill RSL	NSW	0.38 MW
Cogeneration (natural gas)	Oasis Regional Aquatic Centre	Wagga Wagga Council	NSW	0.23 MW
Trigeneration (natural gas)	Maitland	Maitland City Bowls Sports & Recreation Centre	NSW	0.15 MW
			TOTAL	**70.56 MW**

SUMMARY OF CLEAN ENERGY GENERATION



BIOENERGY

6.9%
OF TOTAL CLEAN ENERGY GENERATION

139
OPERATIONAL PLANTS

GEOTHERMAL

0.001%
OF TOTAL CLEAN ENERGY GENERATION

2
OPERATIONAL PLANTS

HOUSEHOLD SOLAR

11%
OF TOTAL CLEAN ENERGY GENERATION

1,250,000
INSTALLATIONS (APPROX)

WIND

26%
OF TOTAL CLEAN ENERGY GENERATION

68
OPERATIONAL PLANTS

55%
OF TOTAL CLEAN ENERGY GENERATION

123
OPERATIONAL PLANTS

7%
EQUIVALENT OF CLEAN ENERGY GENERATED SAVED THROUGH SOLAR WATER HEATING

847,700
INSTALLATIONS

0.21%
OF TOTAL CLEAN ENERGY GENERATION

49
OPERATIONAL PLANTS

0.001%
OF TOTAL CLEAN ENERGY GENERATION

1
OPERATIONAL PLANT

BIOENERGY

Bioenergy refers to renewable energy produced from organic matter, known in the industry as biomass.

Bioenergy is a sustainable way to produce energy from waste. Just under two-thirds of the country's bioenergy generating potential comes from the fibrous sugar cane waste known as bagasse, and as a result cogeneration plants are often found in locations close to sugar cane processing areas.

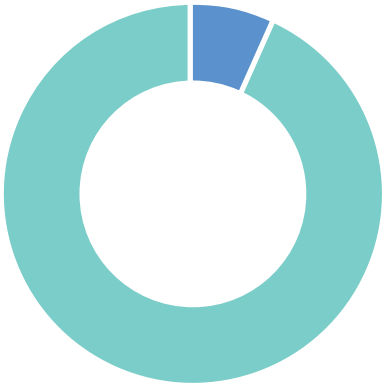
Landfill gas is the second most common fuel used to produce bioenergy in Australia, converting methane from landfills into energy. This type of power has one of the lowest costs of any energy source. Other bioenergy fuel sources include wood waste, household garbage, sewage gas, crop and livestock waste and 'black liquor' – a by-product of the paper-making process. Bioenergy generators tend to be smaller than hydro plants or wind farms.

Queensland has the largest bioenergy sector of any state, with its power stations accounting for over half the country's bioenergy generation potential. Australia's largest bioenergy pant is Sucrogen's 68 megawatt (MW) Pioneer Mill near Ayr in North Queensland.

Mackay Sugar brought its new biomass cogeneration power station online in 2013. The 38 MW Racecourse power plant will generate power for the Racecourse Sugar Mill, as well as delivering enough power to the grid to supply around a third of Mackay's electricity requirements.

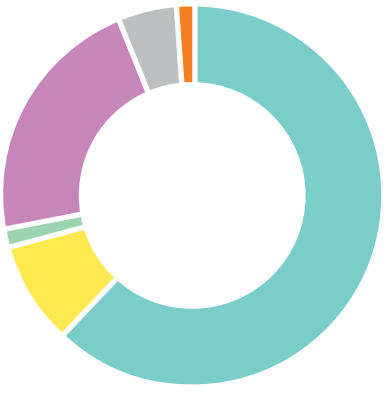
The Colignan Cogeneration plant (0.6 MW), installed by Australian Tartaric Products in Mildura, came online in 2013. The project uses spent grape waste to generate electricity, demonstrating an innovative use of food and agriculture waste.

Bioenergy currently generates approximately 2400 GWh per annum – just over 1 per cent of Australia's total electricity generation.

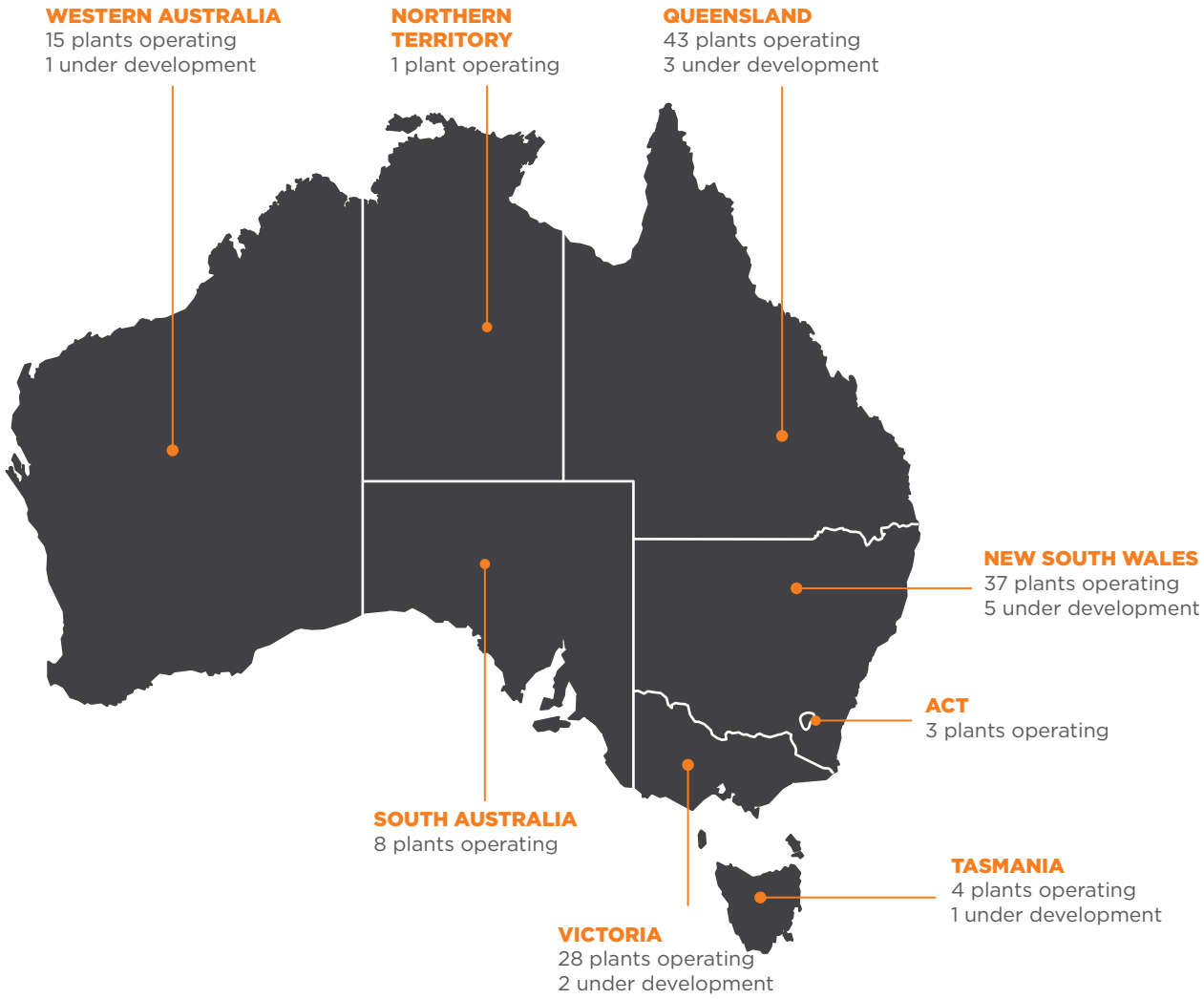


6.9%
OF TOTAL CLEAN ENERGY GENERATION

CAPACITY OF BIOENERGY SUB-SECTORS BY PERCENTAGE[49]



Bagasse Cogeneration	62%
Landfill gas	22%
Black Liquor	9%
Sewage gas	5%
Food and agricultural wet waste	1%
Wood waste	1%



BIOENERGY PLANTS COMMISSIONED IN 2012 AND 2013[50]

FUEL SOURCE	LOCATION	OWNER	STATE	COMMISSION YEAR	INSTALLED CAPACITY
Bagasse Cogeneration	Racecourse	Mackay Sugar	QLD	2013	38 MW
Landfill Gas	Woodlawn Bioreactor (Unit 5)	Veolia Environmental Services	NSW	2012	1.1 MW
Food and Agricultural Wet Waste	Colignan Cogeneration Plant (Mildura)	Australian Tartaric Products	VIC	2013	0.6 MW
Food and Agricultural Wet Waste	Young	Blantyre Farms	NSW	2012	0.16 MW

50 Clean Energy Council Renewable Energy Database

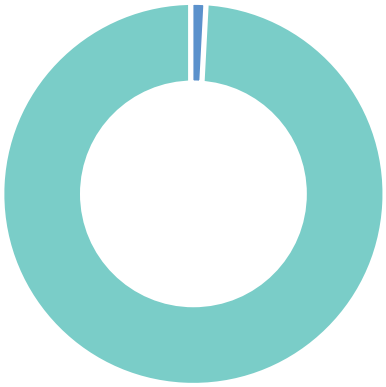
GEOTHERMAL

Geothermal technology has been used successfully on a large scale in many countries.

Several Australian companies have been working on a new type of technology to harness the power of hot rocks and super-heated water reservoirs up to 5 km beneath the surface of the Earth.

Although this technology shows immense promise, progress has not been as swift as its early financial backers may have wished. However, Geodynamics passed a significant milestone in May 2013 when it commissioned Australia's first 'hot rocks' geothermal pilot plant (see case study).

Australia currently has one commercial geothermal power plant at Birdsville in Queensland.



0.001%
OF TOTAL CLEAN ENERGY GENERATION

CASE STUDY
1 MW HABANERO PILOT PLANT PROJECT, COOPER BASIN, SOUTH AUSTRALIA

The Habanero Pilot Plant developed by Geodynamics Limited works by using superheated water from a high-pressure underground reservoir to generate energy.

Although the water is naturally heated to over 250 degrees Celsius, the intense pressure that exists 5 km underground means that it remains in liquid form.

A 'production well' drilled down to the reservoir enabled the water to travel to the surface where the heat was converted to electricity. The cooled water was then pumped back down to the reservoir via a separate 'injection well'. This type of power is known as an enhanced geothermal system (EGS) or hot fractured rock geothermal system.

The Habanero Pilot Plant operated between 30 April and 7 October 2013. It was Australia's first working EGS system and one of only a handful in the world. Two deep wells were drilled for the operation of the plant – one well for the injection of water and the other for the production of power.

Results of the project exceeded expectations and the plant is being maintained for further trials or as part of future commercial development of the technology. The information obtained during the trial was significant both for the Australian geothermal industry and worldwide.

