CLEAN ENERGY COUNCIL

CLEAN ENERGY AUSTRALIA REPORT 2014

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Front cover and this page: Royalla Solar Farm, Australian Capital Territory. Image courtesy FRV Services Australia

INTRODUCTION

While the future for renewable energy in Australia is extremely bright, the industry always knew there would be a few clouds along the way.

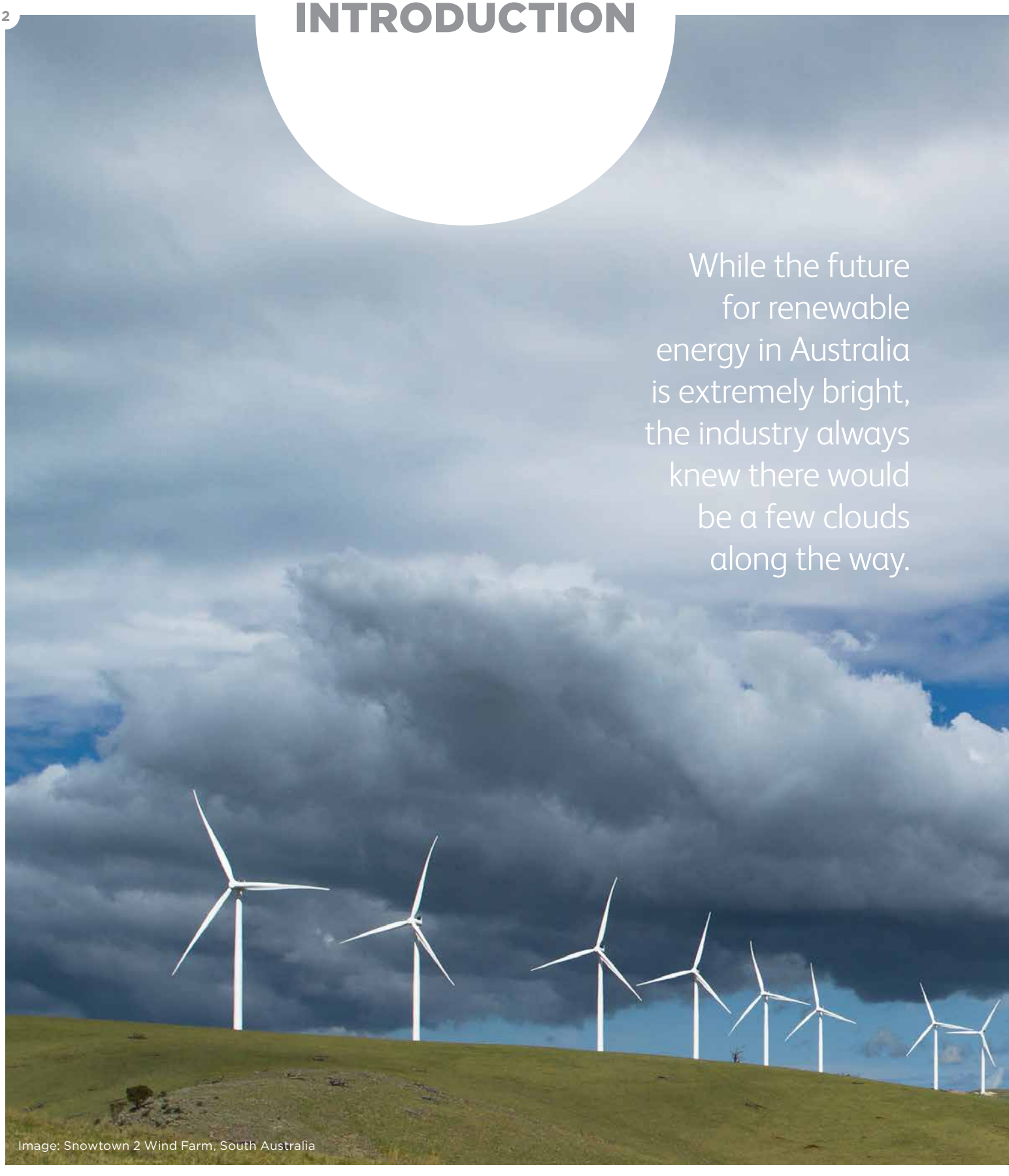


Image: Snowtown 2 Wind Farm, South Australia

Kane Thornton
Chief Executive,
Clean Energy Council

Last year was a tough one for most forms of renewable energy, from large-scale technologies such as bioenergy, wind and solar to emerging technologies like geothermal.

An expert panel for the Federal Government's review of the national Renewable Energy Target (RET) was announced early in the year. The review ultimately froze investment for more than 12 months and, at the time of writing, the future of the RET remained unresolved.

I am hopeful that a bipartisan deal will be reached quickly, allowing many of the major renewable energy projects that have been on ice to finally begin construction in the near future.

Household solar fared better than the large-scale sector last year. Increased consumer engagement and awareness about electricity prices and the benefits of solar technology meant more than 230,000 households and businesses installed either solar power or solar hot water.

And the support and innovative finance solutions provided by the Australian Renewable Energy Agency (ARENA) and the Clean Energy Finance Corporation (CEFC) are helping the next generation of local innovators get their technology out of the laboratory and into the power supply.

Despite all the stops and starts of the last few years, the renewable energy sector is poised for a strong and vibrant period out to 2020 as we deliver on our promises and recommence building projects in earnest. If bipartisan support can be returned to the RET, billions of dollars in investment and thousands of jobs across the country will be unlocked.

Globally, the installation of renewable energy in the last decade has surpassed all expectations. Costs for most technologies have come down significantly, and supporting policies have continued to spread throughout the world. However, Australia went sharply backwards on large-scale renewable energy last year while the appetite for clean energy across the rest of the world increased by 16 per cent to US$310 billion.[1]

It is not too late to catch up again, given our abundant sunshine, wind, waves, biomass and other renewable energy resources – not to mention the extraordinary capability of the local industry.

And we will cement our position as an industry of the future by continuing to exceed expectations in the here and now, as we have virtually every year I have worked in this industry.

1 Bloomberg New Energy Finance, *Rebound in clean energy investment in 2014 beats expectations*, 9 January 2015

EXECUTIVE SUMMARY

The review of the Renewable Energy Target (RET), which was announced in February 2014 and continued beyond the end of the year, essentially froze new investment in large-scale renewable energy in Australia last year. According to Bloomberg New Energy Finance, new investment in large-scale projects such as solar and wind farms was down by 88 per cent in 2014 compared to the year before.

The RET review had a more modest impact on the smaller-scale renewable energy market, and both commercial and domestic solar power continued to perform well. More than 15,000 businesses have now installed a solar power system, collectively saving more than $64 million on their power bills every year. Some consolidation of solar businesses continued as the market continued to mature, and innovative financing options were a feature of the commercial solar sector last year.

Bundaberg in Queensland was Australia's solar power capital at the end of 2014, with the most solar power systems of any postcode in the country. Mandurah in Western Australia was second and Hervey Bay, just over 100 km away from Bundaberg, placed third. Eight of the top 10 solar regions of the year were from the aptly-named Sunshine State, with the remaining two from Western Australia.

Employment across the sector contracted by nearly 1000 full-time positions, leaving approximately 20,000 people directly employed by the renewable energy industry.

Lower rainfall in hydro catchments contributed to a 25 per cent fall in hydro generation, leading to a drop in the proportion of renewable energy in the nation's power supply from 14.76 per cent in 2013 to 13.47 per cent last year. Of the various renewable energy technologies, hydro made the largest contribution to total Australian energy generation (6.2 per cent), followed by wind (4.2 per cent), solar (2.1 per cent) and bioenergy (1 per cent).

Despite the uncertainty that washed through the renewable energy sector during 2014, three large wind farms totalling 566.7 megawatts were completed during the year. Among these was Trustpower's Snowtown 2 in South Australia, Australia's second-largest operating wind farm. These projects were approved and financed long before the beginning of the review of the RET.

The 20 megawatt Royalla Solar Farm developed by Fotowatio Renewable Ventures, the nation's largest at the end of 2014, was officially opened in September. Support from the ACT Government was crucial to the viability of the project.

Energy storage continued to attract keen interest across the renewable energy sector. Innovation and scale step changes such as the construction of the US$5 billion Gigafactory by Tesla Motors in the United States are expected to drive down the price of technology and make it more widely adopted in the next few years.

The Australian Renewable Energy Agency (ARENA) supported a diverse group of projects investigating cutting-edge renewable technologies. These included the use of renewable energy in off-grid situations for a variety of applications, such as mining at Weipa in North Queensland. Hybrid technologies were also a feature of ARENA's work, including a project that aims to integrate solar and wind with diesel at Coober Pedy to provide 70 per cent of the town's electricity from renewables.

Approximately 40 per cent of South Australia's power came from renewable energy during 2014, and the state government increased its own renewable energy target to 50 per cent by 2025. South Australia was completely powered by renewable energy between 9.30am and 6pm on 30 September in 2014, providing a glimpse into the potential of renewable energy in Australia.

ABOUT THE CLEAN ENERGY COUNCIL

The Clean Energy Council is the peak body for the clean energy industry in Australia.

We represent and work with hundreds of leading businesses operating in solar, wind, energy efficiency, hydro, bioenergy, energy storage, geothermal and marine along with more than 4000 solar installers. We are committed to accelerating the transformation of Australia's energy system to one that is smarter and cleaner.

The Clean Energy Council leads and supports the growth of the clean energy industry in Australia through:

- shaping policy
- developing standards and regulations and ensuring the integrity of the industry
- promoting the industry
- providing a range of valuable services to our members, customers and partners.

The Clean Energy Council also operates 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: Portland Wind Energy Project IV, Victoria

SNAPSHOT

Renewable energy provided 13.47 per cent of Australia's electricity in 2014, enough to provide power for the equivalent of approximately 4.5 million average homes.

The proportion of electricity provided by renewable energy generation last year was lower than 2013, when strong rainfall and commercial strategies by hydro companies to maximise the opportunity of the carbon tax meant that renewables delivered 14.76 per cent of the country's electricity.

The steadily rising contribution from both wind (6 per cent increase) and solar power (29 per cent increase) in 2014 was not enough to offset the fall in hydro generation, which was down by almost a quarter compared to the year before. For the first time this century, hydro provided less than half of Australia's renewable energy (approximately 46 per cent of the total) during the calendar year.

Activity in most of the renewable energy sector was subdued during 2014, due to investment uncertainty created by the Federal Government's review of the Renewable Energy Target (RET). The review remained unresolved at the end of 2014.

Three new wind farms completed construction during 2014, including Trustpower's Snowtown 2 project, the second-largest wind farm in the country. Australia's largest solar farm was also completed by Fotowatio Renewable Ventures, at Royalla near Canberra, which was made possible by support from the ACT Government's reverse auction for large-scale solar power.

The uptake of both rooftop solar power and solar hot water continued steadily. Sales were well below the peaks of a few years ago for both technologies, but substantial numbers of both were installed during the year.

The commercial solar power sector was the biggest source of growth during the year, as more businesses switched on to the potential of solar power to help them reduce their power bills. Many new systems over 10 kilowatts were installed across the country during 2014, including an impressive $1.3 million solar power system installed at Mars Confectionery in Ballarat by Conergy. Swedish furniture giant IKEA announced in 2014 that it will install 3.9 megawatts of solar power across its east coast stores and warehouses in partnership with Canadian Solar and Kingspan.

The carbon price was repealed in the second half of 2014, changing commercial drivers in many businesses and leading to an increase in coal generation and a rise in emissions from the power generation sector in the second half of 2014.[2]

With the RET under review, much of the activity in the large-scale renewable energy sector in 2014 was driven by support from the Australian Renewable Energy Agency (ARENA) or loans from the Clean Energy Finance Corporation (CEFC). According to a statement by the CEFC in February 2015, the investments made by the publicly-funded bank are expected to make money for the taxpayer, with an average lifetime investment portfolio yield of approximately 6.5 per cent.[3]

2 H Saddler, H Meade and M Johnston, pitt&sherry, *CEDEX Electricity Update* January 2015

3 Clean Energy Finance Corporation, Australian Government, *CEFC comment on 2015 investment mandate*, February 2015, page 1

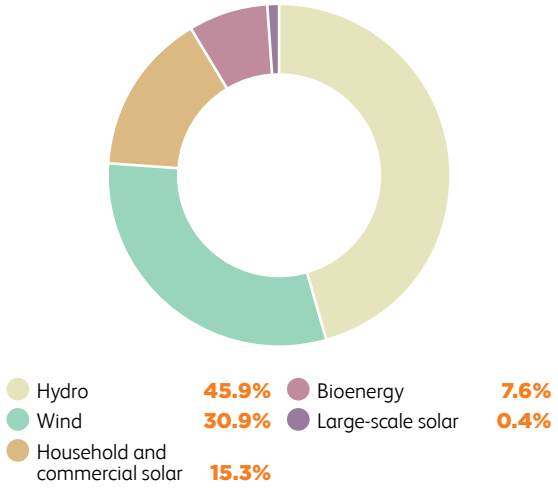
4 Source: Clean Energy Council Renewable Energy Database, BREE2013, REC Registry, AEMO, IMO, IES, ARENA 2014. Note some figures have been rounded. Figures do not include auxiliary load or transmission line losses. Electricity generated equivalent in households is calculated using 7.1 MWh national average annual household energy consumption. 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 2014.

5 Includes large-scale solar PV and solar thermal

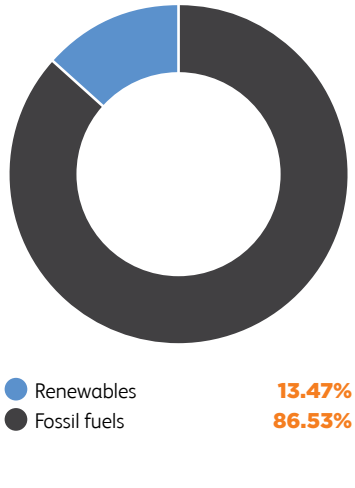
RENEWABLE ENERGY GENERATION IN 2014[4]

Technology	Generation (GWh)	Percent of renewable generation	Percent of total generation	Equivalent number of households powered over course of the year
Hydro	14,555	45.9%	6.19%	2,049,900
Wind	9777	30.9%	4.16%	1,377,000
Household and commercial solar <100 kW	4834	15.3%	2.06%	680,900
Bioenegy	2400	7.6%	1.02%	338,000
Large-scale solar[5]	118	0.4%	0.05%	16,700
Geothermal	0.50	0.002%	0.00%	70
Marine	0.04	0%	0.00%	6
TOTAL	**31,684**	**100%**	**13.47%**	**4,462,600**

ESTIMATED PERCENTAGE CONTRIBUTION OF EACH TECHNOLOGY TO RENEWABLE GENERATION



ANNUAL ELECTRICITY GENERATION 2014



SNAPSHOT
CONTINUED

PROJECT SPOTLIGHT: RENEWABLE ENERGY AND MINING

The massive cost of transporting diesel fuel to remote parts of Australia highlights a major opportunity for renewable energy technologies to play a much greater role in powering mining operations. As energy storage becomes more cost-effective and scalable, these opportunities will multiply.

While this shift is happening in many other countries, a publication by EY on renewables and mining last year noted that "the scale and pace of renewable energy deployment across the (mining) sector is slower than the business case warrants".[6]

The Australian Renewable Energy Agency (ARENA) is supporting several projects that will put the spotlight on the ability of renewable energy to provide reliable power for mining operations. All of these focus on the ability of renewable energy to work as a hybrid technology with diesel power.

One of these will be a large-scale solar plant at **Rio Tinto Alcan's** remote bauxite mine at Weipa in Far North Queensland. The 6.7 megawatt solar farm will reduce the company's reliance on expensive diesel power, the price of which can fluctuate wildly. **First Solar** is supplying the panels, and the project is expected to save 600,000 litres of diesel a year.

Laing O'Rourke successfully led a project to develop a 1 megawatt hybrid solar-diesel power plant that can be used in remote areas. The power plant can be packed down and redeployed, and is designed to address a need for cheaper power in off-grid locations. The permanent long-term nature of solar power plants is also a barrier for their use in some mining operations, and the re-deployable hybrid plant is a solution to this. A test of the technology in 2015 found it could be set up in a week.

Energy Developments Limited successfully obtained ARENA support for a gem of an idea to power approximately 70 per cent of mining town Coober Pedy from renewable energy. The project uses a mix of solar, wind and diesel power. Like the other projects above, the Coober Pedy hybrid system is designed to reduce the town's exposure to diesel, which can fluctuate massively in price. Coober Pedy lends itself well to this project – the sun shines fiercely during the day, while the wind often blows hard at night.