Image: suspended drill at Habanero Pilot Plant Project

GEOTHERMAL PLANTS OPERATING IN 2013

LOCATION	OWNER	STATE	INSTALLED CAPACITY
Innamincka (Cooper Basin)	Geodynamics	SA	1 MW trial plant
Ergon Energy	Birdsville	QLD	0.12 MW

GEOTHERMAL PLANTS IN DEVELOPMENT IN 2013[51]

LOCATION	OWNER	STATE	INSTALLED CAPACITY
Innamincka (Cooper Basin)	Geodynamics	SA	Recorded closed loop flows and high well-head temperatures of 215 degrees Celsius. Looking at using trial results to put forward proposals to companies to further develop the project.
Paralana	Petratherm	QLD	Has drilled two wells. Awarded funding from ARENA to drill third well- Paralana 3.

51 Clean Energy Council Renewable Energy Database

HYDRO

Australia's network of 123 operating hydro power stations produced enough electricity in 2013 to power the equivalent of almost 2.7 million homes. These hydro plants produced 8.2 per cent of all the electricity generated in Australia during the year, and were responsible for more than half of clean energy's total contribution.

55%
OF TOTAL CLEAN ENERGY GENERATION

Most of the country's hydro power is generated by the Snowy River Hydro Scheme in New South Wales and Hydro Tasmania's network of power plants. Most suitable sites for hydro power in Australia have already been developed and there is limited scope for growth. The development of mini hydro plants or upgrading existing power plants makes up most of the additional activity in the sector.

Rainfall was above average for Australia's eastern coastline and northern Tasmania in 2013 – the location of key hydro catchments. Parts of Tasmania experienced repeated heavy rains and flooding between July and November.

The strong rainfalls and a strategy to build up storages to take advantage of the carbon price saw water levels at Hydro Tasmania's Gordon Dam – the state's largest hydro generator – rise to their highest since the late 1990s.

The substantially higher output across the Tasmanian and Snowy Mountain schemes helped hydro push clean energy's contribution to the country's total power supply to 14.76 per cent, a significant increase on the previous year. This is likely to fall in 2014 as generation at the Gordon Dam returns to average levels.

TOP HYDRO PLANTS IN AUSTRALIA IN 2013 – BY GENERATION[52]

HYDRO PLANT	OWNER	STATE	GENERATION
Gordon	Hydro Tasmania	TAS	2794 GWh
Murray 1 & 2	Snowy Hydro	NSW	2395 GWh
Upper Tumut	Snowy Hydro	NSW	1705 GWh
Poatina	Hydro Tasmania	TAS	1372 GWh
Reece 1 & 2	Hydro Tasmania	TAS	1042 GWh

Murray 1 and 2 are physically located in NSW but the electricity is fed into the Victorian electricity market.

52 IES, AEMO

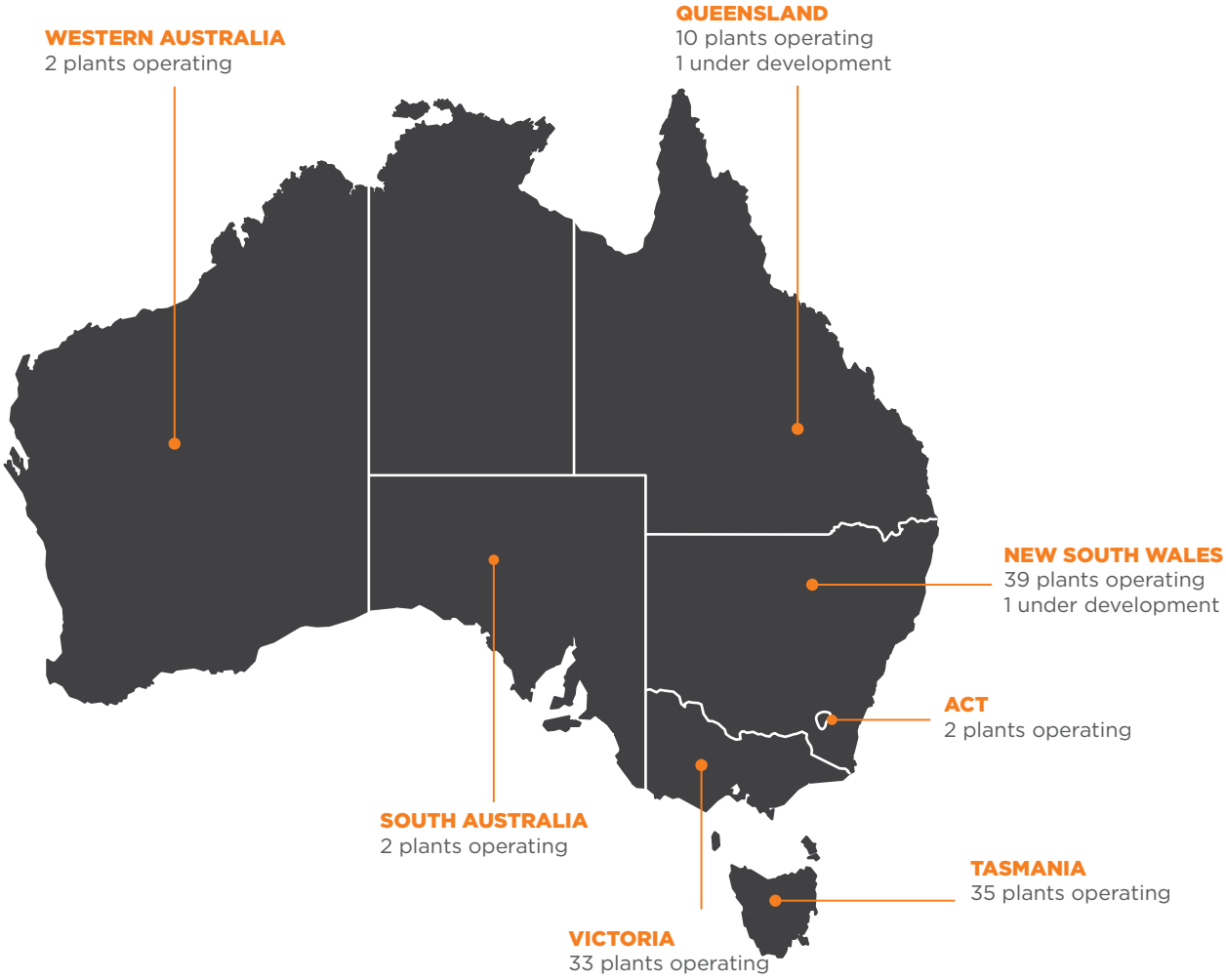


Image: Gordon Hydroelectric Power Station, Tasmania

MARINE

Marine energy uses the movement of water to generate electricity through tides, current or waves. Australia's coastal areas are a massive potential source of marine energy.

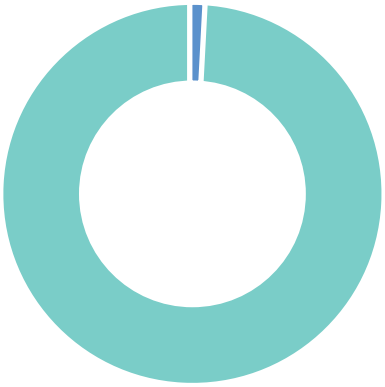
In 2013, 18 companies were actively investigating a variety of innovative marine energy projects in Australia, using tides, currents or waves to generate electricity.

The main challenge with the different types of marine technology in development lies in proving they are economically feasible and able to compete on cost with more established forms of renewable energy.

The country's best sources of wave energy are along the southern coastline. Some of the most outstanding sources of tidal energy occur in areas where there is a large movement between low and high tide, which can be amplified in some areas by the local geographical features. Regions being investigated include the Kimberley and Pilbara coasts of Western Australia's northern coastline, off the coast of northern Australia and Bass Strait in Tasmania.

Marine energy projects under development range from 250 kilowatt trials to Carnegie Wave Energy's 5 megawatt commercial power plant, which will supply power to a Department of Defence submarine facility on Garden Island in Western Australia. Carnegie Wave Energy and UK-based tidal developer Atlantis Resources Corporation announced an agreement in February 2014 to collaborate on a range of areas including technology and project development. The agreement aims to lower the cost of both wave and tidal generation.

In 2013 Lockheed Martin announced that it had signed a contract with Ocean Power Technologies Australasia to develop a 62.5 megawatt wave energy project along the Victorian coastline.



0.001%
OF TOTAL CLEAN ENERGY GENERATION

WAVE AND TIDAL PILOT PLANTS CURRENTLY OPERATING[53]

TECHNOLOGY TYPE	OWNER	LOCATION	STATE	INSTALLED CAPACITY
Wave	Carnegie Wave Energy	Fremantle	WA	0.1 MW
Wave	Oceanlinx	Port MacDonnell	SA	1 MW plant under construction (future of project is currently being assessed)

53 Clean Energy Council Renewable Energy Database

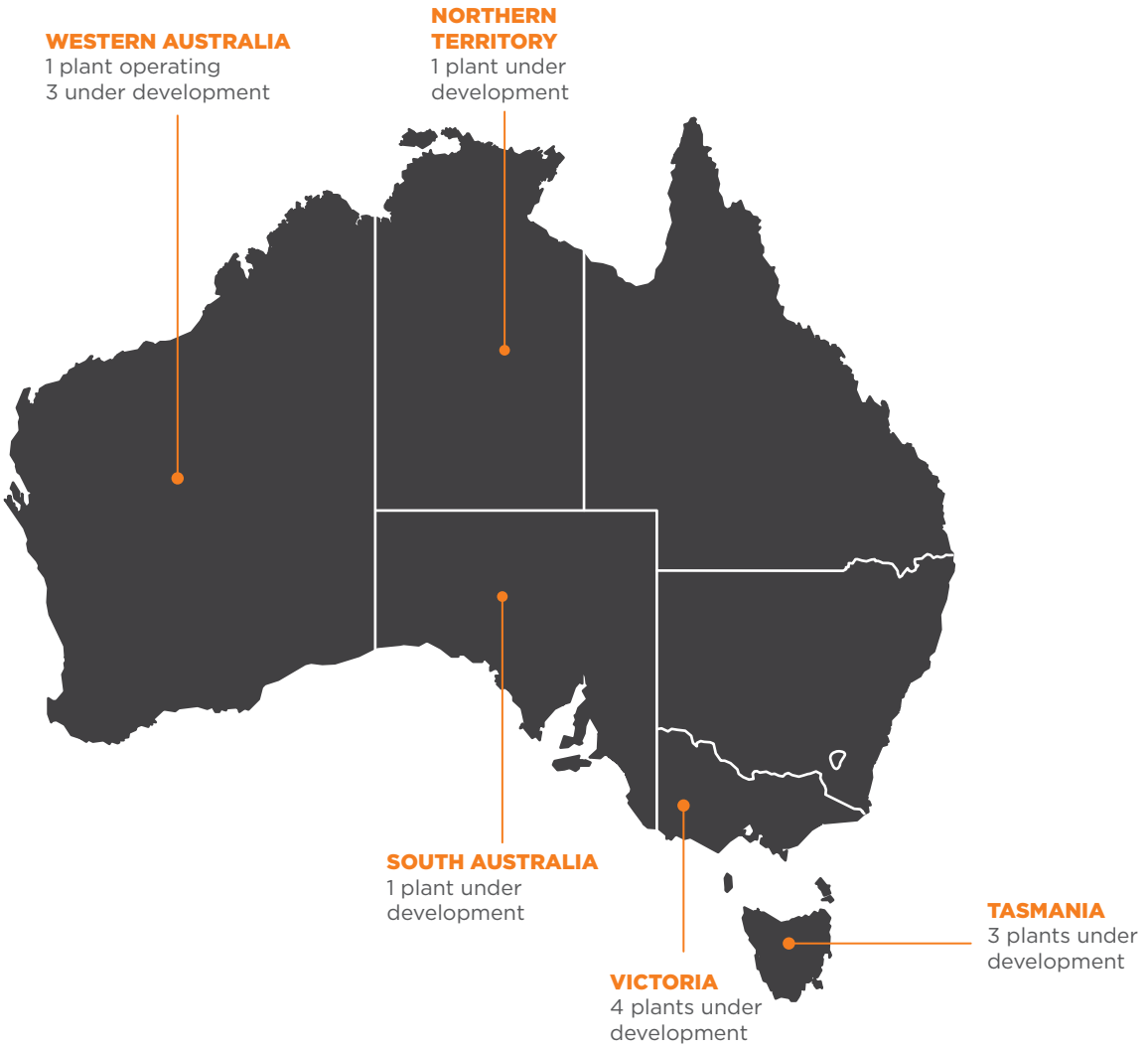


Image: Wave energy research facility, Fremantle

SOLAR POWER

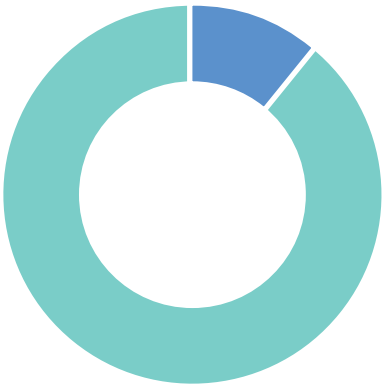
Almost 1.25 million small-scale solar power systems were installed by the end of 2013, meaning that approximately 3.1 million Australians now live or work beneath a set of solar panels. Solar power produced 1.62 per cent of the country's total electricity generation during the 2013 calendar year.

The one millionth solar power system was installed in the first half of 2013. The milestone came in a year where the solar market contracted following the reduction of all state-based solar power incentives. While more than 200,000 systems were installed during the year – the industry's third most successful in history – sales were a long way short of the historical highs of the preceding two years. With the cost of systems continuing to fall alongside growing awareness and concern about rising energy bills, the business case for solar remains very compelling.

Data from the Clean Energy Regulator continues to show that Australians from all walks of life are embracing solar technology. Residents from affluent inner-city suburbs generally installed solar at much lower rates than those in mortgage belt, retirement and regional areas.

Now that the last state-based solar incentive has been reduced, the industry has entered a period of consolidation as less profitable businesses are pushed out of the market. The closure of some state-based support schemes brought forward many months' worth of work as customers rushed to take advantage of them. This resulted in a quieter year in 2013 compared to 2012 and the peak in 2011.

There were 4595 solar installers across the country at the end of 2013. This is a drop of 5 per cent compared to the year before and reflects the consolidation of the sector following the reduction of state support schemes.



11%

OF TOTAL CLEAN ENERGY GENERATION

4670

BUNDABERG, QLD

AUSTRALIA'S TOP SOLAR POSTCODE, WITH 8015 INSTALLATIONS

4595

SOLAR INSTALLERS COUNTRYWIDE AT THE END OF 2013

TOP 10 SOLAR POSTCODES IN AUSTRALIA

POSTCODE	NUMBER OF INSTALLATIONS	POSTCODE COVERAGE
4670	8015	QLD – Bundaberg and surrounds
6210	7362	WA – Mandurah
4551	6574	QLD – Caloundra region
4655	6525	QLD – Hervey Bay
4350	5928	QLD – East Toowoomba
4305	5268	QLD – Ipswich and surrounds
4211	5039	QLD – Nerang and hinterland
6065	4799	WA – Wanneroo
4207	4703	QLD – Beenleigh and Yatala
6155	4662	WA – Canning Vale
4570	4622	QLD – Gympie

TOP SOLAR POSTCODES FOR EACH STATE

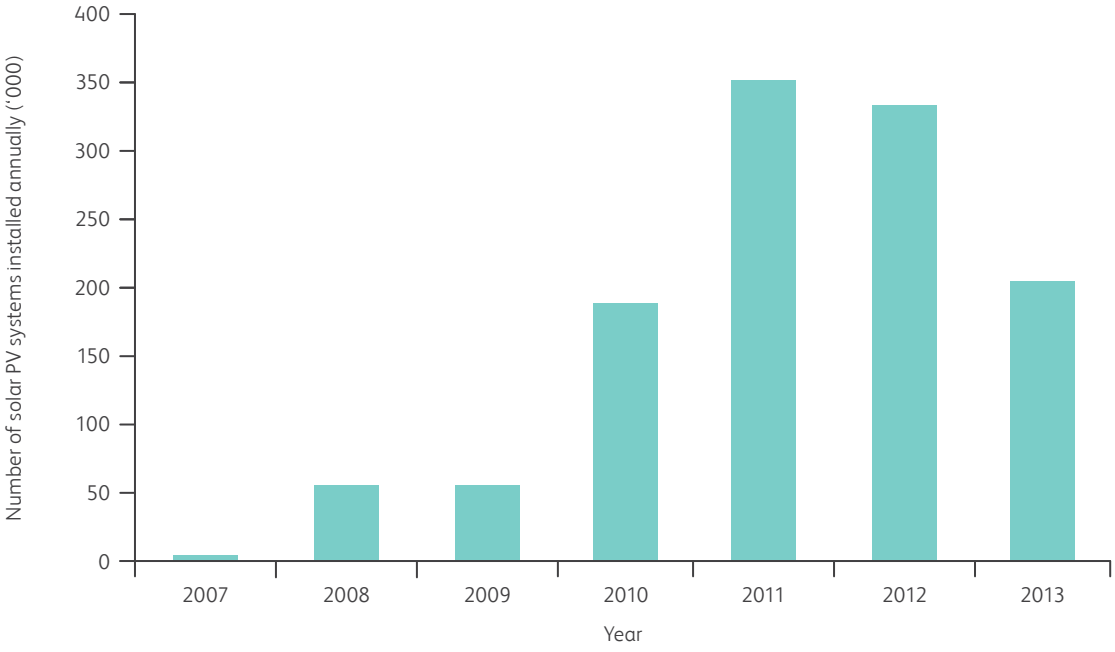
STATE	POSTCODE	NUMBER OF INSTALLATIONS	POSTCODE COVERAGE
QLD	4670	8015	Bundaberg and surrounds
WA	6210	7362	Mandurah
NSW	2830	4024	Dubbo and surrounds
VIC	3029	4185	Hoppers Crossing
SA	5162	3968	Morphett Vale, Woodcraft
TAS	7250	1701	Launceston

The top 10 solar postcodes in each state are available in the Appendix

Image: Solar installers, Melbourne

SOLAR POWER

ANNUAL NUMBER OF SOLAR PV SYSTEM INSTALLATIONS IN AUSTRALIA[54]

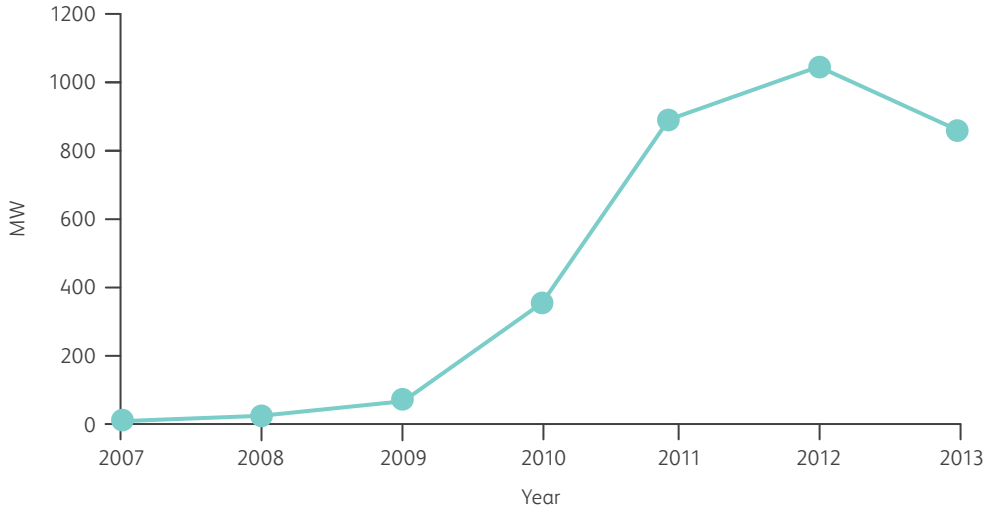


ANNUAL NUMBER OF SOLAR PV SYSTEM INSTALLATIONS IN AUSTRALIA[54]

YEAR INSTALLED	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	NATIONAL
2007	102	670	2	348	719	26	606	156	**2629**
2008	277	14,026	225	18,377	8592	1454	8735	11,166	**62,852**
2009	803	14,009	215	18,283	8573	1452	8429	11,157	**62,921**
2010	2390	69,887	637	48,691	16,703	1889	35,680	22,292	**198,169**
2011	6944	80,115	401	95,261	63,476	2475	60,203	51,658	**360,533**
2012	1560	53,825	512	130,158	41,803	6358	66,198	42,628	**343,042**
2013	2553	36,605	986	79,581	28,247	7552	33,666	24,050	**213,239**
TOTAL*	**14,658**	**269,748**	**2983**	**390,987**	**169,679**	**21,230**	**214,291**	**163,200**	**1,246,775**

*includes pre 2007

ANNUAL CAPACITY OF SOLAR PV INSTALLED IN AUSTRALIA (2007–13)[55]



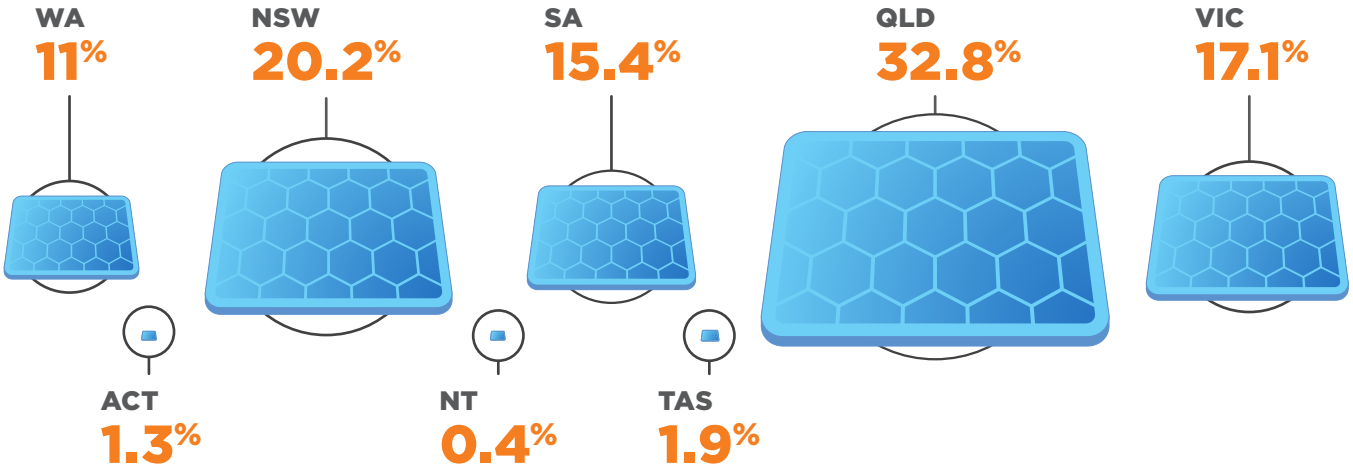
ANNUAL CAPACITY OF SOLAR PV INSTALLED IN AUSTRALIA (2007–13)[55]