Image: Rio Tinto Alcan Weipa Solar Plant, Queensland

Image: Laing O'Rourke hybrid solar/diesel power plant, Queensland

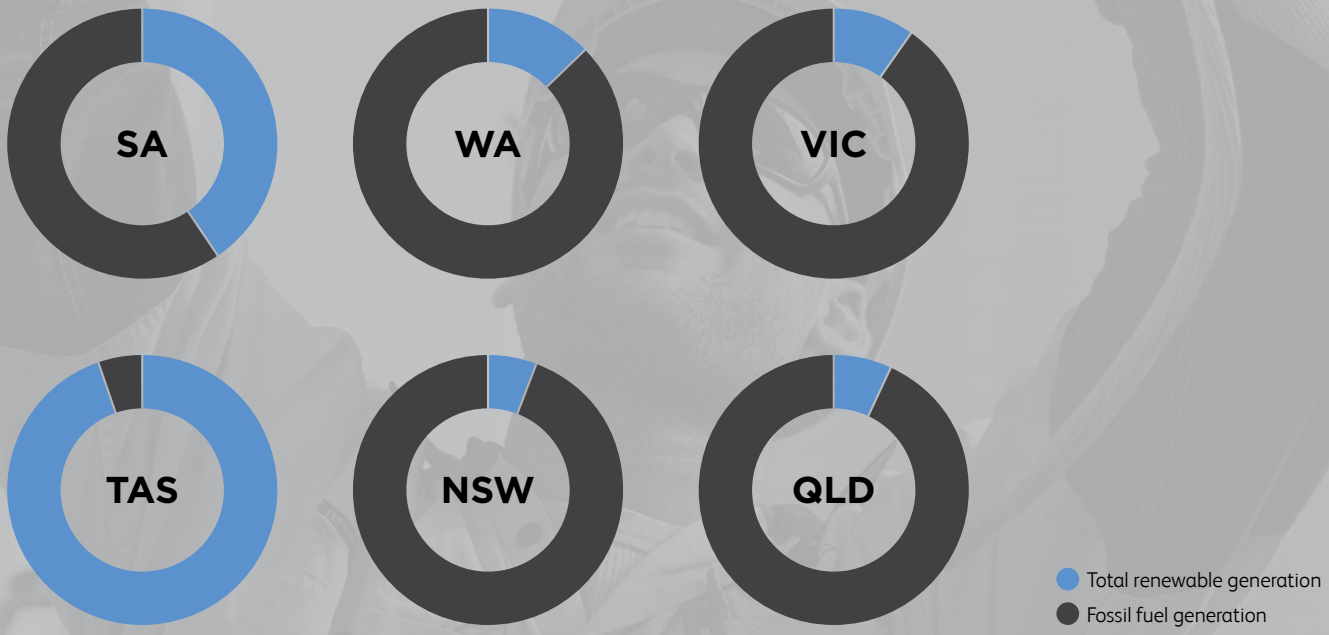
6 EY Global Cleantech Center, *Mining: The growing role of renewable energy*, 2014, page 2

7 Total generation includes NEM and WEM data and small-scale solar PV. Please note: these figures are not the same as the total electricity generation figures as non-scheduled and off-grid generation are not included. Source: NEO mobile, Intelligent Energy Systems

8 Qld total includes 1500 GWh non-scheduled bioenergy

PENETRATION OF RENEWABLE ENERGY – BY STATE

State	Total generation (GWh)[7]	Fossil fuel generation (GWh)	Renewable generation (GWh)	Penetration of renewables
SA	11,933	7115	4817	40%
WA	18,425	16,082	2343	13%
VIC	53,203	48,037	5166	10%
TAS	11,004	584	10,420	95%
NSW	60,594	57,226	3368	6%
QLD[8]	57,683	53,797	3885	7%



2014 IN REVIEW

HOUSEHOLD AND BUSINESS RENEWABLE ENERGY

More than 1.4 million solar power systems had been installed in Australia at the end of 2014, along with more than 900,000 solar hot water systems.

Just over 187,000 solar power systems were installed during 2014, a drop of 8.5 per cent on the year before. This figure is a little more than half the number of solar power installations during the peak installation year of 2011, when more than 358,000 systems were installed nationwide.

However, the average system size has been growing as more businesses in particular recognise the benefits of going solar, and both households and businesses install progressively larger and more efficient systems. State support schemes for solar have now been wound back, meaning people are focused on installing systems that cover the electricity they use themselves. While the overall number of installations was down slightly on 2013, the amount of solar generating capacity installed during 2014 was actually higher than the year before.

9 Analysis by Sunwiz using data from the Clean Energy Regulator, January 2015
10 Clean Energy Council calculation in September 2014 using data supplied by Sunwiz

Image: Solar installer, South Australia

Bundaberg in Queensland was Australia's solar power capital at the end of 2014, with the most solar power systems of any postcode in the country. Mandurah in Western Australia was second and Hervey Bay, just over 100 km away from Bundaberg, placed third. Eight of the top 10 solar regions of the year were from the aptly-named Sunshine State, with the remaining two from Western Australia.[9]

More than 15,000 businesses have now installed solar power, collectively saving approximately $64 million on their power bills each year.[10] These businesses include retail stores, accommodation providers, fast food restaurants, chicken and dairy farms, breweries, wineries, office buildings and much more.

Just under 50,000 solar water heating systems were installed in 2014, taking the total number installed to more than 900,000. These sales figures were a 15 per cent drop on the year before and the lowest for eight years.

The peak year for solar hot water installation was 2009, when almost 195,000 systems were installed following the introduction of federal rebates for home owners. These rebates have since been removed, along with some state regulations which required the installation of solar hot water.

TOTAL HOUSEHOLD SOLAR POWER SYSTEMS

TOTAL CAPACITY
4041 MW
TOTAL SYSTEMS
1,421,601

2014 IN REVIEW
CONTINUED

CUMULATIVE INSTALLED CAPACITY OF SMALL-SCALE SOLAR POWER SYSTEMS (MW)

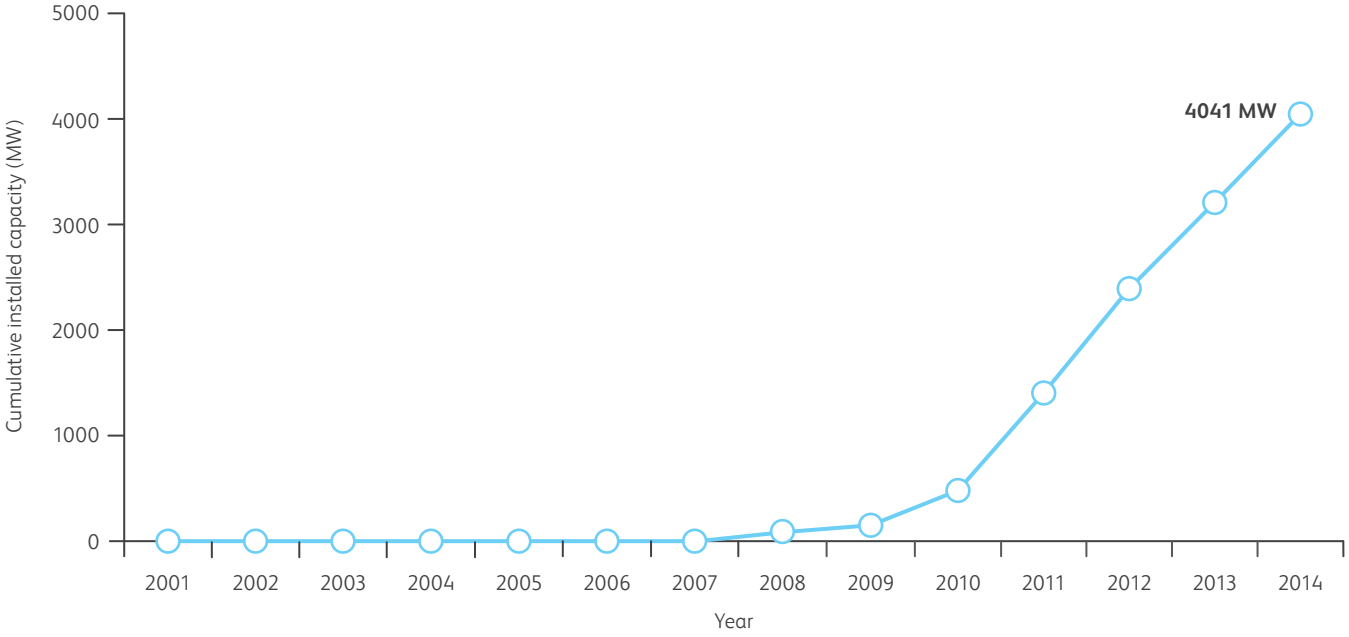


Image: Solar installation, Victoria

LARGE-SCALE RENEWABLE ENERGY

The review of the Renewable Energy Target (RET) – unresolved at the end of 2014 – meant a very subdued year for large-scale renewable energy, including reduced interest from both domestic and international investors.

One of the bright spots was large-scale solar power, which is a relatively new technology in Australia. The support of the Australian Renewable Energy Agency (ARENA) and a reverse auction support scheme run by the ACT Government were extremely important to the viability of many of the pioneering early projects in the sector.

Australia's largest solar power plant was completed in 2014. Fotowatio Renewable Ventures (FRV) launched the landmark 20 megawatt (MW) Royalla Solar Farm near Canberra, Australia's largest, which was made possible by support from the ACT Government's reverse auction for large-scale solar power.

AGL and First Solar were busily at work on the Nyngan and Broken Hill solar farms at the end of 2014, which together will add 155 MW of solar generating capacity to the power network.

Several other large-scale solar projects were also underway. These include the 56 MW Moree Solar Farm in northern New South Wales developed by FRV, the ground-breaking 44 MW Kogan Creek solar thermal coal-solar hybrid project developed by CS Energy and the University of Queensland's 3.275 MW project, which will explore a variety of different technologies and their relationship with the power grid.

Three large wind farms were completed during the calendar year including Goldwind's Gullen Range (New South Wales), Meridian's Mt Mercer (Victoria) and Trustpower's Snowtown 2 (South Australia). These projects, representing 227 wind turbines and 566.7 MW of new power generation capacity, were approved and funded long before the beginning of the RET review in 2014.

Activity on 11 of the 16 wind farms under construction a year ago had slowed by the end of 2014, and planning on new projects remained minimal. Five wind farms are due for completion in 2015 and 2016 and three others were given a new lease of life by the ACT Government's reverse auction on wind power. The successful projects were announced in early 2015.

LARGE-SCALE RENEWABLE ENERGY PROJECTS DELIVERED IN 2014[11]

Fuel source	Location	Owner	State	Installed capacity (MW)
Wind	Snowtown 2	Trustpower	SA	270
Wind	Gullen Range	Goldwind	NSW	165.5
Wind	Mt Mercer	Meridian	VIC	131.2
Solar PV	Royalla	Fotowatio Renewable Ventures	ACT	20
Solar PV	Mildura	Belectric	VIC	3.5

11 Note large-scale projects are over 1 MW in capacity

2014 IN REVIEW
CONTINUED

LARGE-SCALE RENEWABLE ENERGY PROJECTS UNDER CONSTRUCTION IN 2014

Fuel source	Location	Owner	State	Installed capacity (MW)	Expected completion date
Wind	Boco Rock	Electricity Generating Public Company Limited (EGCO)	NSW	113	February 2015
Wind	Taralga	Banco Santander and CBD Energy	NSW	106.8	July 2015
Wind	Bald Hills	Mitsui & Co Ltd	VIC	106.6	June 2015
Solar PV	Nyngan	AGL	NSW	102	June 2015
Solar PV	Moree	Fotowatio Renewable Ventures	NSW	56	Early 2016
Solar PV	Broken Hill	AGL	NSW	53	November 2015
Wind	Portland Wind Energy Project IV (Cape Nelson North and Cape Sir William Grant)	Pacific Hydro	VIC	47.15	March 2015
Solar thermal	Kogan Creek	CS Energy	QLD	44	Late 2016
Wind	Chepstowe	Future Energy	VIC	6	April 2015
Solar PV	University of Queensland	First Solar/UQ	QLD	3	March 2015

Image: Snowtown 2 Wind Farm, South Australia

REVIEW OF THE RENEWABLE ENERGY TARGET

The Federal Government's review of the Renewable Energy Target (RET) froze investment in large-scale renewable energy for 2014.

Multiple studies completed alongside the RET review confirmed something that many in the industry had been saying for years – that removing or dramatically cutting the RET would actually lead to increased power prices in the future. Analysis by consultancy ACIL Allen for the Expert Review Panel showed that any scenario in which the RET was reduced would lead to higher power prices for consumers over the medium to long term. This was backed up by further studies from some of the country's most respected electricity market analysts.

The alternative to a strong target for renewable energy is the increased use of fossil fuels such as coal and gas to generate electricity. Gas in particular has already more than doubled in price since the beginning of the decade, and is poised to increase dramatically due to the looming east coast gas export market. As well as increasing costs for Australian households, this price spike could have grave consequences for the nation's troubled manufacturing sector.

According to a 2014 report by the Grattan Institute, the emergence of an Australian gas export industry projected to be worth $60 billion a year by 2018 is driving the latest price increases. "The downside is that domestic gas prices will increase to compete with the higher prices that other countries are prepared to pay for our gas," the report says.[12]

The future of the RET remained unresolved at the end of the year.

12 T Wood, Grattan Institute, *Gas at the crossroads: Australia's hard choice*, October 2014, page 1

INDUSTRY OUTLOOK 2015-2020

THE IMPORTANCE OF SUPPORTIVE STATE RENEWABLE ENERGY POLICIES

State renewable energy policies are set to play an increasingly important role over the next five years.

$10B

SOUTH AUSTRALIAN GOVERNMENT 2025 CLEAN ENERGY INVESTMENT TARGET

$5.5B

INVESTMENT IN CLEAN ENERGY ALREADY SECURED BY THE SOUTH AUSTRALIAN GOVERNMENT

The South Australian Government has struck a good balance between an attractive investment environment and one that gives communities a strong voice in the planning process.[13] South Australia clearly understands the value of renewable energy to the state, setting an ambitious investment target of $10 billion in clean energy by 2025. It has already secured $5.5 billion of this.[14]

New South Wales's then-Environment Minister Rob Stokes pledged at the Clean Energy Council's Policy and Finance Conference in mid-2014 that his state would be 'Australia's answer to California' for renewable energy. His party's 2015 election victory represents an excellent opportunity to continue delivering on this pledge.

The Victorian Government moved in March 2015 to make its planning system more appealing for wind farm applicants, after new applications virtually stopped dead after the changes made under the former Baillieu Government. The new changes include a reduction of the setback distance between houses and wind turbines from 2 km to 1 km in line with South Australia. These changes are expected to help attract new wind projects, along with the jobs and investment they bring, to the regional Victorian economy.

According to Victorian Premier Daniel Andrews: "Renewable energy creates jobs, drives growth and helps us maintain our lifestyle and protect our environment. Victoria is open for business. Investors want to come to Victoria and back renewable energy."

Beyond supportive planning policy there is much more that can be done to encourage renewable energy and energy efficiency investment and the benefits these can deliver to a state's economy. These include:

- avoid the introduction of measures that would unfairly penalise households that have invested in good faith in a solar power system
- adopt fair and reasonable standards for connecting distributed generation like solar power to the power grid
- clarify regulations for solar power purchase agreements (PPAs) that allow solar companies to on-sell solar electricity, effectively allowing them to offer low or zero up-front costs to small and medium businesses
- develop three-way contracts that would allow public housing tenants to buy or lease solar power systems
- continue or introduce a state energy efficiency target
- promote the Clean Energy Council Solar PV Retailer Code of Conduct to assist consumers in buying from a reputable and committed solar company.

THE BIG MOVERS THIS DECADE

Experts, analysts and banks are tipping energy storage to make a big impact on the electricity market over the next decade. Storage has the potential to revolutionise the Australian energy sector. It allows consumers to more fully manage their energy use, complement their onsite renewable energy generation, help with the management of peak demand and fundamentally change the role of networks and the traditional energy system.

The introduction and use of smarter energy technology over the next decade will help to improve the interaction between onsite renewable energy generation, home energy use, electric vehicles, appliances and the power network. Energy storage and its interaction with the network will be a critical part of this.

Currently the biggest barrier to the wider adoption of storage is the price of both household units and large-scale technology. Tesla has predicted a drop in the price of its lithium ion battery packs by more than 30 per cent by 2017 – the first year of volume production at its US$5 billion Gigafactory in the United States.[15] Step changes in price such as these are what is needed to start expanding the use of energy storage technology.

The increasing number of commercial solar power systems installed by businesses has been one of the shining lights of the market over the last 12 months. As solar companies offer more innovative funding models where they offer to carry much of the risk and deliver a guaranteed return to commercial clients, this expansion is expected to continue.

The current range of offerings will be expanded to incorporate new products such as energy storage devices and new offers such as solar power purchase agreements (PPAs), where a third party installs a solar system on the roof of a home or business and then supplies that customer with the electricity it produces, usually at a price below the rates offered by electricity retailers.

The Bureau of Resource and Energy Economics has predicted that the price of renewable energy technology, particularly solar and wind, will continue to fall rapidly in price over the next decade and will be among the lowest cost of all types of electricity generation within 10 to 20 years.[16]

13 Renewables SA, Government of South Australia, *Wind Farm Planning Policy*, October 2012, www.renewablessa.sa.gov.au/proponents-guide/wind-farms (accessed 17 March 2015)
14 Renewables SA, Government of South Australia, www.renewablessa.gov.au (accessed 17 March 2015)
15 Tesla Motors, *Gigafactory*, 26 February 2014, www.teslamotors.com/blog/gigafactory (accessed 17 March 2015)
16 Bureau of Resources and Energy Economics, Australian Government, *Australian Energy Technology Assessment 2013 Model Update*, December 2013, pages 56-61

EMPLOYMENT

The Australian renewable energy industry employed just over 20,000 people in the 2014 calendar year, about 900 fewer than the year before.[17]

2014 was a tough year for workers in renewable energy in Australia. While there are always multiple factors behind staff lay-off decisions, investment uncertainty was clearly a factor in job losses at Australian firms Keppel Prince Engineering,[18] Pacific Hydro[19] and Hydro Tasmania.[20] Anecdotally there were reports of other businesses reducing staffing levels and asking employees to work reduced hours to try and avoid lay-offs during a period of acute industry uncertainty.

The wind industry was the most affected, with the sector employing approximately 500 fewer people than the year before. Many of these jobs were in construction, and work on many projects was shelved in 2014 pending the outcome of the Renewable Energy Target (RET) review.

More than anything, last year was one of lost opportunity. The large-scale renewable energy sector was poised to ramp up employment across the country to deliver the RET, but in the end was forced to try and hang on until the resolution of the ongoing political deadlock.

17 The employment figures in this section were based on an established methodology for calculating job figures, where multipliers are applied to the levels of renewable energy capacity installed over the course of a year. These multipliers are specific to the Australian context, and have been calculated by industry using a mixture of industry surveys and data. The Clean Energy Council is aware of differences between this data and renewable energy employment data published by the Australian Bureau of Statistics (ABS) in April 2015. The ABS data was based on a different set of assumptions, which the ABS has recognised are in need of further refinement. The Clean Energy Council believes that the methodology used in this document currently provides a more accurate assessment of employment levels across the renewable energy industry.

Image: Workers at Bald Hills Wind Farm, Victoria

EMPLOYEES BY TECHNOLOGY TYPE 2014

1373	2153	2532	12,351	543	85	54	995	20,086
Hydro	Wind	Bioenergy	Solar PV	Large-scale solar[21]	Geothermal	Marine	Solar water heating	**TOTAL**

Full-time employment in the rooftop solar power industry was also down due to a reduction in the number of solar power installations, but this was partly offset by additional positions created by the construction of large-scale solar farms.

Consolidation of businesses in the solar sector also played a factor, while the solar hot water industry experienced job losses due to reduced sales volumes.

These figures are not inclusive of the flow-on employment or additional benefits for suppliers, contractors, restaurants and accommodation providers in the vicinity of large-scale renewable energy projects.

18 H Cook and P Hannam, The Age, *Job losses a blow in Napthine electorate*, 24 October 2014, page 7
19 J Sturmer, The World Today, Australian Broadcasting Corporation, *Clean energy company Pacific Hydro cuts staff because of industry uncertainty*, 10 July 2014
20 Media statement, Hydro Tasmania, *Hydro Tasmania business changes*, 27 June 2014
21 Large-scale solar figure includes solar PV >100 kW and solar thermal

INVESTMENT

Investment in Australia's large-scale renewable energy sector dropped 88 per cent in 2014 compared to the year before, according to analysis by Bloomberg New Energy Finance.

The $240 million invested in large-scale renewable energy such as solar and wind farms was the lowest for the industry since 2002, dropping Australia down the international rankings to place behind nations such as Panama, Sri Lanka and Myanmar.

While investment figures in household renewable energy fared better, the $2.3 billion invested in smaller-scale renewables last year was down more than $600 million on 2013, a drop of more than 20 per cent. Part of this could be explained by a gradual increase in efficiency across the sector, allowing more to be installed for less.

According to Bloomberg New Energy Finance, international clean energy investment rose 16 per cent in 2014.

Fundamentals remain strong for a rebound in investment once policy certainty is restored, thanks to a large pipeline of world-class projects.

16%

RISE IN INTERNATIONAL INVESTMENT IN CLEAN ENERGY TECHNOLOGIES

88%

DROP IN INVESTMENT IN THE LARGE-SCALE RENEWABLE ENERGY SECTOR IN AUSTRALIA IN 2014, COMPARED TO 2013

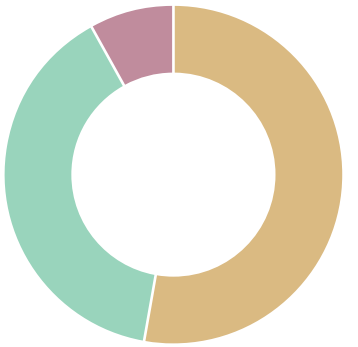
Image: Royalla Solar Farm, Australian Capital Territory

AUSTRALIA'S GLOBAL RANKING FOR LARGE-SCALE RENEWABLE ENERGY INVESTMENT

1st	2013 **11th**	21st	31st	41st
2nd	12th	22nd	32nd	42nd
3rd	13th	23rd	33rd	43rd
4th	14th	24th	34th	44th
5th	15th	25th	35th	45th
6th	16th	26th	36th	46th
7th	17th	27th	37th	47th
8th	18th	28th	38th	48th
9th	19th	29th	2014 **39th**	49th
10th	20th	30th	40th	50th

ELECTRICITY PRICES

NATIONAL AVERAGE ELECTRICITY COST COMPONENTS AS A PORTION OF ELECTRICITY BILLS[22]



Australians endured regular and substantial rises in electricity prices from 2007 to 2013, but a combination of factors in 2014 actually led to the first falls in power prices in years.

A sharp drop in investment in poles and wires infrastructure put the brakes on the price rises weathered by consumers over a six-year period, and the removal of the carbon price in 2014 also contributed to lower electricity prices for households and businesses.

Wholesale power prices are at record lows, due to increased competition from extra generating capacity added under the Renewable Energy Target (RET). This is great news for consumers, but is creating challenges for the broader energy sector, particularly as many older coal power plants have remained in use long after their expected retirement date.

The spending on poles and wires infrastructure by electricity network companies was the primary driver of higher power prices across the country over the last decade. Much of this investment had occurred on the common assumption that demand for electricity would continue to increase out to 2020 and beyond. This assumption has proven to be incorrect, and spending on the electricity networks has eased accordingly, sparing the majority of states further price rises in 2014.

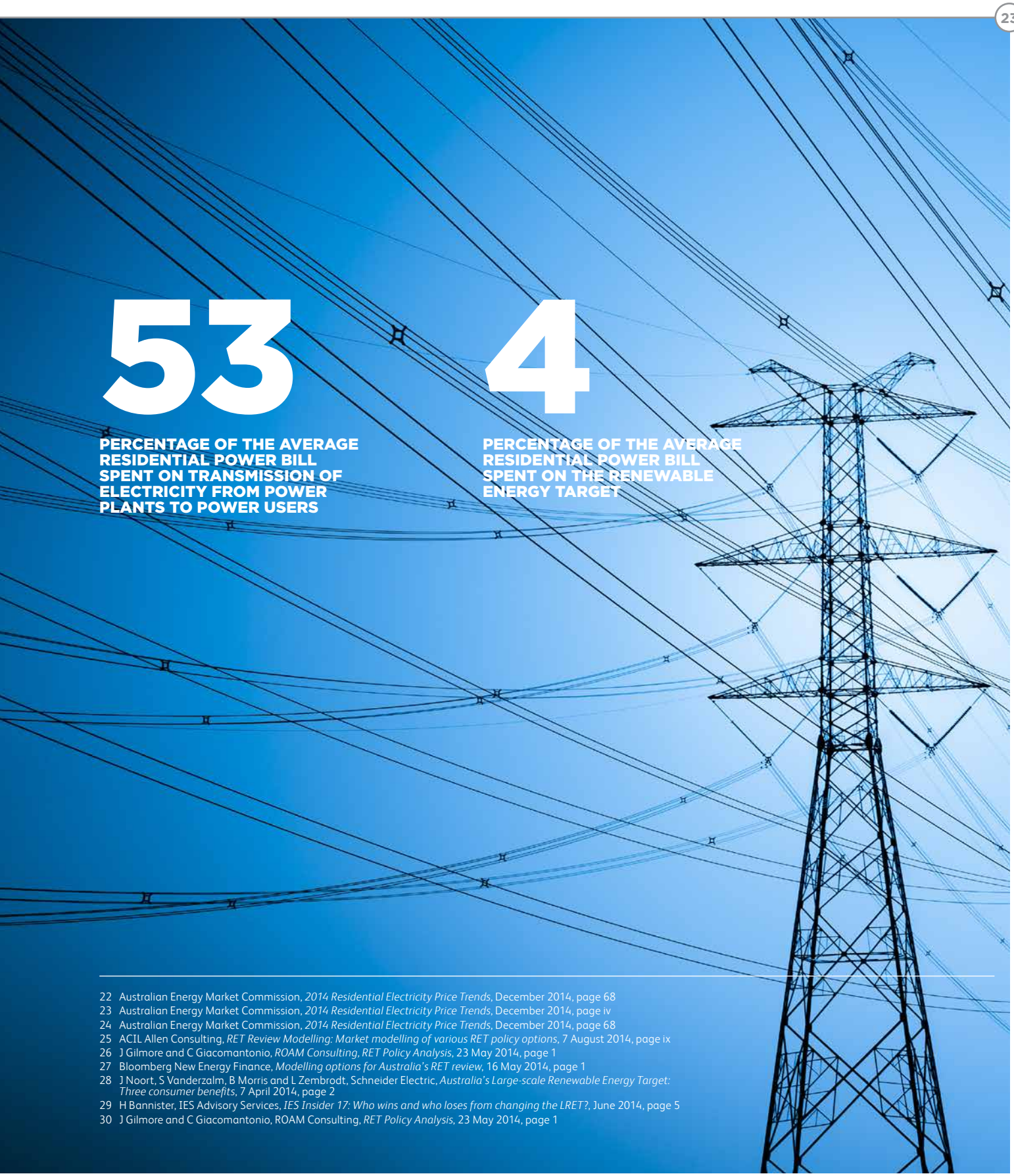
According to the Australian Energy Market Commission: "Wholesale electricity prices are expected to remain generally stable over the reporting period as electricity consumption growth is forecast to remain weak and there is currently an oversupply of generation capacity."[23]

The transmission of electricity from power plants to power users along the poles and wires network represents about 53 per cent of the average residential power bill.[24] The RET is a minor part of electricity bills, making up only about 4 per cent.

Analysis by consultancy ACIL Allen for the review of the RET in 2014,[25] along with studies by ROAM Consulting,[26] Bloomberg New Energy Finance,[27] Schneider Electric[28] and IES Advisory Services,[29] found that removing or substantially reducing the RET would cost more money than it saves. The only winners out of such a move would be coal and gas generators.

The main alternative to renewable energy is the increased use of fossil fuels such as coal and gas to generate electricity. Gas has already more than doubled in price this decade and is expected to become substantially more expensive in the near future, as domestic users compete for contracts with international customers. The increase in renewable energy under the RET helps to suppress wholesale power prices, as well as protecting consumers from the volatility of other fuels such as gas.[30]

Not only do these new technologies bring increased competition to the energy sector in Australia, many of them can operate more cheaply than traditional fossil fuels.



53

PERCENTAGE OF THE AVERAGE RESIDENTIAL POWER BILL SPENT ON TRANSMISSION OF ELECTRICITY FROM POWER PLANTS TO POWER USERS

4

PERCENTAGE OF THE AVERAGE RESIDENTIAL POWER BILL SPENT ON THE RENEWABLE ENERGY TARGET

22 Australian Energy Market Commission, *2014 Residential Electricity Price Trends*, December 2014, page 68
23 Australian Energy Market Commission, *2014 Residential Electricity Price Trends*, December 2014, page iv
24 Australian Energy Market Commission, *2014 Residential Electricity Price Trends*, December 2014, page 68
25 ACIL Allen Consulting, *RET Review Modelling: Market modelling of various RET policy options*, 7 August 2014, page ix
26 J Gilmore and C Giacomantonio, *ROAM Consulting, RET Policy Analysis*, 23 May 2014, page 1
27 Bloomberg New Energy Finance, *Modelling options for Australia's RET review*, 16 May 2014, page 1
28 J Noort, S Vanderzalm, B Morris and L Zembrodt, Schneider Electric, *Australia's Large-scale Renewable Energy Target: Three consumer benefits*, 7 April 2014, page 2
29 H Bannister, IES Advisory Services, *IES Insider 17: Who wins and who loses from changing the LRET?*, June 2014, page 5
30 J Gilmore and C Giacomantonio, ROAM Consulting, *RET Policy Analysis*, 23 May 2014, page 1

DEMAND FOR ELECTRICITY

Electricity use in the National Electricity Market (NEM), which runs from North Queensland down the east coast to South Australia and across to Tasmania via an undersea cable, declined for a sixth straight year in 2014. However, electricity use in Western Australia and off-grid substantially increased, meaning that overall consumption of electricity was almost identical to the year before.

Some of the reasons for the continued drop in power use across the NEM include the increased use of energy efficient appliances and insulation, as well as household technologies such as solar power and solar hot water. In the main these purchases have been driven by concern over the rising cost of electricity, although regulatory energy efficiency programs have also had an impact.[31]

The exit of some major industrial energy users from the Australian market, such as the Port Henry aluminium smelter near Geelong, have also contributed to the continuing decline of demand in the NEM.

According to the Australian Energy Market Operator, these trends are expected to continue[32], although it is important to acknowledge that demand is extremely difficult to predict. The introduction of energy storage to the market, the wider use of electric vehicles, rising gas prices and many other factors will have a profound effect on energy use, while vastly increasing the complexity of demand forecasting.

Modest growth in the market is expected over the next few years due to the operation of some major LNG export projects in Queensland. South Australian demand is predicted to fall due to the installation of solar energy technology and a reduction in the use of the state's desalination plant following the end of operational testing.

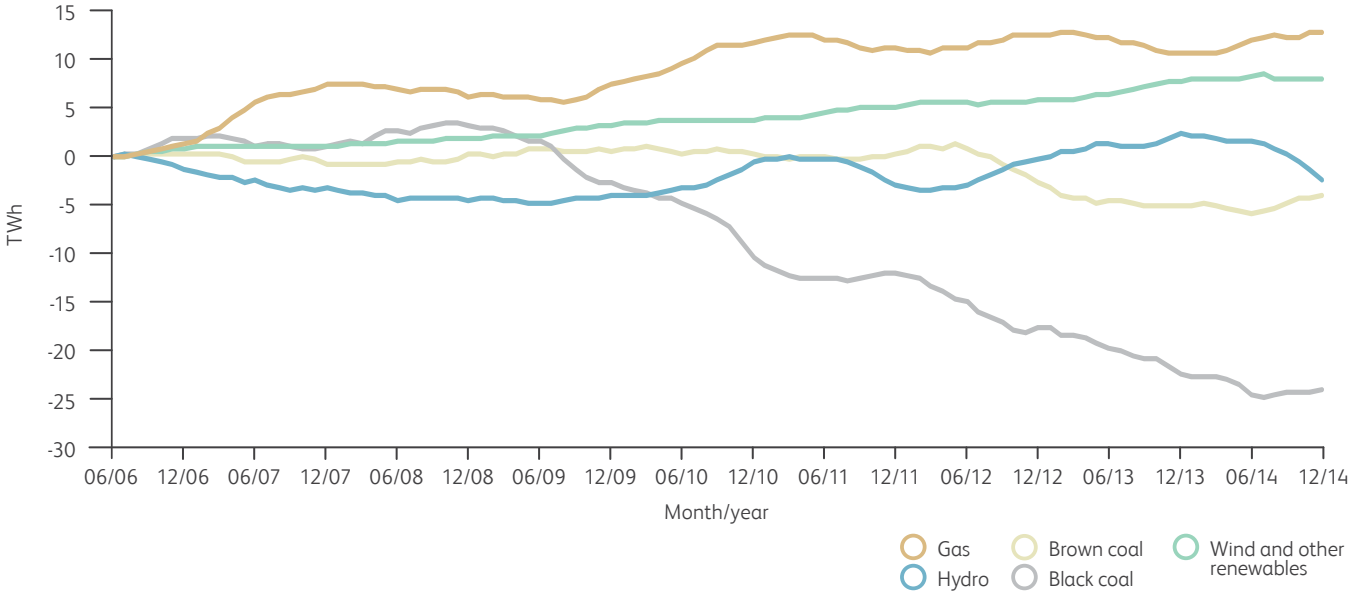
However, the challenge confronting the power system is that while overall energy use has been falling, the peaks of electricity usage are becoming more concentrated.

The forecasts show maximum demand growing at a marginally higher rate than annual energy in all regions except for Queensland. This leads to peakier maximum demands, shifting to later in the day due to rooftop PV, particularly in South Australia.[33]

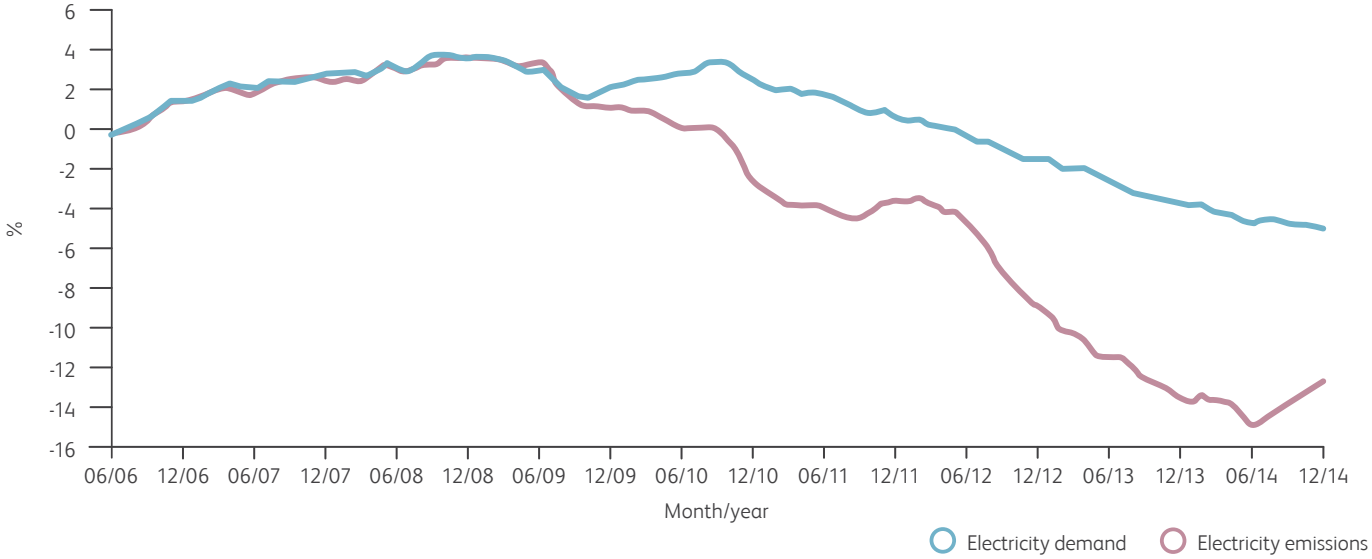
However, the major issue for the broader energy industry at the moment is an excess of generation capacity caused by the continued operation of older coal-fired power plants. In some cases these plants are decades past their expected retirement date.[34]

31 H Saddler, The Australia Institute, *Power down: Why is electricity consumption decreasing*, December 2013, page 4
32 Australian Energy Market Operator, *National Electricity Forecasting Report*, June 2014, page iii
33 Australian Energy Market Operator, *National Electricity Forecasting Report*, June 2014, page iv
34 AGL, *Submission to the 2014 Review of the Renewable Energy Target*, 16 May 2014.
35 pitt and sherry, 2014, *Carbon Emissions Index (CEDEX) Electricity Update*, www.pittsh.com.au/cedex

CHANGES IN ELECTRICITY GENERATION BY FUEL TYPE[35]

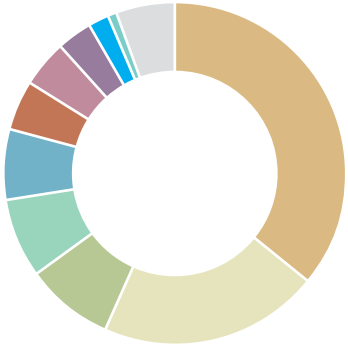


CHANGES IN ELECTRICITY GENERATION AND EMISSIONS[35]



ENERGY EFFICIENCY

VEECS BY ACTIVITY JAN 2014 – JAN 2015[36]



- Lighting – Downlight 12V – 21C **1,306,285 (36.1%)**
- Lighting – GLS lamps – 21A **749,415 (20.7%)**
- Lighting – Downlight mains – 21D **306,806 (8.4%)**
- Commercial lighting **268,230 (7.4%)**
- Weather sealing **240,426 (6.6%)**
- Standby power controller **174,818 (4.8%)**
- Low flow shower rose **154,466 (4.2%)**
- Water heating **122,308 (3.3%)**
- Space heating **69,682 (1.9%)**
- HE television **30,786 (0.9%)**
- Other **197,152 (5.3%)**

TOTAL REGISTERED VEECS 2014 – 2015 **3,620,374**

Australia has been blessed with abundant energy sources, but has traditionally not been very efficient in the way it uses that energy. The increase in power prices since 2007 has greatly increased the awareness of all energy consumers about the benefits of both energy efficiency and energy conservation. Australia's energy productivity is receiving some welcome attention, and helping to make many of our industries more competitive with their international counterparts.