	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	NATIONAL (MW)
2007	0.20	1.10	0.00	0.57	1.16	0.04	0.97	0.27	**4.30**
2008	0.49	4.21	0.41	4.16	4.88	0.24	2.73	2.92	**20.05**
2009	1.28	19.20	0.51	24.51	12.44	1.72	10.51	14.30	**84.48**
2010	5.35	153.06	1.49	92.35	33.23	3.02	58.95	42.15	**389.60**
2011	17.42	194.82	1.80	225.06	163.25	5.91	140.27	122.97	**871.52**
2012	5.08	144.33	4.95	418.01	137.82	20.24	207.46	99.46	**1034.68**
2013	11.66	141.40	4.95	308.64	147.06	32.40	137.17	76.69	**859.97**
TOTAL*	**41.54**	**659.03**	**11.47**	**1073.79**	**502.39**	**63.60**	**559.20**	**358.89**	**3269.90**

*includes pre 2007

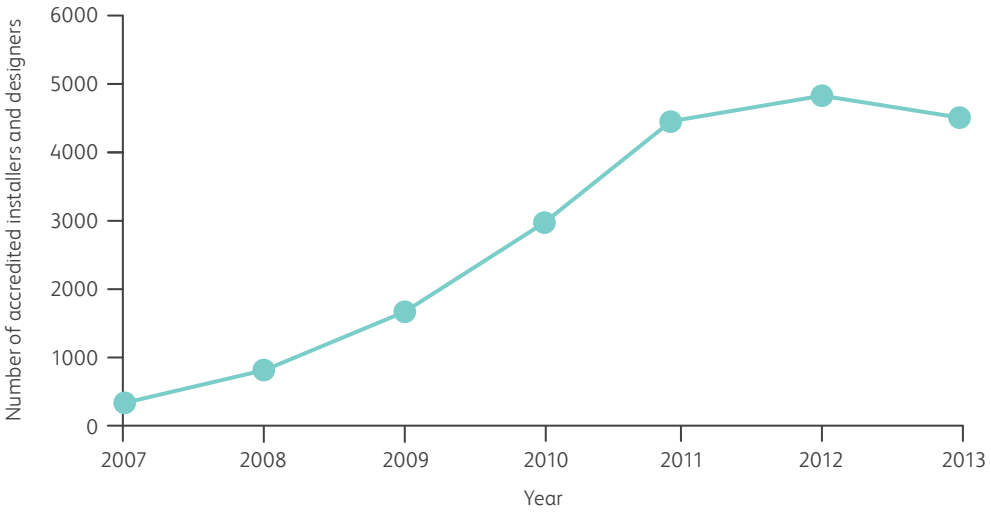
SOLAR POWER

PERCENTAGE OF SOLAR PV CAPACITY INSTALLED BY STATE[56]



Bloomberg New Energy Finance predicts another 2.6 GW – 3.7 GW of solar capacity to be installed in Australia between 2013 and 2016.[55]

TOTAL NUMBER OF ACCREDITED INSTALLERS AND DESIGNERS IN AUSTRALIA[57]

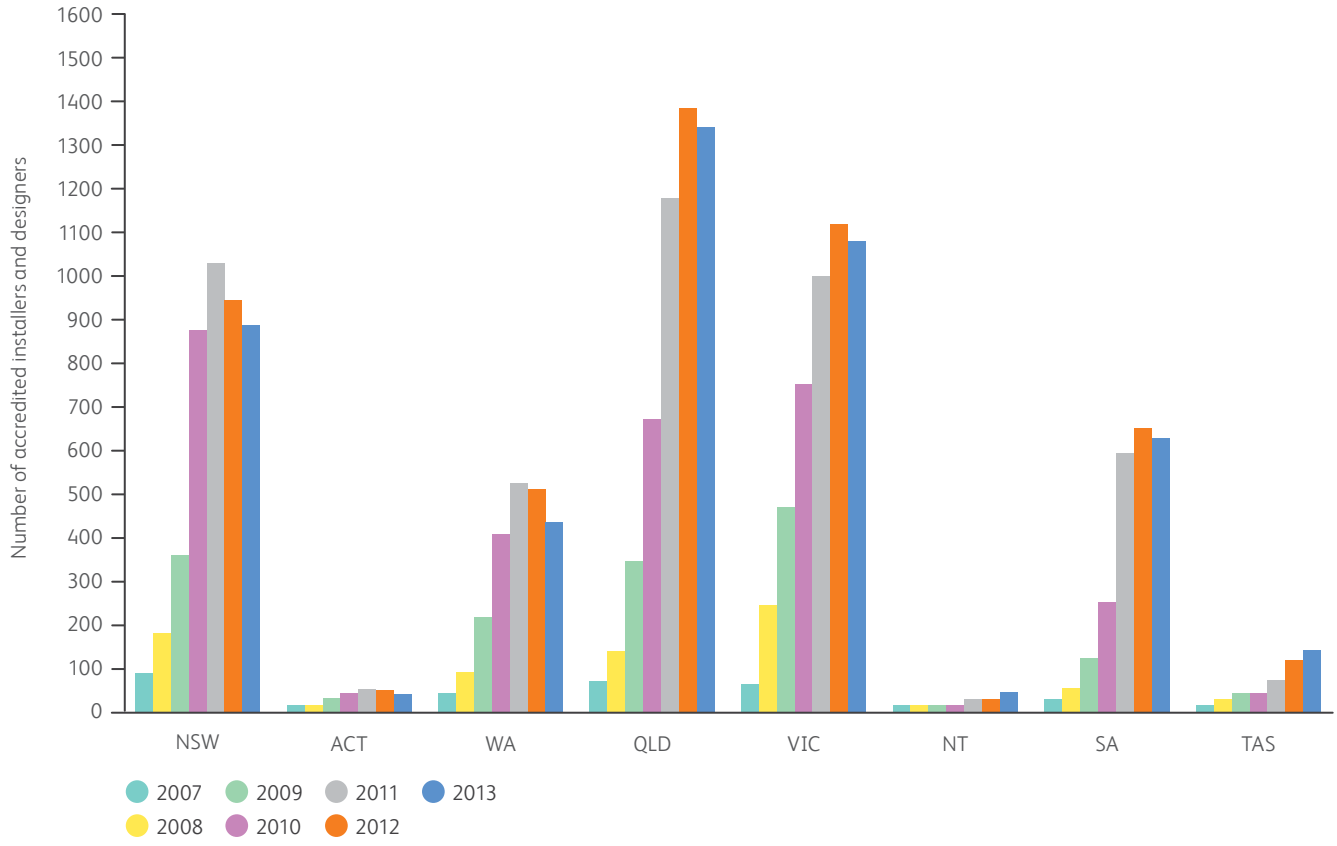


There were 4595 solar installers across the country at the end of 2013. This is a drop of 5 per cent compared to the year before and reflects the consolidation of the sector following the reduction of state support schemes.

56 SunWiz 2014. Due to rounding, totals may not add up to 100 per cent

57 Bloomberg New Energy Finance, 2013, H1 2013 Australia Clean Energy Market Outlook

ACCREDITED SOLAR PANEL INSTALLERS AND DESIGNERS IN AUSTRALIA – BY STATE

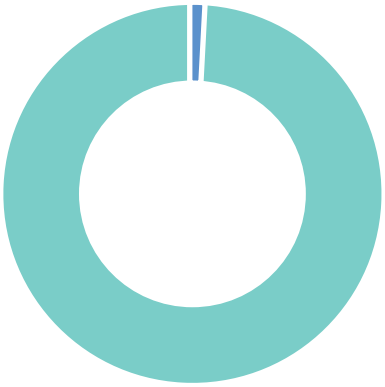


ACCREDITED SOLAR PANEL INSTALLERS AND DESIGNERS IN AUSTRALIA – BY STATE

	NSW	ACT	WA	QLD	VIC	NT	SA	TAS	TOTAL
2007	95	6	46	73	66	13	24	14	**337**
2008	192	11	95	143	245	11	57	24	**778**
2009	360	28	220	349	473	16	130	43	**1619**
2010	879	46	414	675	754	16	252	45	**3081**
2011	1034	53	531	1187	1004	22	593	71	**4495**
2012	948	48	514	1391	1122	28	650	120	**4821**
2013	894	44	439	1336	1093	41	604	144	**4595**

LARGE-SCALE SOLAR POWER

Australia's world-class solar energy resources, wide open spaces and strong public enthusiasm for large-scale solar technology combine to give this technology a bright future. With a series of projects announced in 2013 and several now under construction, large-scale solar power[58] is on its way to playing a major role in Australia's future energy mix.



0.021%
OF TOTAL CLEAN ENERGY GENERATION

Australia currently has only two genuinely large-scale solar power plants – the 10 megawatt (MW) Greenough River solar photovoltaic (PV) facility in Western Australia and a 9.3 MW solar thermal plant which was added to the Liddell coal-fired power plant in New South Wales (NSW). Meanwhile, interest in solar systems of between 30 and 400 kilowatts has rapidly increased as commercial and industrial businesses take up solar to reduce their exposure to rising energy bills. This presents an exciting future growth opportunity for the Australian solar industry.

The Australian Renewable Energy Agency (ARENA) was set up by the former Federal Government with bipartisan support to coordinate support for emerging technologies such as large-scale solar. The 102 MW Nyngan Solar Plant is the first of two large-scale solar PV projects that AGL will deliver in partnership with First Solar, with support from ARENA and the NSW Government. Construction began at Nyngan in early 2014 and it is expected to come online by mid-2015. AGL's second plant at Broken Hill is scheduled to start construction during 2014, with an expected completion date of late 2015.