The International Energy Agency estimates that there is the potential for new energy efficiency measures to reduce global energy consumption by 7 per cent by the end of the decade – which would effectively be the combined energy supply of Australia, Japan, South Korea and New Zealand.[37] It estimates the savings for consumers at more than US$450 billion.

Energy efficiency is difficult to measure across the Australian economy due to a lack of data. While the uptake of solar power is also making a contribution to reducing energy use across the National Energy Market, consultants pitt&sherry suggest the improvement in energy efficiency is a key factor contributing to this trend.[38]

The Australian Energy Market Operator's National Electricity Forecasting report found strong growth (approximately 10 per cent annually to 2016-17) in total energy efficiency savings, with key contributions from air-conditioning, refrigeration and electronics.[39]

Energy efficiency programs provide an incentive to make buildings and equipment more productive in the way they use energy. Programs typically cover everything from energy efficient street lights and building lights to insulation, heating and white goods.

Energy efficiency improvements can make significant improvements to a business's bottom line. In March 2014, RMIT University in Melbourne announced a plan to spend $98 million reducing emissions across 90 buildings in its multiple campuses. The plan will lead to a reduction of 239 million kilowatt-hours of power generation over eight years.[40]

36 Essential Services Commission, Presentation slides from the Victorian Energy Efficiency Target Public Forum, 20 February 2015, https://www.veet.vic.gov.au/public/Public.aspx?id=Home (accessed March 2015)
37 Department of Industry and Science, Australian Government, *Energy White Paper: Green Paper 2014*, September 2014, page 55
38 H Saddler, H Meade and M Johnston, pitt&sherry, CEDEX Electricity Update 20 November 2014, November 2014, page 3

POTENTIAL DROP IN GLOBAL ENERGY CONSUMPTION BY THE END OF THIS DECADE AS A RESULT OF NEW ENERGY EFFICIENCY MEASURES

ESTIMATED SAVINGS, IN BILLIONS OF US DOLLARS, TO CONSUMERS

The Victorian Energy Efficiency Target (VEET), the New South Wales Energy Savings Scheme and the Residential Energy Efficiency Scheme in South Australia were all introduced in 2009.

The SA Residential Energy Efficiency Scheme finished at the end of 2014 and a program called the Retailer Energy Efficiency Scheme was introduced in 2015. It builds on the previous scheme and has a particular focus on assisting low-income households.

The new Victorian Government has pledged to strengthen its VEET scheme following a review in 2015. Recent data from the VEET scheme is typical of state energy efficiency programs, showing various lighting upgrades making up a large proportion of the activity.

The Federal Government's Energy White Paper process acknowledged significant potential to improve the harmonisation of state schemes through a national program.

AVERAGE HOUSEHOLD ENERGY USE – BREAKDOWN[41]

4% COOKING

8% APPLIANCES

10% ENTERTAINMENT

11% LIGHTING

32% HEATING

2% COOLING

16% HOT WATER

17% WHITEGOODS

39 Australian Energy Market Operator, *National Electricity Forecasting Report*, June 2014, page ii
40 RMIT University, *RMIT launches $98 million sustainability program*, March 2014, www.rmit.edu.au/news/all-news/media-releases/2014/march/rmit-launches-98-million-sustainability-program/ (accessed March 2015)
41 Sustainability Victoria, *Energy efficiency at home*, www.sustainability.vic.gov.au/services-and-advice/households/energy-efficiency/at-home (accessed March 2015)

ENERGY STORAGE

Energy storage will dramatically transform the way the world uses energy in the near future.

As well as offering more flexible, reliable and efficient energy use for consumers, storage is also an effective way to smooth out the supply of variable forms of renewable energy such as solar and wind power. It gives consumers greater control of their power use and enables them to take full advantage of the solar energy they generate themselves.

A 2014 report by investment bank UBS using analysis by Navigant Research predicts a 50-fold increase for global energy storage technology by 2020.

Energy storage technologies currently on offer vary greatly, from household battery systems to large-scale pumped hydro storage where water is pumped up a hill to a reservoir to be used when needed. Other bulk technologies are also being explored, including compressed air energy storage. Each has its own advantages and shortcomings.

If large amounts of electricity generated by renewable energy could be saved and used at times when power generation from these sources is low, it would be possible to integrate significantly higher levels of renewables into the power grid without compromising reliability.

Modelling released by the Clean Energy Council in 2013 predicts a 3000 megawatt (MW) market for energy storage in Australia by 2030, without targeted government incentives or support of any kind.

Hard data on energy storage installed in Australia is elusive. Some estimates for 2014 put the numbers as low as 500 grid-connected systems and 4 to 5 MW of off-grid storage, but these figures are disputed by some in the industry. The Clean Energy Council has developed a comprehensive roadmap to ensure the full potential of energy storage can be realised, laying the foundations for a robust and well-managed sector.

The biggest factor influencing the adoption of storage technology is cost. Navigant Research expects lithium ion batteries to remain the dominant form of storage for the next decade. Electric car maker Tesla estimates that the construction of its US$5 billion Gigafactory in the United States will reduce the cost of its lithium ion battery packs more than 30 per cent by 2017. Cost reductions such as these will help to make energy storage technology vastly more appealing to the budget-conscious consumer.

Although the future opportunities provided by energy storage in Australia are substantial, the established markets for storage technology are currently in the United States, Europe and some parts of Asia. This will allow the Australian industry and the nation's policymakers to learn from the early experiences with energy storage in these areas.

50x

INCREASE FOR GLOBAL ENERGY STORAGE TECHNOLOGY BY 2020

3000 MW

MARKET FOR ENERGY STORAGE IN AUSTRALIA BY 2030 WITHOUT GOVERNMENT SUPPORT OR INCENTIVES

$5B

COST, IN US DOLLARS, OF TESLA'S AMERICAN GIGAFACTORY

30%

REDUCTION IN COST OF LITHIUM ION BATTERY PACKS FROM TESLA BY 2017

Image: Grid Energy Storage System, Victoria

SUMMARY OF CLEAN ENERGY GENERATION

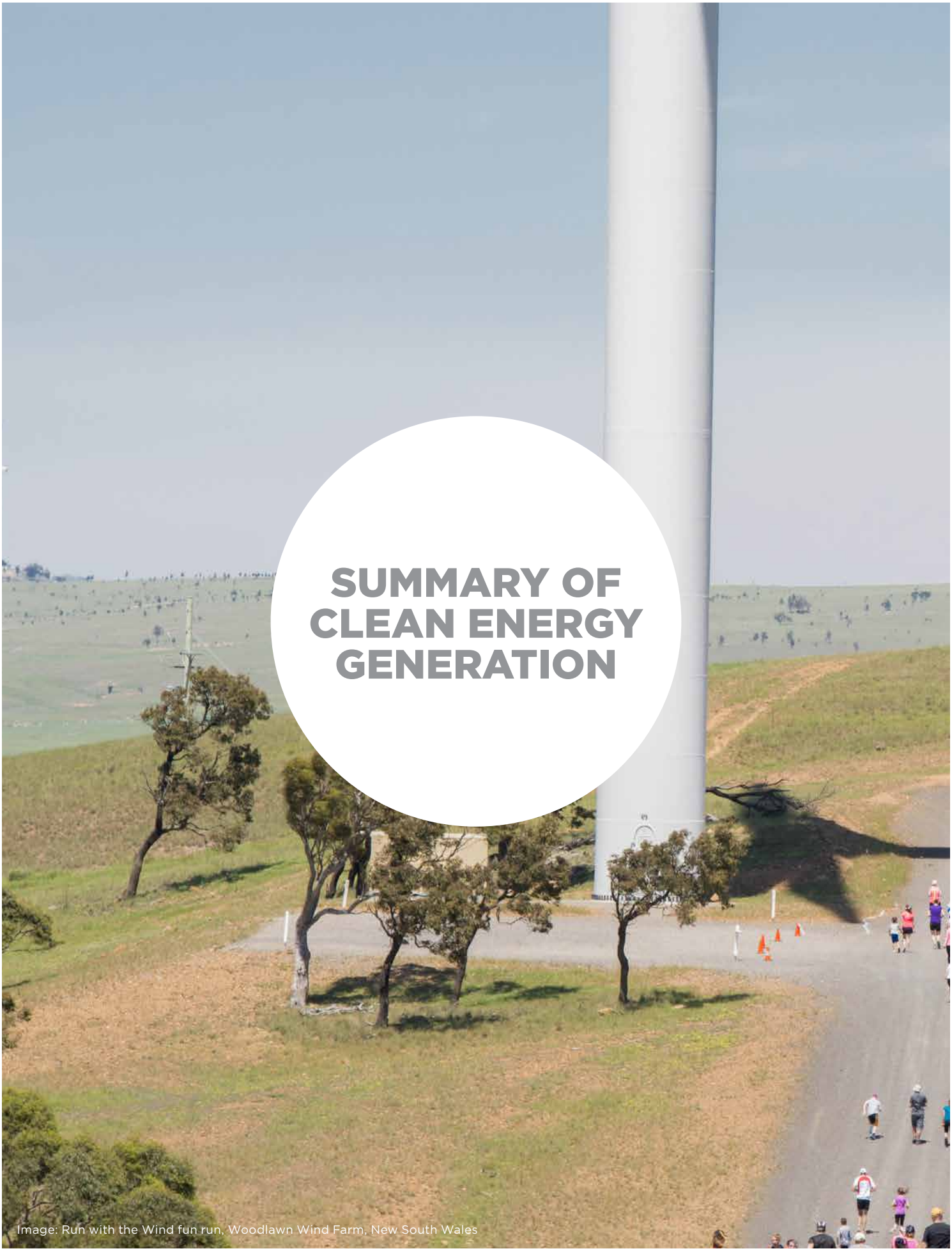


Image: Run with the Wind fun run, Woodlawn Wind Farm, New South Wales

BIOENERGY

7.6% OF TOTAL CLEAN ENERGY GENERATION

1% OF TOTAL GENERATION

139 OPERATIONAL PLANTS

GEOTHERMAL

0.002% OF TOTAL CLEAN ENERGY GENERATION

1 OPERATIONAL PLANT

SOLAR*

15.3% OF TOTAL CLEAN ENERGY GENERATION

2.1% OF TOTAL GENERATION

1,421,601 INSTALLATIONS

LARGE-SCALE SOLAR**

0.4% OF TOTAL CLEAN ENERGY GENERATION

0.05% OF TOTAL GENERATION

107 OPERATIONAL PLANTS (8>1MW, 99<1MW)

Image: Waubra Wind Farm, Victoria

HYDRO

45.9% OF TOTAL CLEAN ENERGY GENERATION

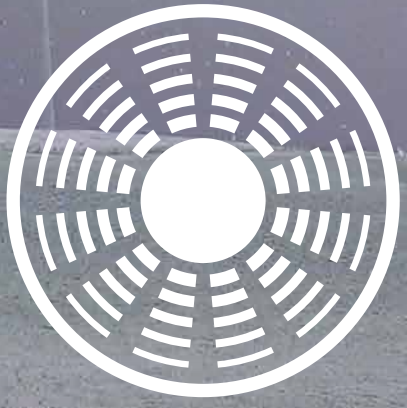
6.2% OF TOTAL GENERATION

123 OPERATIONAL PLANTS

MARINE

<0.0% OF TOTAL CLEAN ENERGY GENERATION

1 OPERATIONAL PLANT



SOLAR WATER HEATING

901,923 INSTALLATIONS

WIND

30.9% OF TOTAL CLEAN ENERGY GENERATION

4.2% OF TOTAL GENERATION

71 OPERATIONAL PLANTS

* Includes household and commercial installations up to 100kW
**Includes installations over 100kW

BIOENERGY

Bioenergy is a sustainable way to produce energy from agricultural or biological sources, particularly from waste or by-products.

Australian industries make use of many different kinds of bioenergy. Sugar cane waste, or bagasse, is the most common form of Australian bioenergy generation, and is used to produce both electricity and heat in many parts of the country.

Landfill gas, sewage gas, agricultural and wood waste are also commonly used as fuel to produce renewable electricity. Landfill gas has among the lowest cost per unit of any energy source.[42] Australia has the potential to make much better use of our waste streams to produce cost-effective power both onsite and for export to the power grid, saving money and increasing the competitiveness of businesses in the process.

The review of the Renewable Energy Target (RET) by the Federal Government in 2014 caused uncertainty across the entire sector, and the bioenergy sector was hit particularly hard. While farmers are keen to use bioenergy as an alternative revenue stream to shield them from changing economic conditions, without the certainty of a strong RET the agricultural sector has been reluctant to invest in new bioenergy power plants.

The Australian Renewable Energy Agency (ARENA) and the Clean Energy Finance Corporation, both arms of the Federal Government, have been working on supporting innovative bioenergy projects. The sector is expecting a better year in 2015.

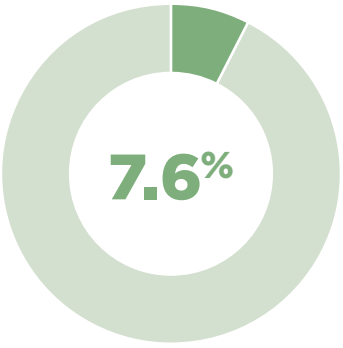
GARDEN PRODUCTS COMPANY POWERS ALL ITS OPERATIONS FROM WASTE

Leading Australian garden product supplier Richgro is using ground-breaking waste-to-energy technology supplied by Biogass Renewables to meet all its power needs.

Using organic waste from its onsite operations, a $3.3 million anaerobic digestion plant with a capacity of 2 megawatts produces enough electricity for Richgro's operations at Jandakot in the south of Perth, Western Australia.

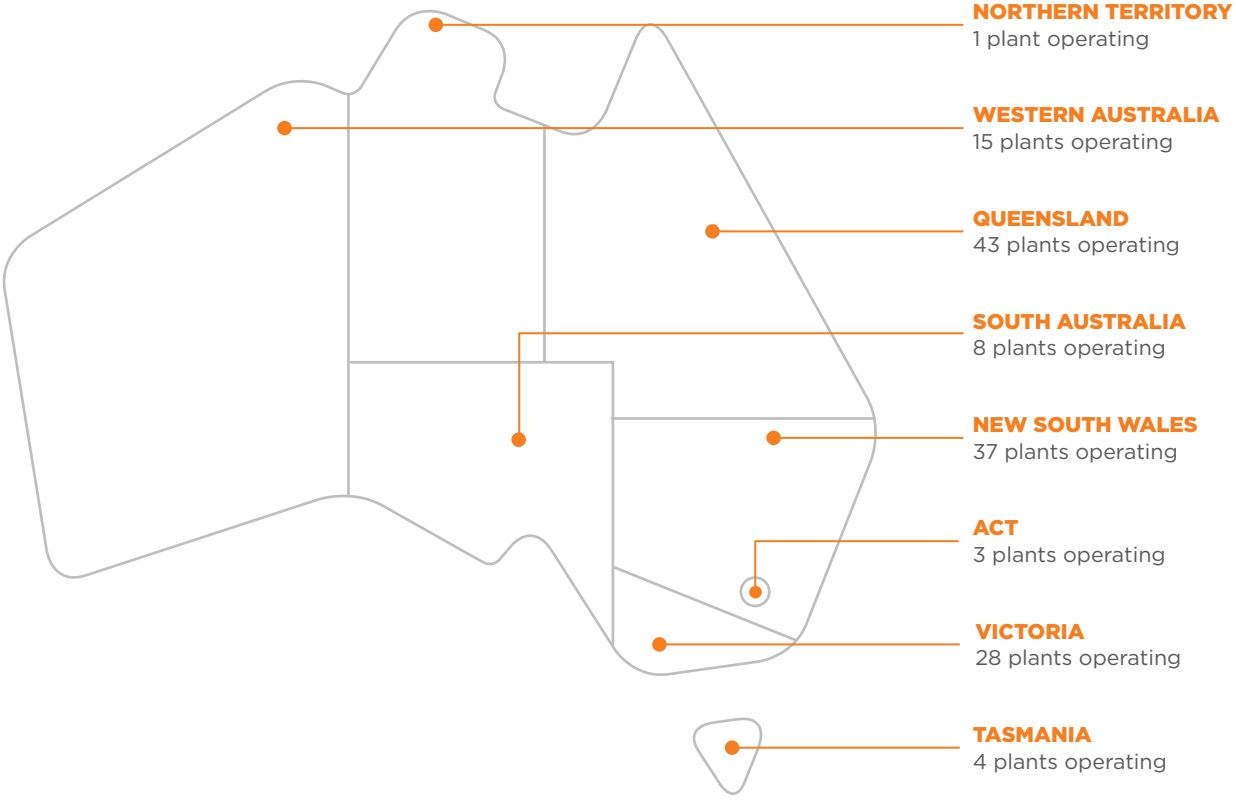
That includes powering equipment and potentially Richgro's onsite vehicle fleet. And the by-product from the plant can be used as a raw material in Richgro's garden products, meaning the company produces zero net waste from its operations.

Low Carbon Australia, a Federal Government body which has since merged with the Clean Energy Finance Corporation, provided finance for the project. The plant also received a grant through the Australian Government Clean Technology Investment Program.



OF TOTAL CLEAN ENERGY GENERATED IN AUSTRALIA IN 2014

OF ELECTRICITY GENERATED IN AUSTRALIA IN 2014



LARGEST BIOENERGY PROJECTS

Technology	State	Owner	Location	Commission year	Capacity (MW)
Bagasse cogeneration	QLD	Sucrogen	Pioneer II	2005	68
Black liquor	VIC	Australian Paper	Maryvale	1976 - 1989	54.5
Bagasse cogeneration	QLD	Sucrogen	Invicta	1976 - 1996	50.5
Bagasse cogeneration	QLD	Mackay Sugar Ltd	Racecourse	2013	38
Bagasse cogeneration	NSW	Capital Dynamics	Broadwater II	2009	30

42 Bureau of Resources and Energy Economics, Australian Government, *Australian Energy Technology Assessment*, 2013, page 80

GEOTHERMAL

Most Australian companies working on geothermal energy this decade have focused on developing a new kind of technology that aims to harness the power of hot rocks and super-heated water reservoirs located up to 5 km under the Earth's surface. This technology is known as an Enhanced Geothermal System (EGS).

Other types of geothermal energy are well established in many countries, but the geothermal resource in Australia is well suited to EGS technology.

So far progress on Australian geothermal remains slow.

The successful Habanero Pilot Plant run by Geodynamics in South Australia's Cooper Basin in 2013 provided some cause for optimism, but the remote nature of the site has made it challenging to find customers for the resource. Geodynamics is now looking to diversify into other types of renewable energy while it continues to develop its geothermal technology.

Only one small commercial power plant is currently operating, run by Ergon Energy at Birdsville in Queensland.

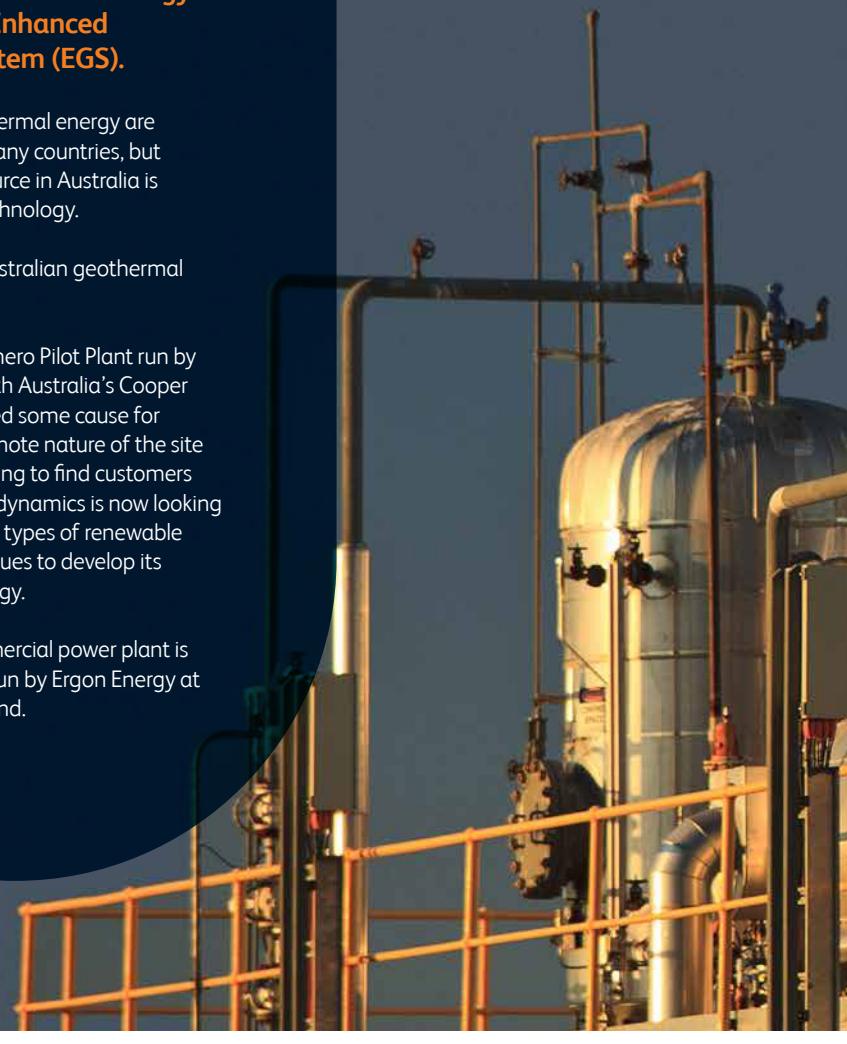


Image: Habanero Pilot Plant, South Australia

OF TOTAL CLEAN ENERGY GENERATED IN AUSTRALIA IN 2014

QUEENSLAND
1 plant operating

GEOTHERMAL PLANT OPERATING IN 2014

Location	State	Owner	Capacity (kW)
Birdsville	QLD	Ergon Energy	120

HYDRO

Hydroelectricity generated the largest share of Australia's renewable energy during 2014.

The electricity generated by the hydro sector returned to average levels last year, following the extremely high output from Hydro Tasmania's Gordon Dam in 2013 and many other hydro power plants.

Both Hydro Tasmania and Snowy Hydro conducted cloud seeding operations over their respective hydro catchment areas in the winter months of 2014. However, a dry summer for the Apple Isle and below average rainfall in the Snowy Hydro catchments meant a subdued year for hydro generation following several very healthy seasons. Some plants had also intentionally run down reserve levels during the 2013-14 financial year to take advantage of the carbon price.

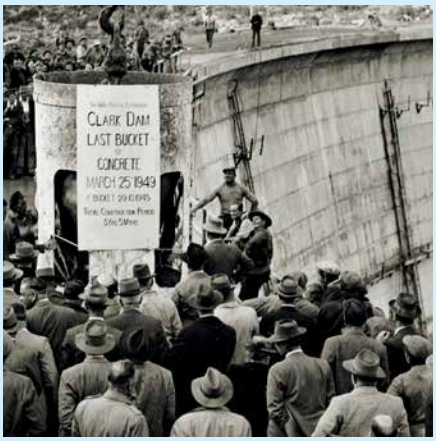
The result was substantially lower renewable energy generation overall. Hydro's contribution to total renewable energy was down almost a quarter on 2013, causing the sector's share of total renewable energy generation to dip under 50 per cent for the first time (it contributed approximately 46 per cent of the total).

Hydro Tasmania turned 100 in 2014, while Snowy Hydro marked 65 years since the beginning of construction on the nation-building project. Both anniversaries provided opportunities to recognise organisations that have provided employment for generations of Australians, while supplying clean energy to millions of homes.

HYDRO POWER'S CONTRIBUTION TO AUSTRALIAN ELECTRICITY GENERATION

Year	Generation (GWh)	Contribution to total renewable energy generation	Contribution to total energy generation
2013	19,243	55%	8%
2014	14,567	46%	6%

HYDRO TASMANIA CENTENARY



Hydro Tasmania turned 100 in 2014, and the business celebrated its centenary during the year with a series of free events such as power station tours, a travelling exhibition and documentary screenings.

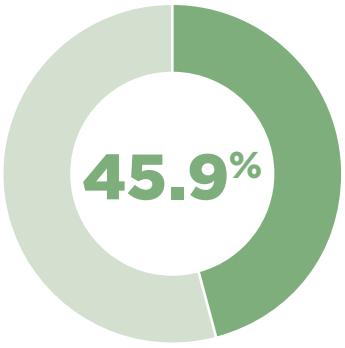
It also created a dedicated website (hydro100.com.au/) to bring its history to life, collating stories and images contributed by members of the public with connections to the company.

Hydro Tasmania spent eight decades creating Tasmania's electricity system, building 30 power stations and 55 major dams. It was a key force in the state's economic development stretching from the Great Depression until the early 1980s. Hydro Tasmania Chief Executive Officer Stephen Davy said the company's history went well beyond the corporate story and was 'part of the living memory of thousands of workers and their families'.

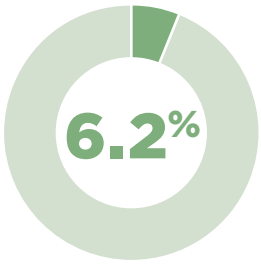
"Hydro Tasmania shaped Tasmania's industries, economy, landscape and community. Its legacy is not only its engineering and construction feats, but also its lasting impact on the state's population and culture," Mr Davy said.

"It employed more than 5200 people at the peak of construction and has employed about 30,000 people in the past century."

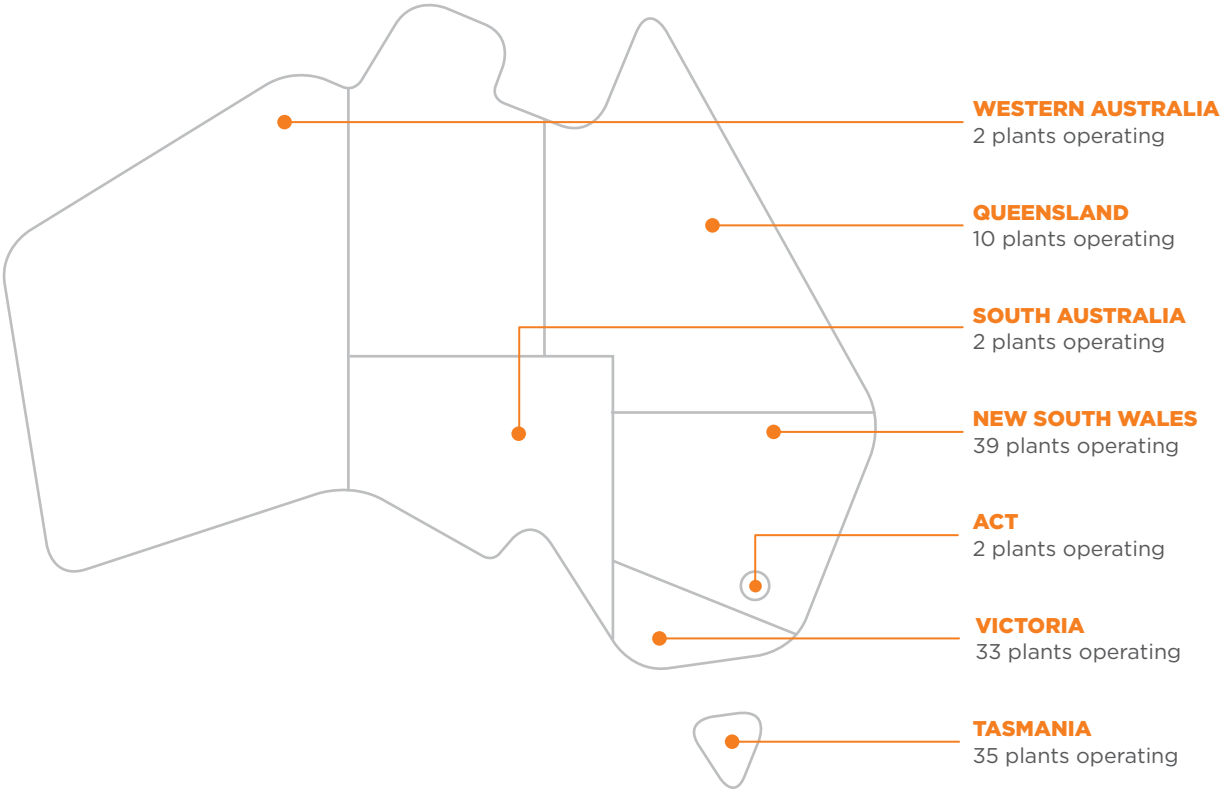
The company plans to last for the long term, confident that renewable energy will be more important 100 years from now than it ever has been.



OF TOTAL CLEAN ENERGY GENERATED IN AUSTRALIA IN 2014



OF ELECTRICITY GENERATED IN AUSTRALIA IN 2014



TOP PLANTS BY GENERATION

Station	State	Owner	Generation (GWh)
Gordon	TAS	Hydro Tasmania	2142
Poatina	TAS	Hydro Tasmania	1584
Murray	VIC	Snowy Hydro	1022
Liapootah-Wayatinah-Catagunya	TAS	Hydro Tasmania	831
Reece	TAS	Hydro Tasmania	790

MARINE

Marine energy technologies generate electricity through the movement of waves, tides or currents.

Australian marine energy technology has exceptional promise and strong public support, but is still at a relatively early stage of development. Early-stage energy technology is inherently risky, and 2014 saw a mix of successes and failures for this emerging sector.

Local businesses Carnegie Wave Energy and BioPower Systems continued to improve and refine their respective wave energy technologies. Carnegie's CETO technology delivers both power and desalinated water, and the company has signed a contract to supply wave power to the Garden Island facility in Western Australia, run by the Department of Defence. Carnegie installed the first of its 240 kilowatt (kW) CETO 5 units at Garden Island in November 2014 (see case study for more information).

BioPower Systems and Worley Parsons have joined forces to deliver the final engineering and design for a 250 kW wave energy project in Victoria, which is scheduled for completion in 2015.

The Carnegie and BioPower projects were supported by the Australian Government through the Australian Renewable Energy Agency (ARENA), and this support remains critical to their success.

It wasn't all plain sailing for marine energy in 2014. A 1 megawatt GreenWave pilot wave generator developed by Oceanlinx was damaged at sea and sank while being transported to Port MacDonnell in South Australia, forcing the company to go into administration and return its funding to ARENA.

The Victorian Wave Partners coalition failed to deliver on its promised PowerBuoy technology at Portland in Victoria and returned all public funding to the government.

WORLD-FIRST RENEWABLE ENERGY PROJECT RIDING A WAVE IN WESTERN AUSTRALIA

Australian business Carnegie Wave Energy signed an agreement in 2012 to supply electricity to the HMAS Stirling naval base on Garden Island in Western Australia, and in November 2014 Australia's first wave-to-wire unit began generating electricity.

The deal with the Department of Defence was the culmination of more than a decade of work by the company on its CETO wave power technology, which produces both clean energy and desalinated water.

With support from the Australian Renewable Energy Agency (ARENA), the company installed the first of its 240 kilowatt CETO 5 wave energy generating units late last year, and all three CETO 5 units had been installed in March 2015 as part of the demonstration phase of the project.

The project was a world leader in two ways: it was the first project to use the energy of waves to produce both electricity and desalinated water, as well as the first to link several wave generating units together.

The CETO technology is named after a Greek sea goddess, and the units operate beneath the surface of the water. The next step is the development of the next-generation CETO 6 technology, which has a targeted power capacity of 1 megawatt per unit.

WAVE AND TIDAL PLANTS CURRENTLY OPERATING

Technology	State	Owner	Location	Installed capacity (kW)
Wave	WA	Carnegie Wave Energy	Garden Island	240

UNDER CONSTRUCTION IN 2015

Technology	State	Owner	Location	Installed capacity (kW)
Wave	WA	Carnegie Wave Energy	Garden Island	480
Wave	VIC	BioPower Systems	Port Fairy	250

SOLAR

HOUSEHOLD AND COMMERCIAL SYSTEMS UP TO 100kW

The total number of solar power systems installed in 2014 might have been down, but the average size of each system installed continued to grow, as it has every year since 2009.

An increasing number of businesses switched on to the potential of solar power to help them save on their electricity bills. Consequently the total amount of solar power generating capacity installed in 2014 was slightly higher than the year before.

More than 15,000 businesses across the country have now installed a solar power system, collectively saving more than $64 million on their power bills.[43]

With all state-based solar power incentives scaled back in comparison to several years ago, along with ongoing innovation and competition, the solar industry continued to consolidate during 2014. Established industry leaders continued to embrace newer business models such as solar leasing and worked on securing new residential and commercial customers.

The ongoing consolidation of the sector led to a second straight year of contraction in the number of installers accredited with the Clean Energy Council. Almost 4400 accredited installers were operating across the country at the end of 2014, a modest drop of 4 per cent on the year before.

The quality of solar power systems will continue to come under scrutiny by state and federal governments in the coming years. This only highlights the importance of both Clean Energy Council accreditation for solar installers and the Solar PV Retailer Code of Conduct, which was introduced in 2013.

The Solar PV Retailer Code of Conduct provides an additional level of reassurance to solar customers that they are choosing a reputable solar company which is committed to high quality products, customer service, responsible marketing practices, system warranties and after-sales service. Businesses that apply to become an approved solar retailer must meet a set of strict criteria in order to be accepted into the program.

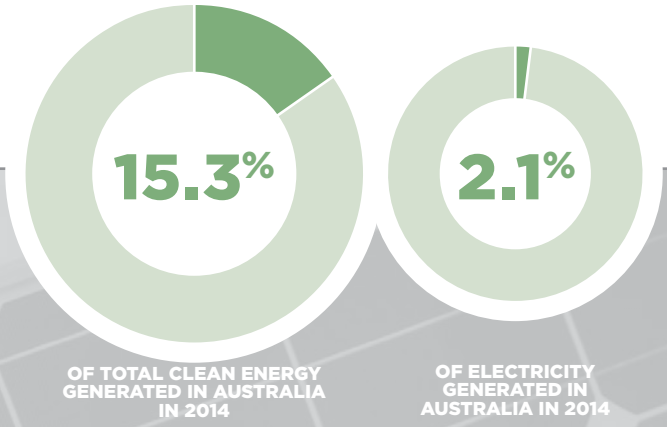
At the end of 2014, 18 companies across the country were approved solar retailers under the program.