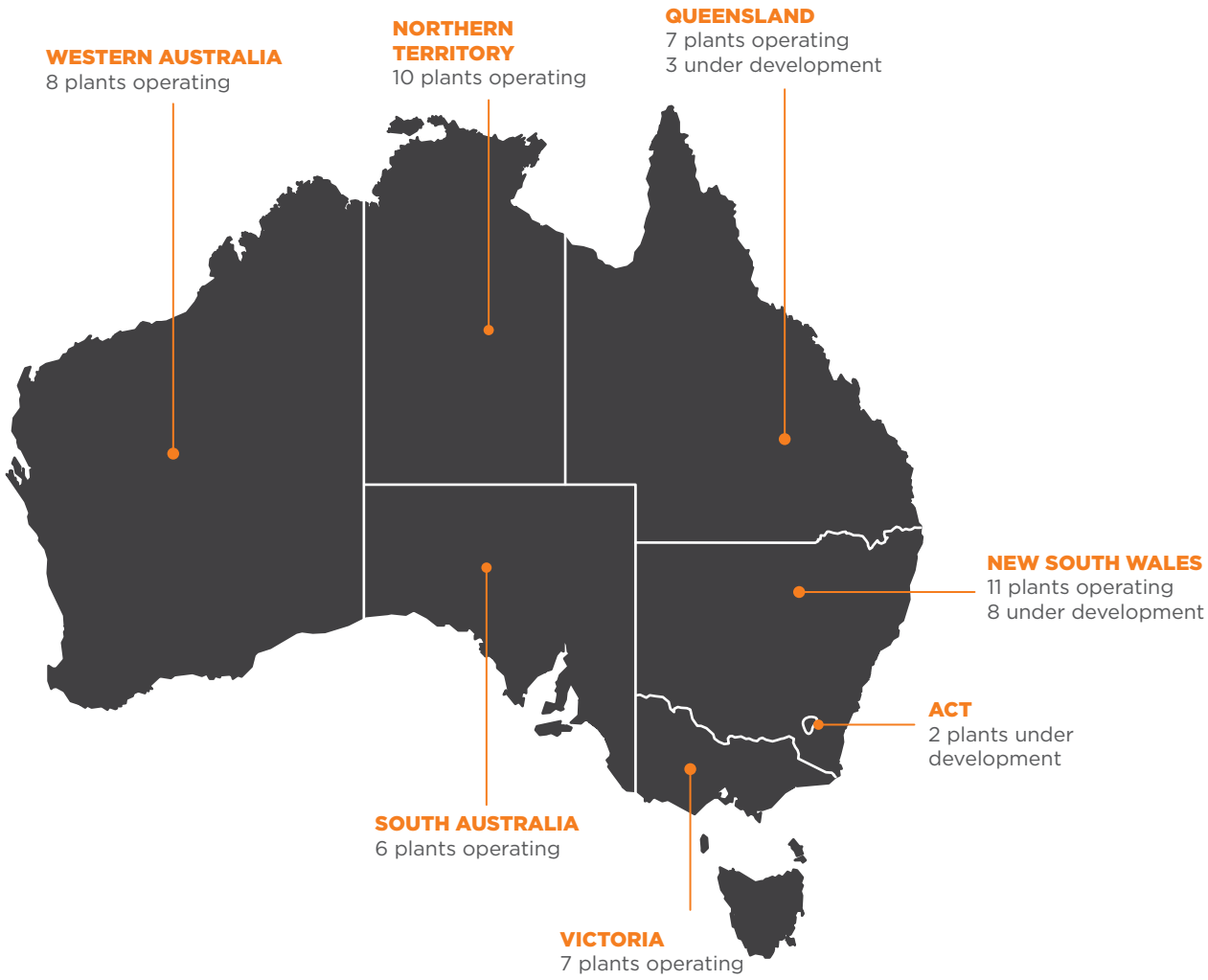
The Australian Capital Territory Government has also run a 'reverse auction' support process to reward the proponents of lowest cost large-scale solar projects. Fotowatio Renewable Ventures is currently constructing a 20 megawatt solar plant at Royalla in the ACT under this process, while two other projects have been awarded and are heading towards construction.

Almost all recent activity in the large-scale sector has been in solar PV technology, which is the same kind of technology that is installed on household rooftops.

The domestic market for large-scale solar has attracted interest from leading Australian renewable energy companies and major international investors and developers. The Federal Government announced in the 2014 Federal Budget that ARENA would be abolished and its $1.3 billion of unspent funding removed.

There are concerns that this move will cause many international investors to seek out other markets with more support for large-scale solar power.

58 Large-scale is defined as larger than 100 kilowatts



LARGE-SCALE SOLAR PLANTS COMMISSIONED IN 2013[59]

FUEL SOURCE	LOCATION	OWNER	STATE	INSTALLED CAPACITY
Solar PV	Mildura Stage 1	Silex (Solar Systems)	VIC	1.5 MW
Solar PV	Darwin	Nightcliff Shopping Centre	NT	1.06 MW
Solar PV	KJM Contractors	Edinburgh Park	SA	0.5 MW
Solar PV	Port Melbourne	NEXTDC	VIC	0.4 MW
Solar PV	Griffith	Griffith University	NSW	0.38 MW
Solar PV	Bibra Lake	Bidvest Foodservices	WA	0.3 MW
Solar PV	Griffith	De Bortoli Winery	NSW	0.23 MW
Solar PV	Frankland River	Ferngrove Wines	WA	0.23 MW
Solar PV	Moorebank	Tacca Plastics	NSW	0.2 MW
Solar PV	Mount Cotton	Sirromet Wines	QLD	0.2 MW
Solar PV	McLaren Vale	D'Arenberg Winery	SA	0.2 MW
Solar PV	Bibra Lake	Australian Wool Testing Authority	WA	0.15 MW
Solar PV	Capital East Solar Farm	Infigen Energy	NSW	0.13 MW

59 Clean Energy Council Renewable Energy Database

LARGE-SCALE SOLAR POWER

TOP 5 LARGE-SCALE COMMERCIAL SOLAR PLANTS[60]

FUEL SOURCE	LOCATION	OWNER	STATE	COMMISSION YEAR	INSTALLED CAPACITY
Solar PV	Greenough River Solar	Verve Energy / GE Energy	WA	2012	10 MW
Solar Thermal Concentrator	Liddell III	Areva / Macquarie Generation	NSW	2012	9.3 MW
Solar PV	Mildura Stage 1	Silex (Solar Systems)	VIC	2013	1.5 MW
Solar PV	St Lucia Campus	University of QLD / Ingenero	QLD	2011	1.2 MW
Solar PV	Newington	Newington Athletes Village	NSW	2010	1.1 MW

LARGE-SCALE SOLAR PROJECTS CURRENTLY UNDER CONSTRUCTION

FUEL SOURCE	LOCATION	OWNER	STATE	COMMISSION YEAR	INSTALLED CAPACITY
Solar Thermal	CS Energy	Kogan Creek	QLD	TBA	44 MW
Solar PV	Fotowatio Renewable Ventures	Royalla	ACT	2014	20 MW
Solar PV	AGL	Nyngan	NSW	2015	102 MW
Solar PV	AGL	Broken Hill	NSW	Construction expected to commence mid-2014	62 MW

60 Clean Energy Council Renewable Energy Database

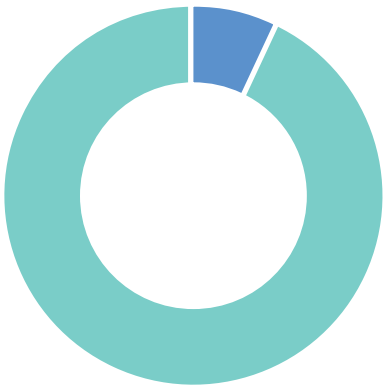
Image: Capital East Solar Farm, New South Wales

SOLAR WATER HEATING

The energy saved from solar water heating in 2013 was equivalent to 7 per cent of the clean energy generated in Australia.

Solar water heating can refer to either a solar hot water system or heat pump technology. Solar hot water systems typically use collectors on the roof of a house to capture the warmth from the sun to heat water in a tank. Heat pumps draw warmth from the air to heat water and are approximately three times more efficient than a conventional electric storage water heater.

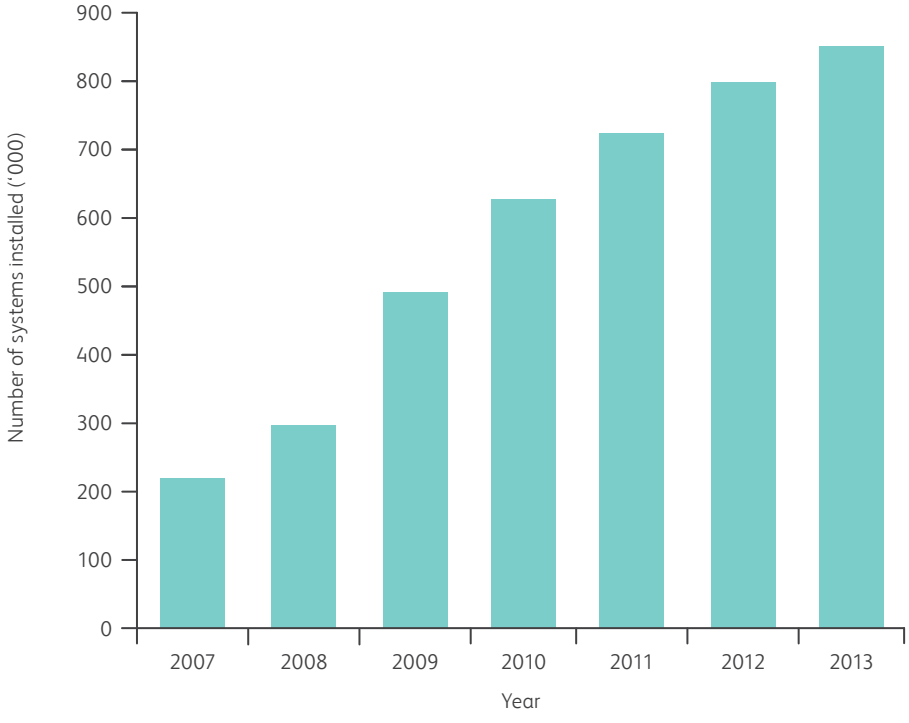
A solar water heating system can save the average household hundreds of dollars on power bills every year compared to an electric hot water system, as well as lowering emissions by 2.4 to 3 tonnes. Many solar water heaters are manufactured in Australia, and the use of this technology supports local jobs.



7%

EQUIVALENT OF CLEAN ENERGY GENERATED SAVED THROUGH SOLAR WATER HEATING

CUMULATIVE SOLAR WATER HEATER INSTALLATIONS IN AUSTRALIA[61]

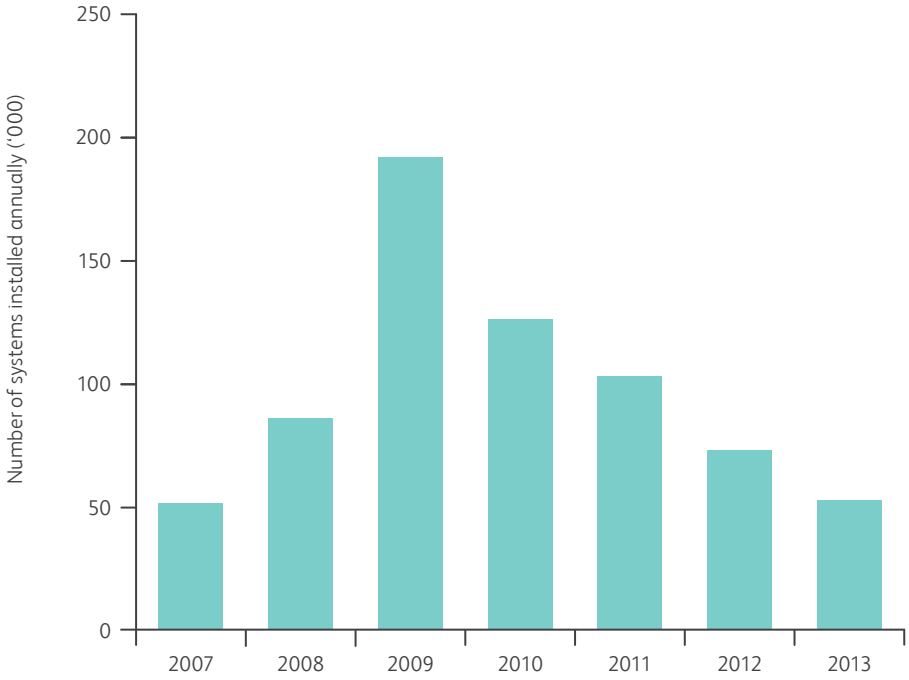


YEAR	CUMULATIVE NUMBER OF INSTALLATIONS
2007	212,422
2008	297,806
2009	492,497
2010	619,589
2011	724,639
2012	794,105
2013	847,700

ANNUAL INSTALLATIONS OF SOLAR WATER HEATERS BY STATE PER YEAR[62]

Approximately 54,000 solar hot water systems and heat pumps were installed in 2013, a 23 per cent decline on the year before and the continuation of a downward trend since a peak in 2009. Sales in recent years have been affected by the removal of state and federal government rebates. Solar power has also made substantial inroads into the market share of solar water heating.

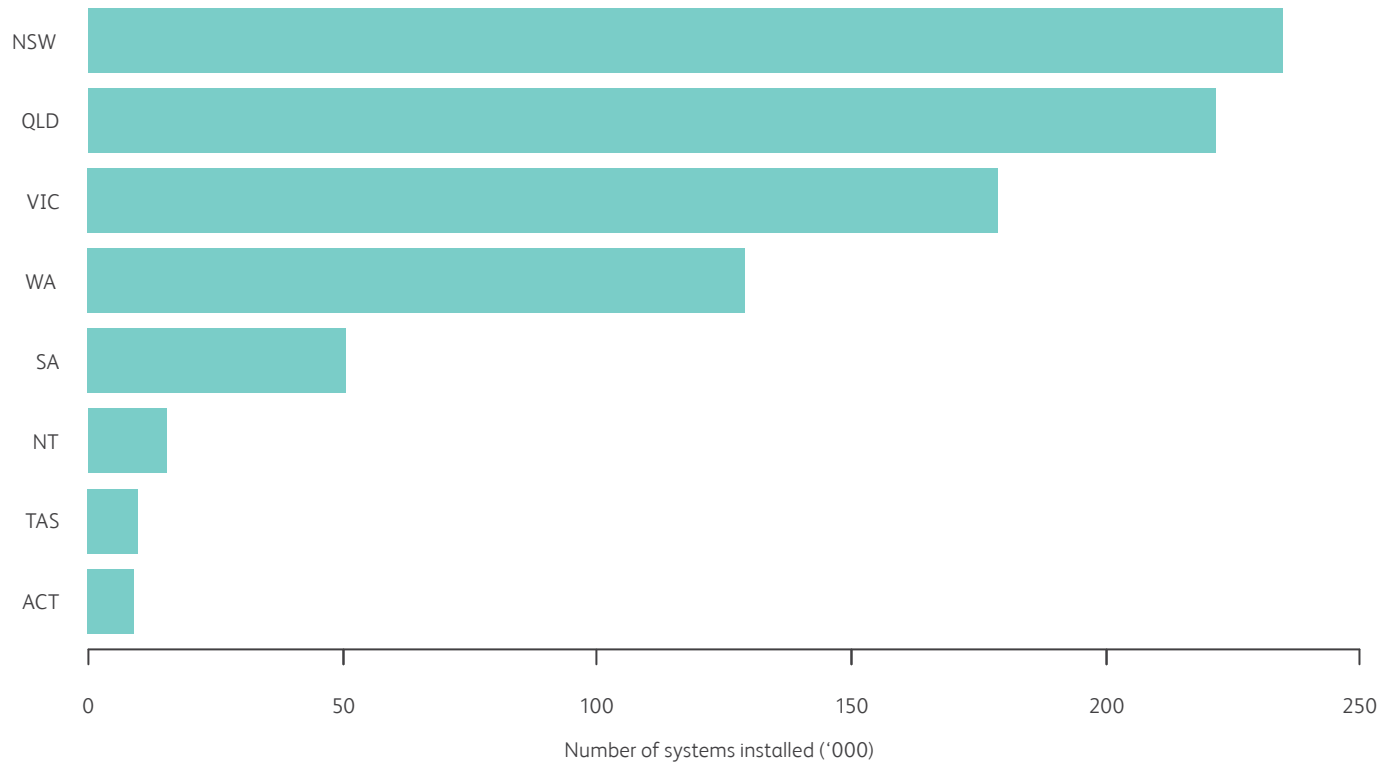
Installations in 2013 were strongest in Victoria due to state building regulations that encourage higher levels of energy efficiency, including the installation of solar water heating.

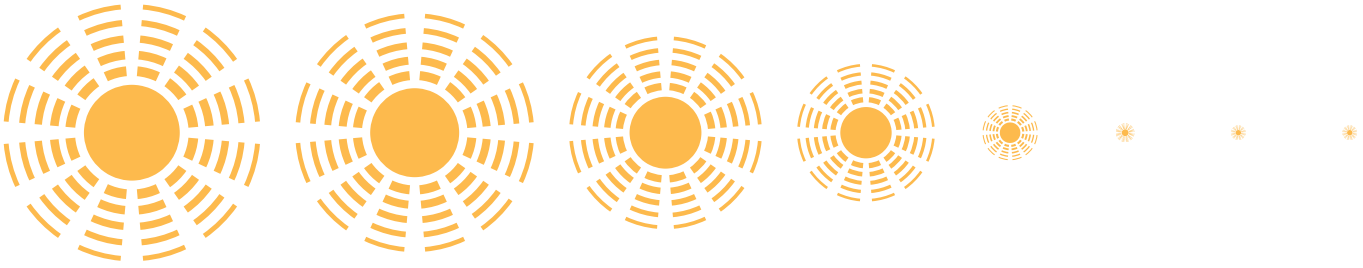


YEAR	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	NATIONAL
2007	453	8765	1414	16,830	2869	350	9157	11,139	**50,977**
2008	1001	20,203	1236	23,330	5103	906	21,207	12,398	**85,384**
2009	1974	85,454	1731	36,659	8793	2269	42,119	15,692	**194,691**
2010	960	38,524	1303	34,262	6812	1433	27,733	16,065	**127,092**
2011	1038	25,331	1267	30,937	5444	1725	26,446	12,862	**105,050**
2012	734	10,810	1171	18,973	3473	899	21,594	11,812	**69,466**
2013	400	8957	698	12,398	2541	734	17,594	10,273	**53,595**

SOLAR WATER HEATING

CURRENT TOTAL NUMBER OF SOLAR WATER HEATING SYSTEMS INSTALLED BY STATE[63]





NSW	QLD	VIC	WA	SA	NT	TAS	ACT
28%	26%	21%	15%	6%	2%	1%	1%

Image: Rooftop solar hot water installation

WIND POWER

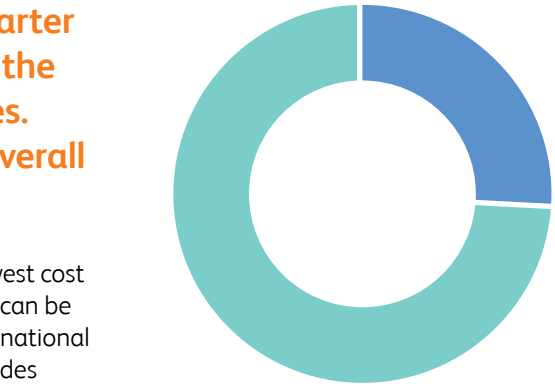
Australia's 68 wind farms produced just over a quarter of all clean energy generated in 2013, enough for the equivalent of more than 1.3 million average homes. Wind power supplied 4 per cent of the country's overall electricity needs during the year.

There were 1639 wind turbines operating at the end of 2013, providing a combined capacity of 3240 megawatts (MW). Six new projects came online during the year, including the Southern Hemisphere's largest operating wind farm at Macarthur in western Victoria. The 420 MW project led the wind sector to an 80 per cent increase on the amount of wind power installed during 2012, with the 655 MW of new capacity representing the largest yearly increase in installed capacity in the industry's history.
The $1.5 billion of new financial investment was almost double the level of the year before.

Wind power is currently the lowest cost type of renewable energy that can be rolled out on a large scale. The national Renewable Energy Target provides an incentive to build the lowest cost renewable energy projects, meaning that wind power is likely to be the main technology supported by the target this decade.

At the end of 2013, 16 projects with a combined capacity of 1896 MW were under construction and expected to be fully operational within three years.

South Australia had the most wind turbines of any state at the end of 2013, accounting for over a third (37 per cent) of the nation's wind capacity. More than a quarter (28 per cent) of its demand for electricity was produced by wind power in the 2013 calendar year.