AUSTRALIA'S TOP SOLAR POSTCODE, WITH 9309 INSTALLATIONS

BUSINESSES ACROSS AUSTRALIA HAVE INSTALLED SOLAR POWER

ACCREDITED INSTALLERS AUSTRALIA-WIDE AT THE END OF 2014

43 Clean Energy Council calculation in September 2014 using data supplied by Sunwiz



TOP TEN SOLAR POSTCODES IN AUSTRALIA

State	Postcode	Suburbs	Number of installations (projected)	Capacity (kW)
QLD	4670	Bundaberg	9309	27,805
WA	6210	Mandurah	8378	17,884
QLD	4655	Hervey Bay	7971	22,032
QLD	4551	Caloundra	7500	18,868
QLD	4350	Toowoomba	6894	20,295
QLD	4305	Ipswich	6018	16,129
QLD	4211	Nerang and Lamington National Park	5879	17,525
WA	6065	Wanneroo	5802	15,392
QLD	4207	Beenleigh	5447	15,370
QLD	4570	Gympie	5415	16,166

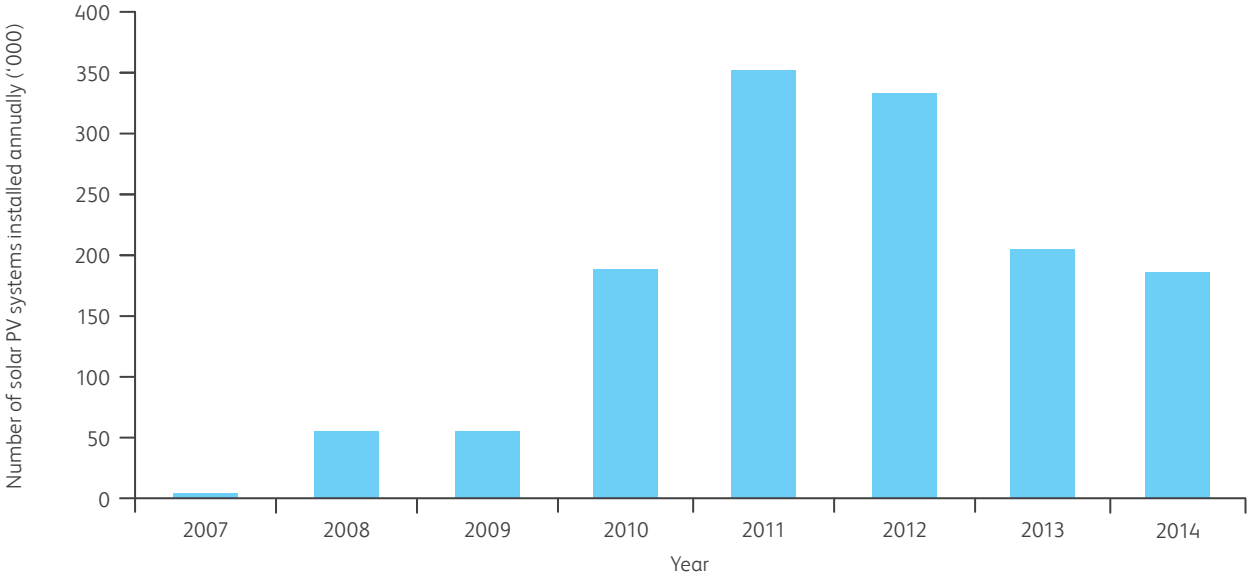
TOP SOLAR POSTCODE IN EACH STATE

State	Postcode	Suburbs	Number of installations (projected)	Capacity (kW)
QLD	4670	Bundaberg	9309	27,805
WA	6210	Mandurah	8378	17,884
VIC	3029	Hoppers Crossing	4978	13,072
NSW	2480	Lismore and surrounds	4457	11,914
SA	5162	Morphett Vale, Woodcroft	4319	11,577
TAS	7250	Launceston	4065	13,866
ACT	2615	Belconnen	1927	5278
NT	0870	Alice Springs	1091	4686

SOLAR

HOUSEHOLD AND COMMERCIAL SYSTEMS UP TO 100kW

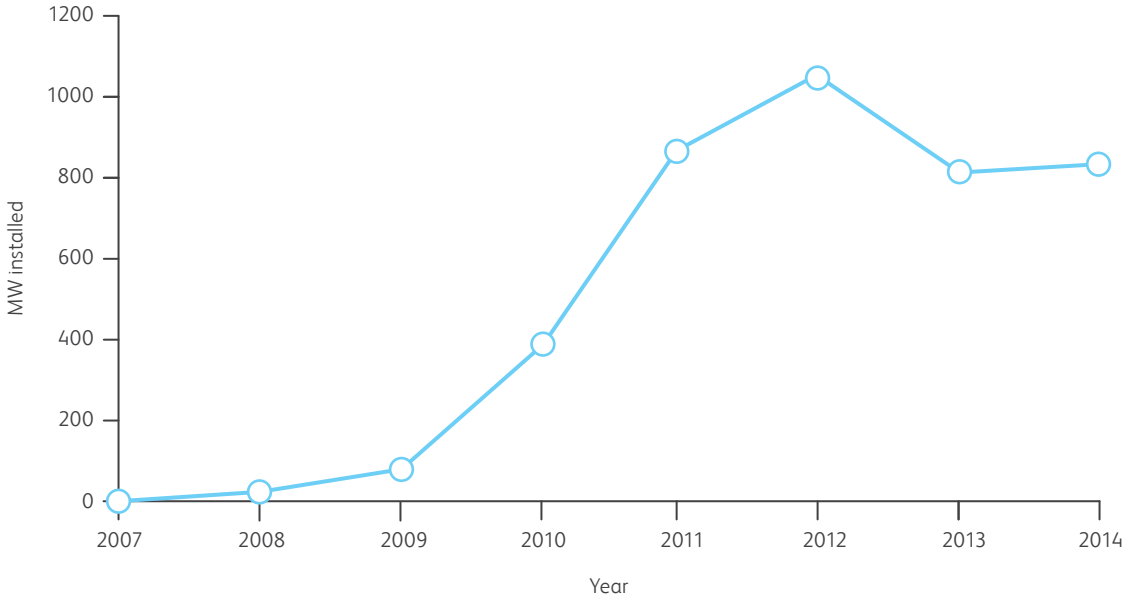
ANNUAL SOLAR PV INSTALLATIONS



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	2366	66,958	614	47,693	16,587	3775	35,028	23,079	**196,100**
2011	6909	76,940	378	93,359	63,023	4927	59,013	53,580	**358,129**
2012	1554	51,659	488	127,386	41,455	12,657	64,962	43,875	**344,036**
2013	2452	32,474	982	69,498	28,941	15,259	32,679	22,083	**204,368**
2014	1154	36,903	946	59,174	15,424	8393	39,526	25,656	**187,176**
TOTAL*	**15,646**	**294,250**	**3855**	**434,406**	**184,880**	**47,967**	**249,752**	**190,845**	1,421,601

*Total includes pre-2007 installations

ANNUAL INSTALLED CAPACITY OF SOLAR PV IN AUSTRALIA (MW)



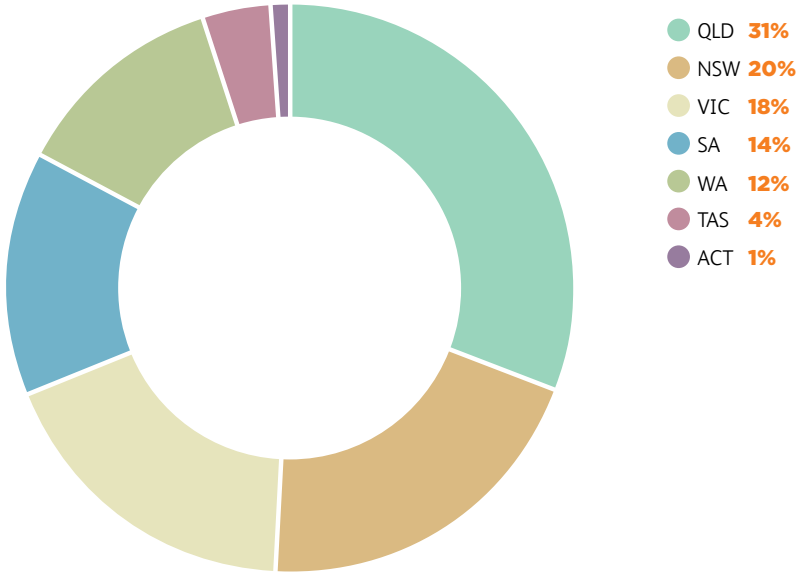
Year Installed	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	National
2007	0.20	1.10	0.00	0.57	1.16	0.04	0.97	0.27	**4.30**
2008	0.49	4.21	0.41	4.16	4.88	0.24	2.73	2.92	**20.05**
2009	1.28	19.20	0.51	24.51	12.44	1.72	10.51	14.30	**84.48**
2010	5.25	146.08	1.36	90.27	33.01	6.03	57.82	45.25	**385.05**
2011	17.24	186.47	1.56	220.66	161.88	11.77	137.04	135.26	**871.88**
2012	5.05	138.35	2.05	409.28	136.59	40.24	202.72	104.42	**1038.69**
2013	10.83	127.72	4.77	262.11	140.07	62.60	128.03	71.34	**807.47**
2014	4.52	166.90	5.67	255.22	83.66	38.06	167.16	102.24	**823.42**
TOTAL*	**44.90**	**790.94**	**16.34**	**1267.26**	**576.23**	**160.73**	**708.10**	**476.14**	**4040.65**

*Total includes pre-2007 installations

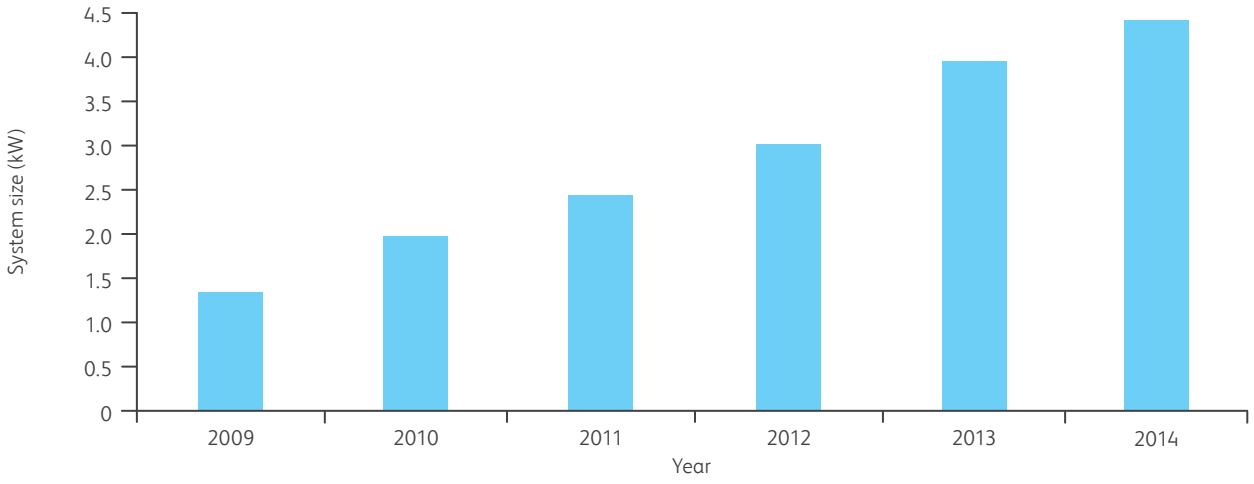
SOLAR

HOUSEHOLD AND COMMERCIAL SYSTEMS UP TO 100kW

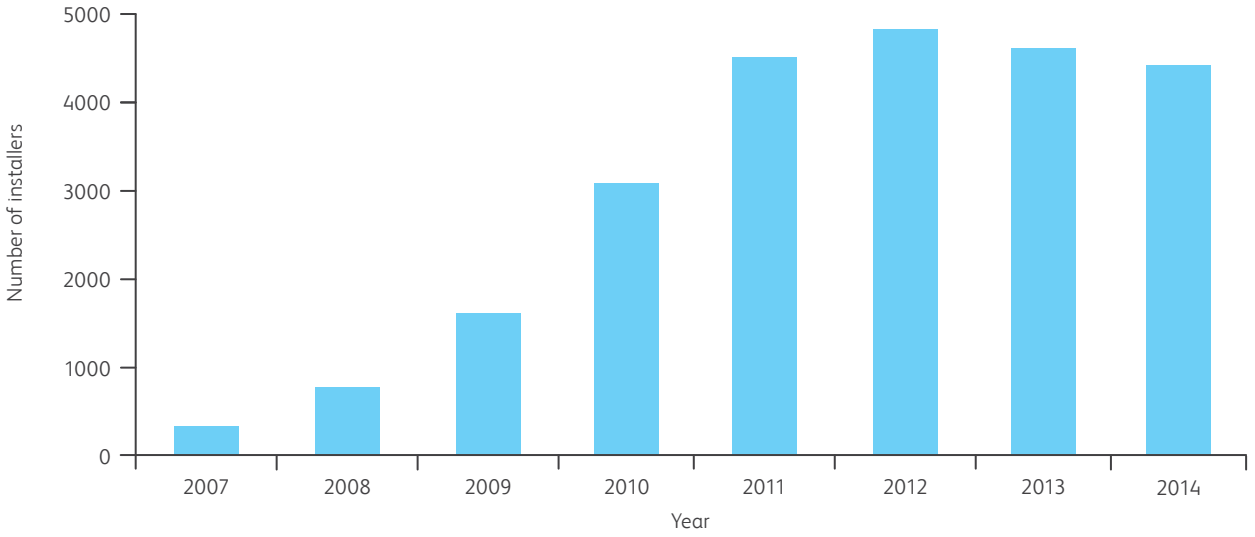
PERCENTAGE OF SOLAR PV CAPACITY INSTALLED BY STATE



NATIONAL AVERAGE SOLAR PV SYSTEM SIZE (kW)



TOTAL NUMBER OF ACCREDITED DESIGNERS AND INSTALLERS WORKING IN AUSTRALIA



TOTAL NUMBER OF ACCREDITED DESIGNERS AND INSTALLERS WORKING IN AUSTRALIA – BY STATE

	NSW	ACT	WA	QLD	VIC	NT	SA	TAS	TOTAL
2007	95	6	46	73	66	13	25	14	**338**
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**
2014	908	44	401	1263	1075	47	521	137	**4396**

LARGE-SCALE SOLAR

With the launch of the Royalla Solar Farm near Canberra and several very large projects due for completion in 2015, the Australian large-scale solar industry has gained some much-needed momentum.

Although it is an extremely popular technology with immense local potential due to Australia's world-beating sun intensity, only a handful of projects are currently operating across the country. The cost of the technology has fallen sharply along with the cost of household solar power, and is expected to be competitive with the cheapest forms of renewable energy in the future.

The 20 megawatt (MW) Royalla Solar Farm developed by Fotowatio Renewable Ventures (FRV) was officially opened in September 2014. It was the largest facility in the country at the end of the year, ahead of the Greenough River Solar Farm in Western Australia.

Both of these will ultimately be overshadowed by twin projects being developed by AGL and First Solar at Nyngan (102 MW) and Broken Hill (53 MW) in New South Wales. The combined 155 MW of solar power will provide enough electricity to power the equivalent of about 50,000 homes.

Even larger would be a solar power project at Bulli Creek, which was approved in February 2015 by the Toowoomba Regional Council. If all goes to plan, the proposed solar farm of up to 2000 MW would be built on more than 5200 hectares of cleared cattle grazing land over the next eight years.

Other projects under construction include the 56 MW Moree Solar Farm in northern New South Wales, and a 3.275 MW array by the University of Queensland that will explore different solar and battery storage technologies and their integration with the power grid.

Large-scale solar has the potential to provide reliable power to remote industrial operations such as mining. In 2014, Rio Tinto and ARENA announced a project to build a 6.7 MW photovoltaic solar project at the mining giant's Weipa bauxite mine on Cape York. It will be a 'show and tell' project that will help to demonstrate the economics and reliability of renewable energy to the Australian mining industry.

The 44 MW Kogan Creek Solar Boost project will integrate solar power with an existing coal-fired power station north-west of Dalby in Queensland, and is expected to be the world's largest integrated power plant of its kind when it opens in late 2016.

The additional support provided by ARENA and the ACT Government's reverse auction scheme has enabled large-scale solar projects to perform well in the current market conditions compared to other renewable energy technologies. However, the ongoing political deadlock surrounding the future of the Renewable Energy Target means many more opportunities in this sector have been lost in the last 12 months, as domestic and international investors wait for a more bankable investment environment.

OF TOTAL CLEAN ENERGY GENERATED IN AUSTRALIA IN 2014

NORTHERN TERRITORY
1 plant operating

WESTERN AUSTRALIA
1 plant operating

QUEENSLAND
1 plant operating

SOUTH AUSTRALIA
1 plant operating

NEW SOUTH WALES
1 plant operating

ACT
1 plant operating

VICTORIA
2 plants operating

All projects listed are 1 MW or larger.