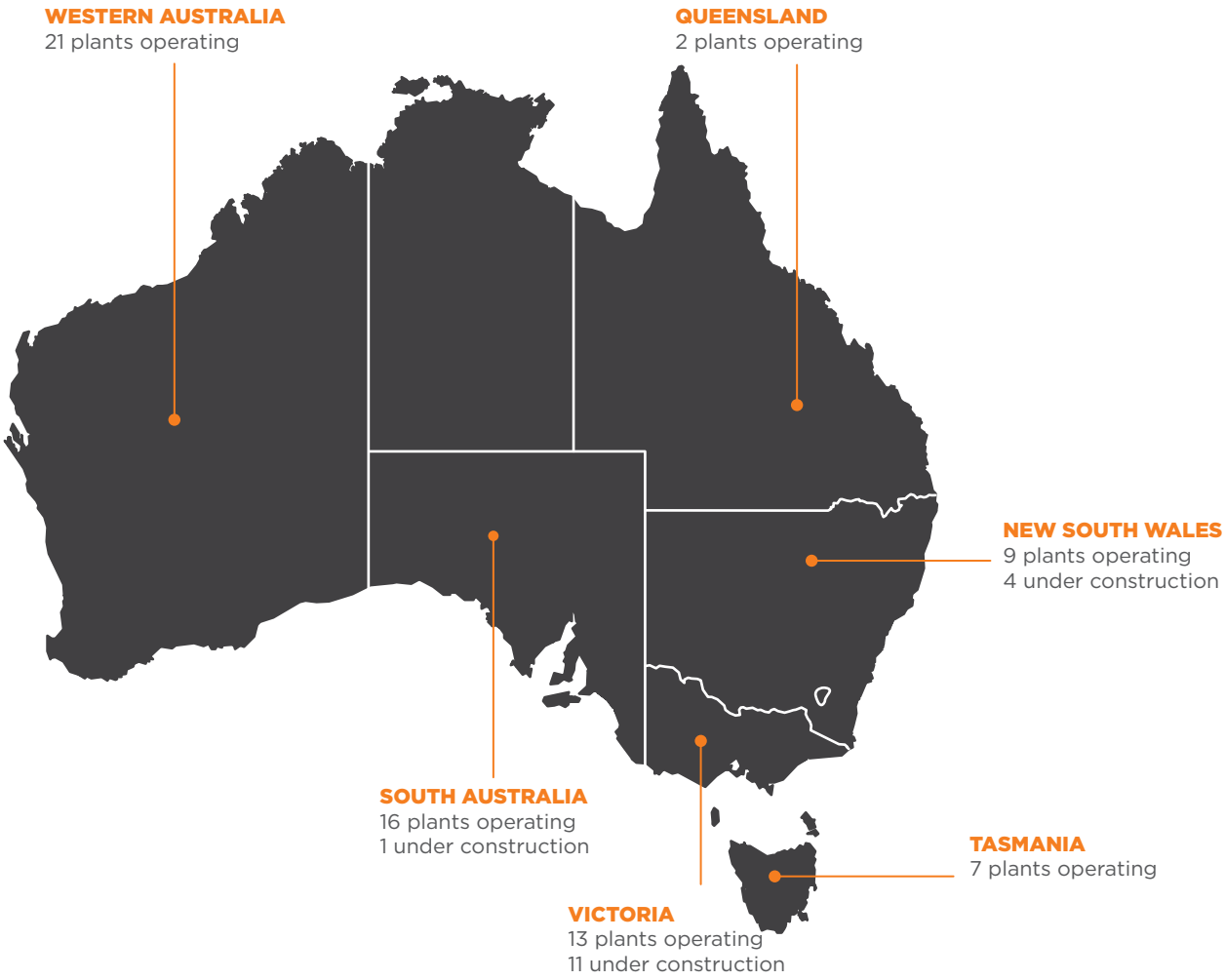


26%
OF TOTAL CLEAN ENERGY GENERATION

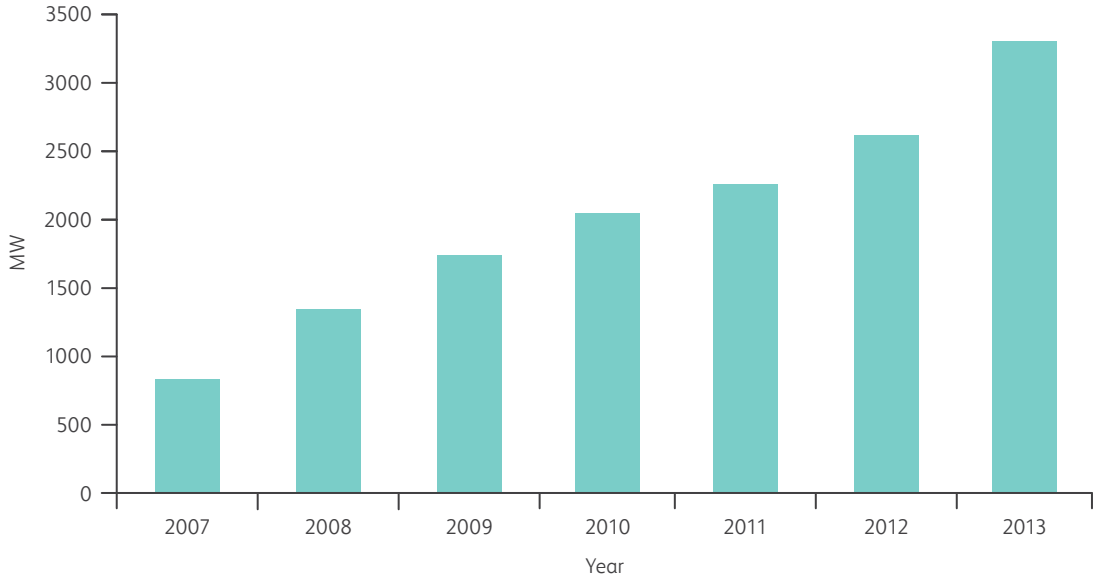
"I am very proud and will, at every opportunity, advocate that southwest Victoria is not only the home of renewable energy, but we've only just started in terms of the potential for renewable energy in this area.

"I think they (the turbines) are absolutely fantastic."

Victorian Premier Denis Napthine at the launch of the Macarthur Wind Farm, from The Herald Sun, 12 April 2013.



CUMULATIVE INSTALLED WIND CAPACITY IN AUSTRALIA[64]



64 Clean Energy Council Renewable Energy Database

WIND POWER

WIND FARMS COMMISSIONED IN 2013[65]

OWNER	LOCATION	STATE	INSTALLED CAPACITY
AGL Energy and Malakoff Corp BHD	Macarthur	VIC	420 MW
Woolnorth Wind Farm Holdings	Musselroe	TAS	168 MW
Verve Energy and Infrastructure Capital Group	Mumbida	WA	55 MW
Blair Fox	Karakin (Lancelin)	WA	5 MW
Blair Fox	West Hills Farm (Lancelin)	WA	5 MW
Denmark Community Wind Farm	Denmark Community Wind Farm	WA	2.4 MW

WIND FARMS UNDER CONSTRUCTION AT END 2013

OWNER	LOCATION	STATE	EXPECTED COMMISSION YEAR	INSTALLED CAPACITY
Trustpower Australia	Snowtown 2	SA	2014	270 MW
RES	Ararat	VIC	2015	247.5 MW
ACCIONA	Mt Gellibrand	VIC	2015	189 MW
Goldwind Australia	Gullen Range	NSW	2014	165.5 MW
Union Fenosa	Ryan Corner	VIC	TBA	134 MW
Meridian Energy	Mt Mercer	VIC	2015	131.2 MW
Electricity Generating PCL	Boco Rock	NSW	2015	113 MW
CBD Energy and Banco Santander	Taralga	NSW	2015	106.8 MW
Mitsui & Co Ltd	Bald Hills (1 and 2)	VIC	2015	106.6 MW
Union Fenosa	Crookwell 2	NSW	TBA	92 MW
Pacific Hydro	Crowlands	VIC	2015	84 MW
ACCIONA	Mortlake South	VIC	2016	76.5 MW
Union Fenosa	Hawkesdale	VIC	TBA	62 MW
Pacific Hydro	Portland Stage 4	VIC	2015	47.2 MW
Wind Farm Developments	Woolsthorpe	VIC	2015	40 MW
Trustpower Australia	Salt Creek	VIC	2015	31.5 MW

65 Clean Energy Council Renewable Energy Database

TOTAL INSTALLED WIND CAPACITY BY STATE[66]

SA	**1205** MW	**561** TURBINES	**16** PROJECTS
VIC	**939** MW	**454** TURBINES	**13** PROJECTS
WA	**491** MW	**308** TURBINES	**21** PROJECTS
TAS	**310** MW	**124** TURBINES	**7** PROJECTS
NSW	**282** MW	**170** TURBINES	**9** PROJECTS
QLD	**12.5** MW	**22** TURBINES	**2** PROJECTS
TOTAL	**3240** MW	**1639** TURBINES	**68** PROJECTS

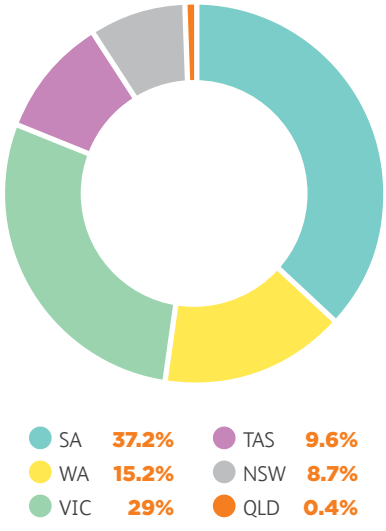
Image: Musselroe Wind Farm, Tasmania

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

WIND POWER

PENETRATION OF WIND GENERATION IN EACH STATE AS A PERCENTAGE OF DEMAND[67]

PERCENTAGE OF INSTALLED WIND CAPACITY BY STATE[68]



All images: Macarthur Wind Farm, Victoria

67 Clean Energy Council Renewable Energy Database, AEMO, IMO, IES
68 Clean Energy Council Renewable Energy Database

Images (clockwise from top left):
Musselroe Wind Farm, Tasmania
Musselroe Wind Farm, Tasmania
Macarthur Wind Farm, Victoria
Macarthur Wind Farm, Victoria
Musselroe Wind Farm, Tasmania
Musselroe Wind Farm, Tasmania
Macarthur Wind Farm, Victoria

APPENDIX 1
TOP 10 SOLAR POSTCODES BY STATE[69]

QUEENSLAND

POSTCODE	TOTAL SYSTEMS INSTALLED	TOTAL CAPACITY OF INSTALLED SYSTEMS (KILOWATTS)	SUBURB
4670	8015	22,648	Bundaberg
4551	6574	15,322	Caloundra
4655	6525	16,513	Hervey Bay
4350	5928	16,280	Toowoomba
4305	5268	13,227	Ipswich
4211	5039	13,716	Nerang and surrounding Hinterland
4207	4703	12,257	Beenleigh
4570	4622	12,905.325	Gympie
4556	4510	11,366.152	Buderim
4306	4314	12,751.662	Amberley and Wivenhoe

NEW SOUTH WALES

POSTCODE	TOTAL SYSTEMS INSTALLED	TOTAL CAPACITY OF INSTALLED SYSTEMS (KILOWATTS)	SUBURB
2830	4024	8800	Dubbo
2480	3864	9595	Lismore and surrounds
2170	3216	6988	Liverpool
2486	3116	6786	Tweed Heads South
2560	3062	6752	Campbelltown
2444	2958	7161	Port Macquarie
2259	2842	5994	Wyong
2250	2622	5770	Gosford
2540	2573	6042	Jervis Bay, Falls Creek
2478	2345	5627	Ballina

VICTORIA

POSTCODE	TOTAL SYSTEMS INSTALLED	TOTAL CAPACITY OF INSTALLED SYSTEMS (KILOWATTS)	SUBURB
3029	4185	9981	Hoppers Crossing
3030	3706	9185	Werribee
3977	3502	8561	Cranbourne
3023	2782	6634	Caroline Springs and Deer Park
3805	2461	6340	Narre Warren
3064	2390	6053	Craigieburn
3216	2,267	5728	Belmont and Highton
3150	2055	4758	Glen Waverley
3551	1875	5873	Bendigo suburbs
3037	1871	4935	Calder Park

WESTERN AUSTRALIA

POSTCODE	TOTAL SYSTEMS INSTALLED	TOTAL CAPACITY OF INSTALLED SYSTEMS (KILOWATTS)	SUBURB
6210	7362	14,462	Mandurah
6065	4799	11,279	Wanneroo
6155	4662	10,104	Willeton
6164	4019	9126	Jandakot
6112	3493	7488	Armadale
6163	3398	7017	Spearwood
6169	3273	6814	Safety Bay
6027	3073	6951	Joondalup
6030	2916	6123	Clarkson
6110	2909	5994	Gosnells