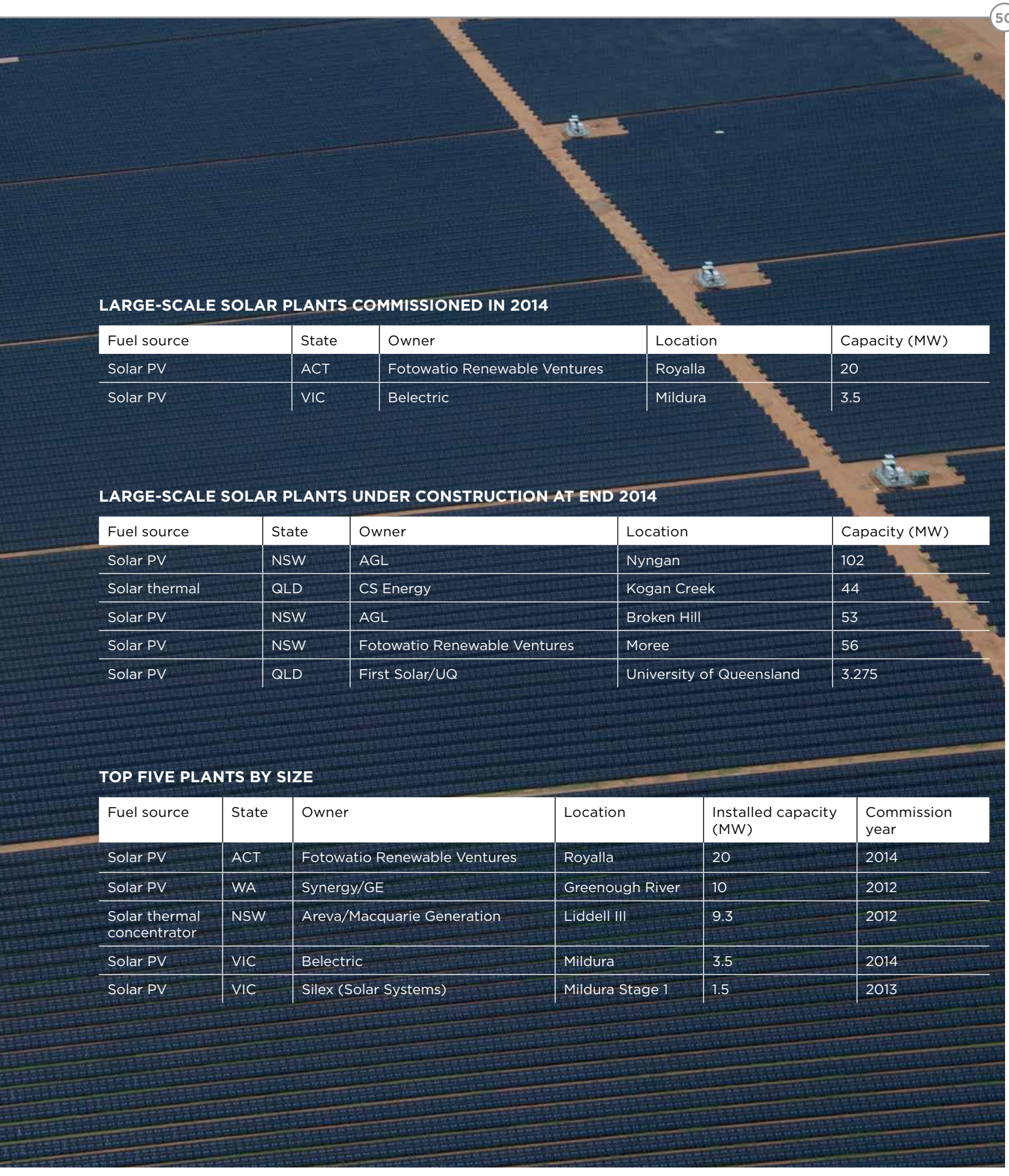
MEDIUM-SCALE SOLAR POWER

In addition to the two large-scale projects launched in 2014, there were 52 new solar power systems installed that were over 100 kW but less than 1 MW. This is the size range typically favoured by major commercial operations.

Six of the systems built in 2014 were over 500 kW. Four of these were built by Swedish furniture giant IKEA and two by Toyota. IKEA announced in 2014 that it will install 3.9 MW of solar power across its east coast stores and warehouses in partnership with Canadian Solar and Kingspan. Many new systems over the 100 kW threshold were installed across the country during 2014, including an impressive $1.3 million solar power system installed at Mars Confectionery in Ballarat, Victoria by Conergy.

LARGE-SCALE SOLAR

Image: Nyngan Solar Farm, New South Wales



LARGE-SCALE SOLAR PLANTS COMMISSIONED IN 2014

Fuel source	State	Owner	Location	Capacity (MW)
Solar PV	ACT	Fotowatio Renewable Ventures	Royalla	20
Solar PV	VIC	Belectric	Mildura	3.5

LARGE-SCALE SOLAR PLANTS UNDER CONSTRUCTION AT END 2014

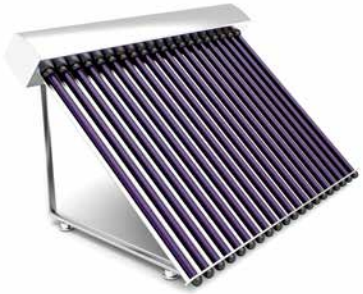
Fuel source	State	Owner	Location	Capacity (MW)
Solar PV	NSW	AGL	Nyngan	102
Solar thermal	QLD	CS Energy	Kogan Creek	44
Solar PV	NSW	AGL	Broken Hill	53
Solar PV	NSW	Fotowatio Renewable Ventures	Moree	56
Solar PV	QLD	First Solar/UQ	University of Queensland	3.275

TOP FIVE PLANTS BY SIZE

Fuel source	State	Owner	Location	Installed capacity (MW)	Commission year
Solar PV	ACT	Fotowatio Renewable Ventures	Royalla	20	2014
Solar PV	WA	Synergy/GE	Greenough River	10	2012
Solar thermal concentrator	NSW	Areva/Macquarie Generation	Liddell III	9.3	2012
Solar PV	VIC	Belectric	Mildura	3.5	2014
Solar PV	VIC	Silex (Solar Systems)	Mildura Stage 1	1.5	2013

SOLAR WATER HEATING

Approximately 50,000 solar water heating systems were installed during 2014, taking the total installed across the country to more than 900,000.



50,000
SOLAR WATER HEATING SYSTEMS WERE INSTALLED DURING 2014

Sales were 15 per cent down on the year before, continuing a trend that has seen solar power systems continue to take market share from the solar water heating industry since its peak in 2009, when Federal Government rebates helped to increase sales.

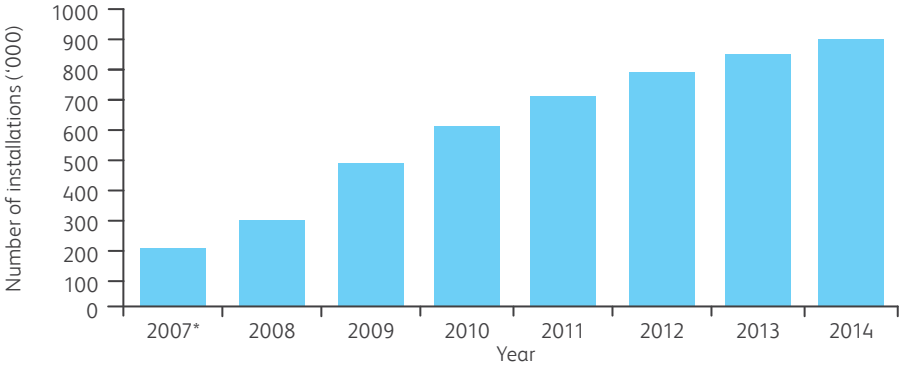
Installations of solar water heaters in 2014 declined in all states and territories. Solar water heating refers to either a solar hot water system or a heat pump. Solar hot water systems generally use solar collectors to heat water using energy from the sun, which is stored in tanks and is then available after the sun sets. Heat pumps use warmth from the air to heat water.

Both are highly efficient technologies that use natural warmth to help households save money on their hot water while reducing emissions by as much as 3 tonnes a year compared to an electric hot water system.

Many solar water heating systems are manufactured in Australia. Buying a locally-made system supports local jobs.

900,000+
SOLAR WATER HEATING SYSTEMS NOW INSTALLED COUNTRYWIDE

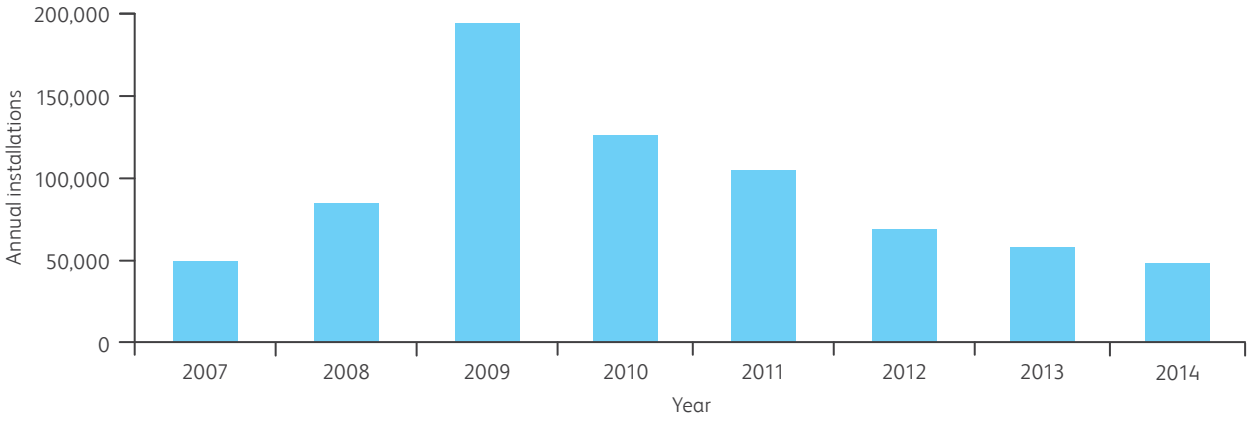
CUMULATIVE SOLAR WATER HEATER INSTALLATIONS IN AUSTRALIA



2007*	2008	2009	2010	2011	2012	2013	2014
212,423	297,808	492,503	619,596	724,646	794,112	852,410	901,923

*Includes pre-2007 installations

ANNUAL INSTALLATIONS OF SOLAR WATER HEATERS IN AUSTRALIA

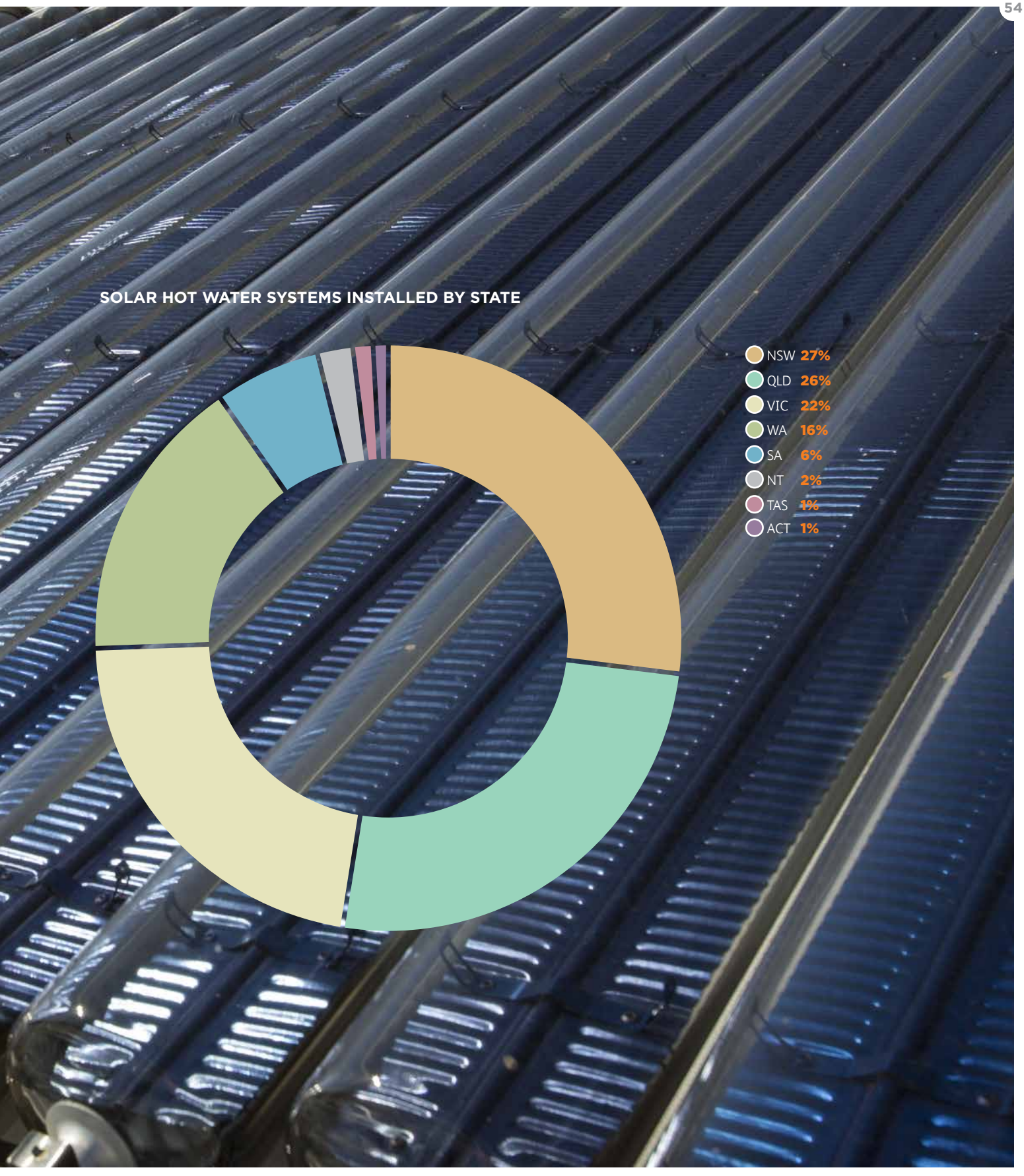


	NSW	ACT	WA	QLD	VIC	NT	SA	TAS	NATIONAL
2007	8765	453	11,139	16,830	9157	1414	2869	350	**50,977**
2008	20,203	1001	12,398	23,330	21,208	1236	5103	906	**85,385**
2009	85,456	1974	15,692	36,659	42,120	1731	8794	2269	**194,695**
2010	38,525	960	16,065	34,262	27,733	1303	6812	1433	**127,093**
2011	25,331	1038	12,862	30,937	26,446	1267	5444	1725	**105,050**
2012	10,810	734	11,812	18,973	21,594	1171	3473	899	**69,466**
2013	9144	453	10,989	13,410	19,608	884	2983	827	**58,298**
2014	8433	371	9499	12,211	16,208	642	1373	776	**49,513**

SOLAR WATER HEATING

TOTAL INSTALLED SOLAR HOT WATER HEATERS BY STATE

NSW	QLD	VIC	WA
244,300	234,929	196,758	139,809
SA	NT	TAS	ACT
51,568	15,658	9993	8908


SOLAR HOT WATER SYSTEMS INSTALLED BY STATE
NSW 27%
QLD 26%
VIC 22%
WA 16%
SA 6%
NT 2%
TAS 1%
ACT 1%

WIND POWER

Wind power is one of the most mature renewable energy technologies, and is the lowest-cost renewable energy that can be rolled out on a large scale.

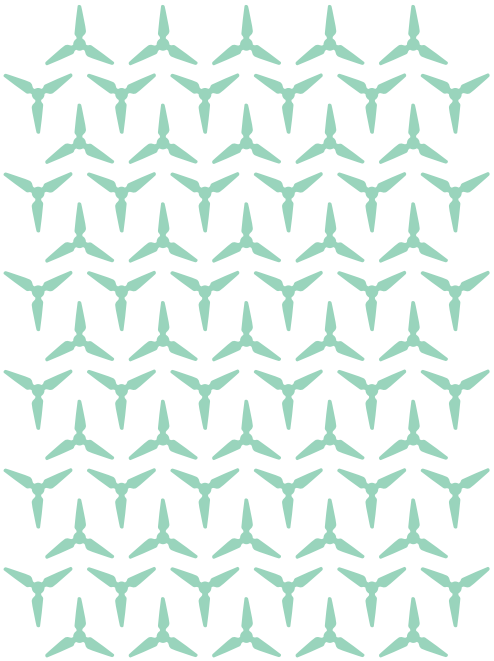
While this decade looked extremely promising for wind power, the political deadlock over the review of the Renewable Energy Target (RET) in 2014 robbed the sector of momentum in the short term.

Most of the 16 wind farms under construction 12 months ago had slowed by the end of the year, as financiers and project developers waited for some kind of certainty that would allow them to move forward with confidence. Five wind farms remained in progress early in 2015 and are expected to be completed in 2015.

Three wind farms with a combined power generation capacity of 566.7 megawatts (MW) – or 227 turbines – were completed in 2014, all of which were planned and funded long before the beginning of the RET review. Trustpower's Snowtown 2 project, completed in 2014, is the second-largest wind farm in Australia behind AGL's Macarthur Wind Farm in western Victoria.

These additional projects took the Australian wind industry to a total of 71 wind farms with a capacity of 3807 MW, made up of 1866 turbines. These wind projects place Australia 16th in the world for installed capacity, according to the Global Wind Energy Council.[44] In 2014, China installed more than six times the amount of wind power than has been built in the history of the Australian wind industry.

South Australia continues to lead the nation with the most wind turbines. The Australian Capital Territory plans to substantially increase the amount of renewable energy in its power supply. Its first 'reverse auction' for wind power projects will produce enough renewable electricity for about a third of Canberra's homes, while also helping to circumvent the investment uncertainty created by the RET review.

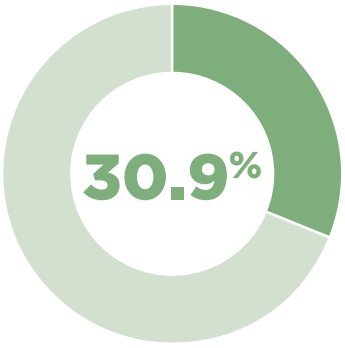


71
WIND FARMS AUSTRALIA WIDE

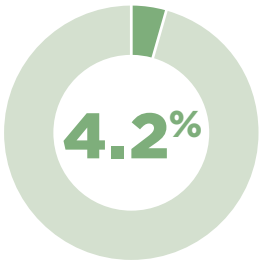
1866
INDIVIDUAL TURBINES

3807
GENERATION CAPACITY, IN MW

44 Global Wind Energy Council, *Global Wind Statistics 2014*, 10 February 2015, page 2



OF TOTAL CLEAN ENERGY GENERATED IN AUSTRALIA IN 2014



OF ELECTRICITY GENERATED IN AUSTRALIA IN 2014

WIND FARMS COMMISSIONED IN 2014

State	Owner	Location	Installed Capacity (MW)
NSW	Goldwind	Gullen Range	165.5
VIC	Meridian	Mt Mercer	131.2
SA	Trustpower	Snowtown 2	270

WIND POWER

WIND FARMS UNDER CONSTRUCTION BUT ON HOLD AT END OF 2014 DUE TO RET UNCERTAINTY

State	Owner	Location	Installed capacity (MW)
VIC	Acciona Energy	Mortlake South	76.5
VIC	Acciona Energy	Mt Gellibrand	189
VIC	Pacific Hydro	Crowlands	84.05
VIC	RES (Renewable Energy Systems) Australia	Ararat	247.5
VIC	Trustpower	Salt Creek (Woorndoo)	31.5
VIC	Union Fenosa	Hawkesdale	62
VIC	Union Fenosa	Ryan Corner	134
VIC	Union Fenosa	Berrybank	190
NSW	Union Fenosa	Crookwell 2	92
VIC	WestWind Energy	Lal Lal	128
VIC	Wind Farm Developments	Woolsthorpe	40

Image: Portland Wind Energy Project IV, Victoria

BLOWING AWAY THE COMPETITION AT BOCO ROCK

The Clean Energy Council gave a Community Engagement Award to CWP Renewables in 2014 for its work with locals at the Boco Rock Wind Farm near Nimmitabel in New South Wales. The 113 MW wind farm was commissioned in February 2015 after 18 months of construction.