TASMANIA

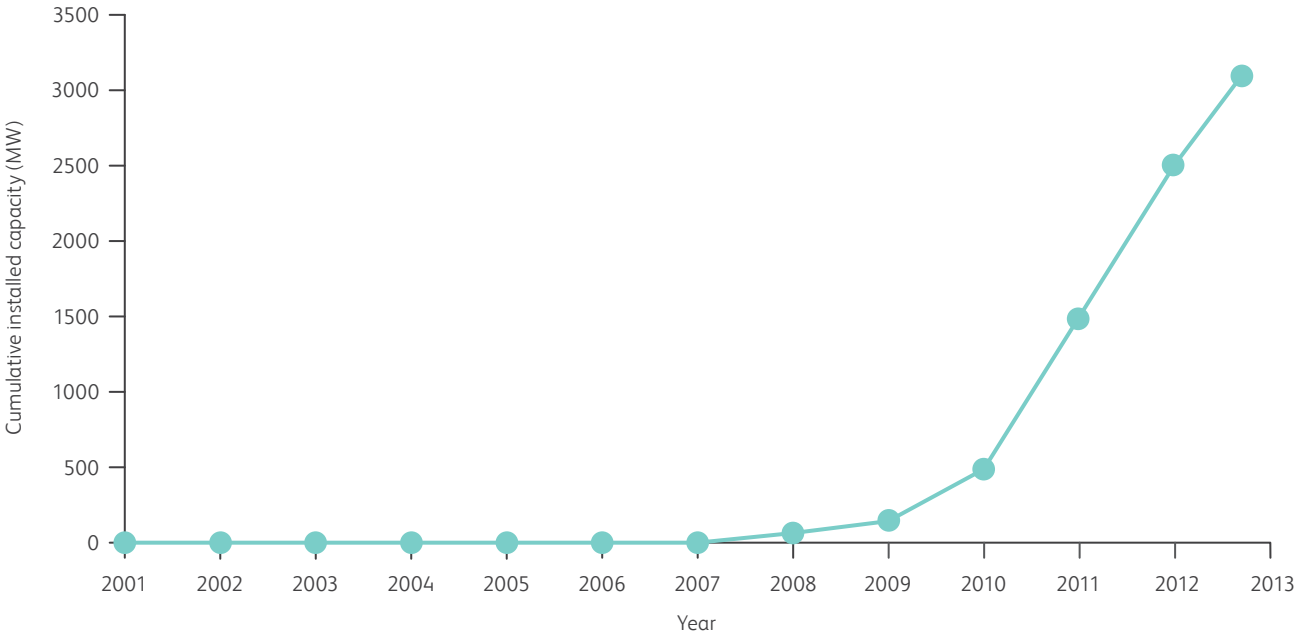
POSTCODE	TOTAL SYSTEMS INSTALLED	TOTAL CAPACITY OF INSTALLED SYSTEMS (KILOWATTS)	SUBURB
7250	1701	5414	Launceston
7310	784	2510	Devonport
7018	761	2090	Rosny
7030	596	1851	Bridgewater
7011	526	1368	Claremont
7315	505	1808	Ulverstone
7054	501	1502	Margate
7050	468	1392	Kingston
7010	447	1311	Glenorchy
7109	437	1288	Huonville

SOUTH AUSTRALIA

POSTCODE	TOTAL SYSTEMS INSTALLED	TOTAL CAPACITY OF INSTALLED SYSTEMS (KILOWATTS)	SUBURB
5162	3968	10,075	Morphett Vale
5159	3928	10,560	Aberfoyle Park Happy Valley
5108	3347	8803	Salisbury and Paralowie
5158	3179	8394	Hallett Cove
5114	2979	8336	Craigmore
5211	2881	7076	Victor Harbor
5125	2176	6018	Golden Grove
5109	2090	5394	Salisbury
5118	2063	6475	Gawler
5253	2042	6414	Murray Bridge

APPENDIX 2

CUMULATIVE INSTALLED CAPACITY OF SOLAR PV IN AUSTRALIA[70]

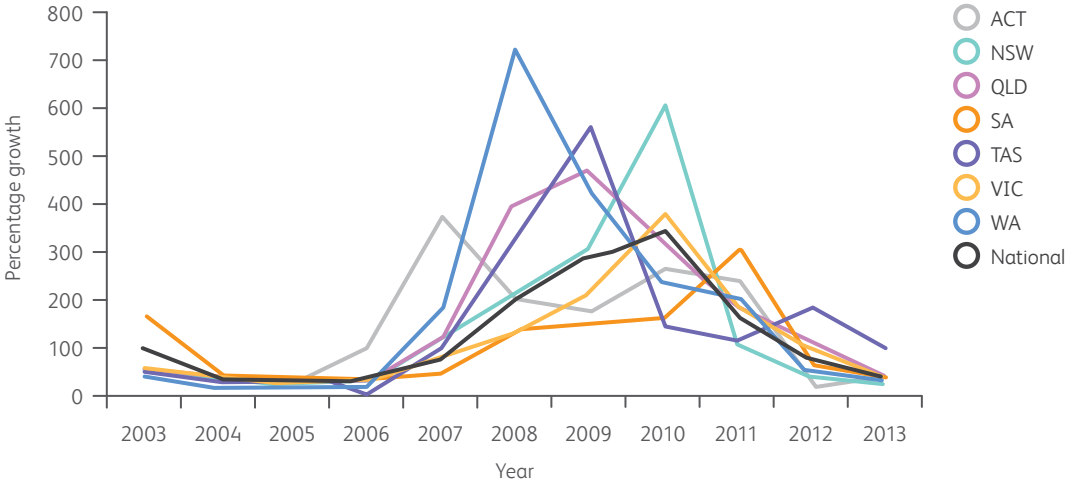


YEAR INSTALLED	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	TOTAL (MW)
2001	0.007	0.062	0.004	0.061	0.126	0.002	0.113	0.034	**0.409**
2002	0.010	0.236	0.006	0.110	0.330	0.011	0.255	0.055	**1.013**
2003	0.015	0.378	0.006	0.178	0.876	0.017	0.439	0.081	**1.989**
2004	0.021	0.495	0.006	0.280	1.269	0.022	0.616	0.095	**2.804**
2005	0.026	0.671	0.007	0.387	1.865	0.032	0.827	0.116	**3.931**
2006	0.053	0.907	0.009	0.488	2.542	0.034	1.133	0.143	**5.307**
2007	0.249	2.007	0.012	1.057	3.705	0.072	2.099	0.410	**9.609**
2008	0.741	6.221	0.426	5.214	8.588	0.308	4.830	3.334	**29.660**
2009	2.024	25.421	0.936	29.724	21.025	2.030	15.343	17.635	**114.136**
2010	7.373	178.483	2.429	122.075	54.256	5.046	74.290	59.780	**503.732**
2011	24.797	373.307	4.233	347.137	217.510	10.958	214.565	182.748	**1375.255**
2012	29.876	517.636	6.516	765.144	355.330	31.196	422.028	282.205	**2409.932**
2013	41.538	659.034	11.468	1073.786	502.387	63.597	559.196	358.892	**3269.899**

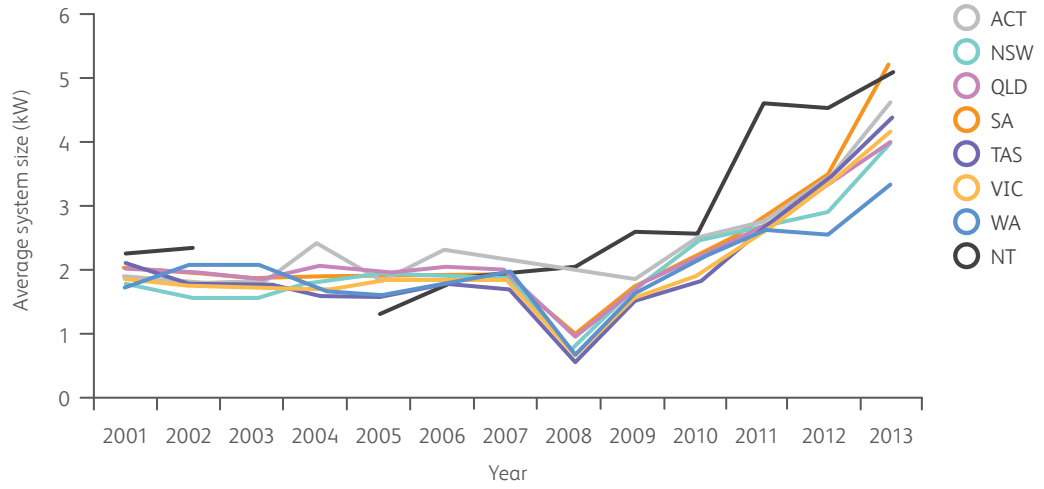
70 SunWiz 2014

APPENDIX 2

GROWTH RATES OF SOLAR PV CAPACITY BY STATE SINCE 2003[71]



AVERAGE SOLAR PV SYSTEM SIZE BY INSTALLATION YEAR[72]



71, 72 SunWiz 2014

COMPANIES INVESTIGATING MARINE ENERGY IN AUSTRALIA[73]

OWNER	TECHNOLOGY TYPE	LOCATION OF PLANT	STATE	SUBURB
Advanced Wave Power	Wave	Moreton Bay	QLD	Has deployed and tested one array
AquaGen Technologies	Wave	Lorne, Portland	VIC	1.5 kW unit installed at Lorne Pier in 2010
Atlantis Resources	Tidal	San Remo	VIC	Completed testing of turbines
BioPower Systems	Wave	King Island Port Fairy Flinders Island	TAS VIC TAS	Construction on 250 kW pilot in Port Fairy expected to commence 2014
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. Construction expected to commence on 2 MW demonstration project at Garden Island in 2014
Oceanlinx	Wave	Portland Port MacDonnell	VIC SA	Developing 1MW and 2.5 MW prototypes.
Tenax Energy	Tidal	Clarence Strait Port Phillip Heads Banks Strait	NT VIC TAS	Plans to build a 2 MW plant near Darwin by 2015
Tidal Energy Australia	Tidal	Derby	WA	Has plans to develop a 48 MW project
Ocean Power Technologies (OPT)	Wave	Portland	VIC	Joint venture between OPT and Lockheed Martin to develop a 19 MW plant. Awarded $66m government grant through ARENA
Wave Rider Energy	Wave	Elliston	SA	Development of pre-commercial wave rider platform

73 Clean Energy Council Renewable Energy Database

IMAGE CONTRIBUTORS

The Clean Energy Council thanks the following CEC members and media companies for providing some of the stunning photographs contained in this report:

- AGL
- Carnegie Wave Energy
- CSR Building Products
- First Solar
- FRV
- Geodynamics
- Infigen
- New Era Media
- ReneSola
- Siemens
- Simons Green Energy
- Solahart
- Trustpower Australia
- Woolnorth Wind Farm Holdings

Design by streamer design and communication

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