CWP Renewables Head of Development Ed Mounsey said genuine community engagement takes a step beyond informing the community to collaborating with them, a principle the company followed at Boco Rock.

"Significant effort was made throughout construction to build partnerships with and collaborate with local community members and networks," Mr Mounsey said.

"There is no magic to community consultation. Innovation is not the key – the key is hard work, a genuine, honest and consistent approach, close listening and clear communication.

"It is comprehensive and constant work that doesn't end at 5pm or on a Friday. If you get it all right, the community will embrace the project and the idea of renewable energy," he said.

Some of the activities that have helped to build a relationship with the community included participation at events such as the Cooma Australia Day Celebrations, as well as the Nimmitabel and Bombala Shows. A Boco Blade Parade allowed about 300 school kids and community members to get up close to a wind farm blade in transport, and the wind farm community open day attracted more than 1000 visitors.

Add a sponsorship to the ACT University of Canberra Brumbies in 2014, and it's not surprising that CWP Renewables has managed to build strong relationships with many people in the local area. Even though the wind farm is now owned by EGCO, the Electricity Generating Public Company Limited of Thailand, CWP Renewables have stayed on as the project's asset manager and operator, and they're in it for the long haul.

WIND POWER

WIND FARMS UNDER CONSTRUCTION AT END 2014

State	Owner	Location	Installed capacity (MW)	Expected completion date
NSW	Banco Santander and CBD Energy	Taralga	106.8	July 2015
VIC	Pacific Hydro	Portland Wind Energy Project IV (Cape Nelson North and Cape Sir William Grant)	47.15	March 2015
VIC	Mitsui & Co Ltd	Bald Hills	106.6	June 2015
NSW	Electricity Generating PCL (EGCO)	Boco Rock	113	February 2015
VIC	Future Energy	Chepstowe	6	April 2015

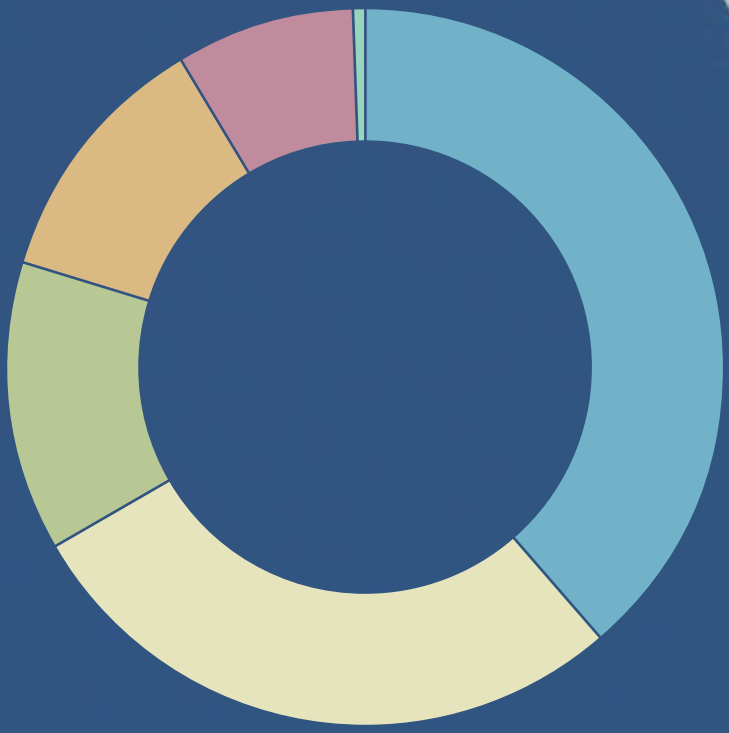
WIND FARMS THAT WILL GO AHEAD UNDER THE ACT REVERSE AUCTION

State	Owner	Location	Installed capacity (MW)
VIC	RES Australia	Ararat	80.5
SA	Neoen	Hornsdale	100
VIC	Windlab	Coonooer Bridge	19.4

TOP FIVE PLANTS BY SIZE

State	Owner	Location	Installed capacity (MW)	Commission year
VIC	Macarthur	AGL	420	2013
SA	Snowtown 2	Trustpower	270	2014
WA	Collgar	UBS IIF/REST	206	2012
VIC	Waubra	Acciona Energy	192	2009
TAS	Musselroe	Woolnorth Wind Farm Holdings	168	2013

PERCENTAGE OF WIND FARM CAPACITY BY STATE

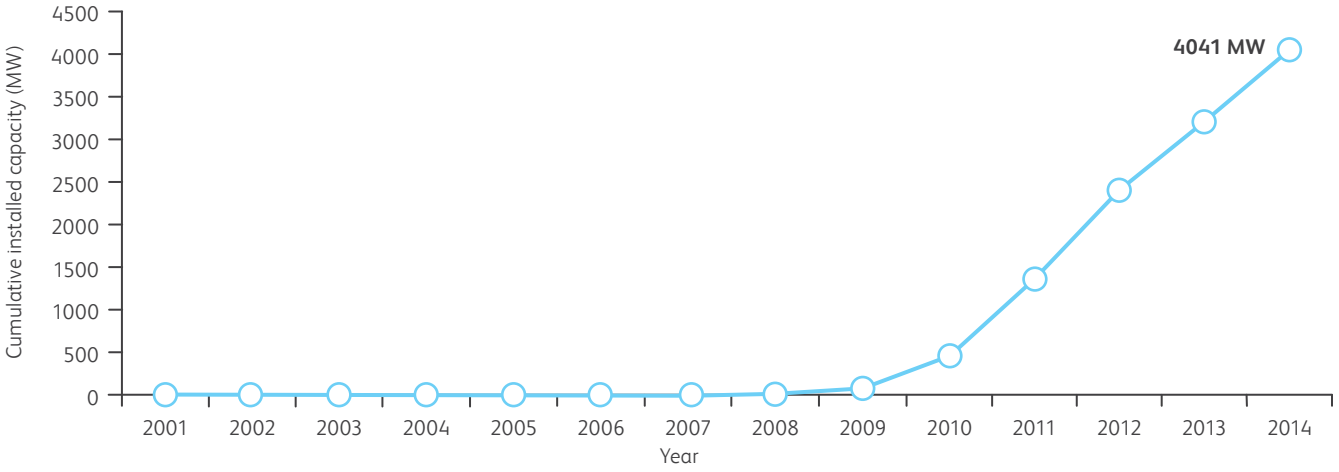


SA **38.8%**
VIC **28.1%**
WA **12.9%**
NSW **11.8%**
TAS **8.2%**
QLD **0.3%**

Image: Portland Wind Energy Project IV, Victoria

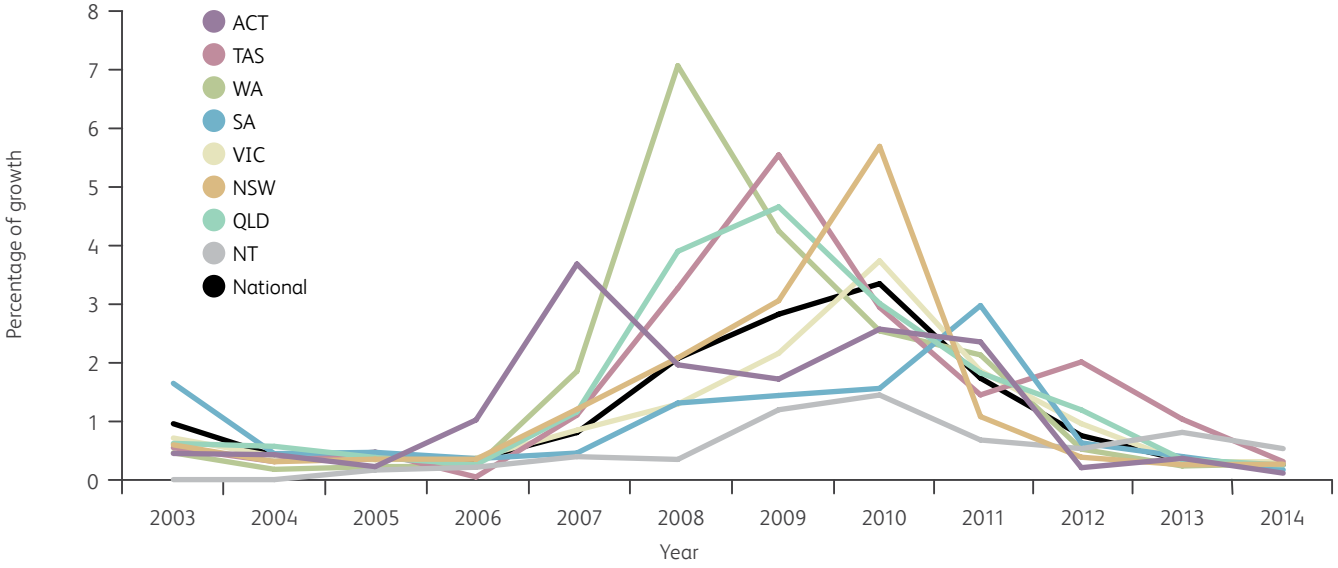
APPENDICES

CUMULATIVE INSTALLED CAPACITY OF SOLAR PV IN AUSTRALIA

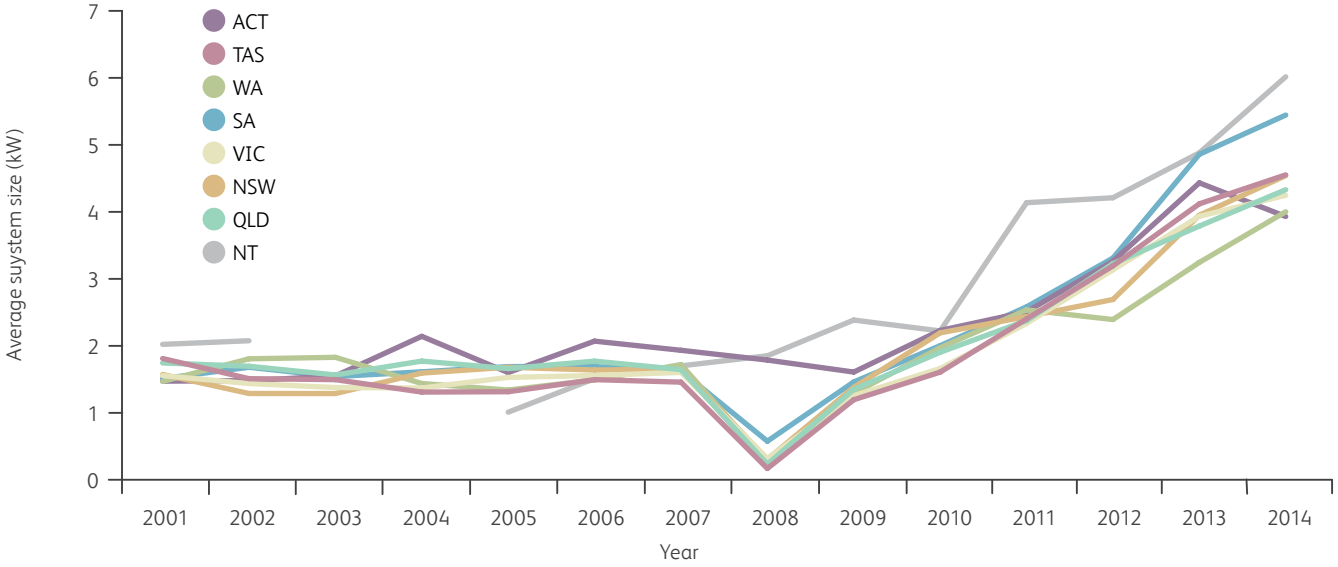


Year installed	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	TOTAL (kW)
2001	7.31	62.476	4.02	60.676	126.06	1.8	112.728	33.542	**408.612**
2002	10.25	236.421	6.084	109.519	329.731	10.8	255.453	55.088	**1013.346**
2003	14.87	378.311	6.084	177.936	876.221	16.74	438.703	80.536	**1989.401**
2004	21.26	495.436	6.084	280.104	1268.589	21.94	615.533	94.814	**2803.76**
2005	26.03	670.724	7.084	387.343	1864.823	32.383	826.626	116.104	**3931.117**
2006	52.785	906.816	8.584	487.709	2541.54	33.868	1132.887	142.759	**5306.948**
2007	248.81	2007.203	11.964	1056.609	3704.543	71.522	2098.503	409.546	**9608.7**
2008	740.81	6221.203	425.964	5213.609	8587.543	307.522	4829.503	3333.546	**29659.7**
2009	2023.81	25421.2	935.964	29723.61	21024.54	2029.522	15342.5	17634.55	**114135.7**
2010	7269.81	171498.2	2292.964	119996.6	54033.54	8057.522	73160.5	62879.55	**499188.7**
2011	24510.81	357963.2	3849.964	340656.6	215911.5	19829.52	210200.5	198142.5	**1371065**
2012	29558.81	496317.2	5895.964	749931.6	352502.5	60070.52	412916.5	302562.5	**2409756**
2013	40383.81	624040.2	10669.96	1012043	492568.5	122674.5	540943.5	373905.5	**3217229**
2014	**44900.81**	**790941.2**	**16339.96**	**1267258**	**576231.5**	**160732.5**	**708104.5**	**476144.5**	**4040653**

GROWTH RATES OF SOLAR PV CAPACITY BY STATE SINCE 2003



AVERAGE SOLAR PV SYSTEM SIZE BY INSTALLATION YEAR



APPENDICES

TOP 10 SOLAR POSTCODES BY STATE

State	Postcode	Suburbs	Total systems installed	Total capacity of systems (kW)
ACT	2615	Belconnen (north-west region)	1,927	5,278
ACT	2611	Brindabella	1,288	3,710
ACT	2905	Bonython, Isabella Plains	1,262	3,558
ACT	2617	Belconnen	1,237	3,582
ACT	2913	Nicholls	1,225	3,303
ACT	2602	Braddon	1,146	3,233
ACT	2614	Belconnen (south region)	922	2,583
ACT	2902	Kambah	833	2,362
ACT	2904	Monash, Fadden	818	2,045
ACT	2914	Bonner, Forde	800	2,216
NSW	2480	Lismore	4,457	11,914
NSW	2830	Dubbo	4,366	10,806
NSW	2170	Liverpool, Prestons	3,593	8,935
NSW	2486	Tweed Heads South	3,569	8,554
NSW	2560	Campbelltown	3,497	8,309
NSW	2444	Port Macquarie	3,347	8,787
NSW	2259	Wyee, Hamlyn Terrace, Wyong	3,278	7,665
NSW	2250	Gosford, Central Coast	2,941	7,690
NSW	2478	Ballina, Lennox Head	2,719	7,126
NSW	2153	Bella Vista, Baulkham Hills, Winston Hills	2,570	6,239
NT	0870	Alice Springs	1,091	4,686
NT	0810	Coconut Grove, Lee Point	597	2,302
NT	0830	Palmerston, Marlow Lagoon	388	1,284
NT	0812	Karama, Marrara	331	1,184
NT	0832	Rosebery	272	933
NT	0836	Humpty Doo, Girraween	271	1,153
NT	0820	East Point, Winnellie, Stuart Park	145	985
NT	0822	Kakadu and surrounds	135	884
NT	0835	Howard Springs	132	513
NT	0850	Katherine	131	902

State	Postcode	Suburbs	Total systems installed	Total capacity of systems (kW)
QLD	4670	Bundaberg	9,309	27,805
QLD	4655	Hervey Bay	7,971	22,032
QLD	4551	Caloundra	7,500	18,868
QLD	4350	Toowoomba	6,894	20,295
QLD	4305	Ipswich	6,018	16,129
QLD	4211	Nerang and Lamington National Park	5,879	17,525
QLD	4207	Beenleigh	5,447	15,370
QLD	4570	Gympie	5,415	16,166
QLD	4740	Mackay	5,393	19,491
QLD	4556	Buderim	5,119	13,788
SA	5162	Morphett Vale, Woodcroft	4,319	11,577
SA	5159	Flagstaff Hill	4,257	12,127
SA	5108	Salisbury Downs	3,713	10,370
SA	5158	Hallett Cove	3,472	9,633
SA	5114	Blakeview, One Tree Hill	3,299	9,787
SA	5211	Victor Harbor	3,152	8,353
SA	5125	Golden Grove, Greenwith	2,367	7,117
SA	5109	Salisbury Plain	2,312	6,496
SA	5253	Murray Bridge	2,299	7,942
SA	5118	Gawler	2,241	7,371
TAS	7250	Launceston	4,065	13,866
TAS	7310	Devonport	2,142	7,399
TAS	7018	Rosny Park, Howrah	1,851	5,477
TAS	7030	Bridgewater	1,439	4,781
TAS	7315	Ulverstone	1,344	5,036
TAS	7054	Fern Tree, Margate	1,241	4,061
TAS	7011	Berriedale, Claremont	1,241	3,444
TAS	7050	Kingston	1,176	3,929
TAS	7010	Glenorchy	1,083	3,427
TAS	7109	Huonville	1,043	3,349

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TOP 10 SOLAR POSTCODES BY STATE

State	Postcode	Suburbs	Total systems installed	Total capacity of systems (kW)
VIC	3029	Hoppers Crossing	4,978	13,072
VIC	3977	Cranbourne	4,503	12,289
VIC	3030	Werribee, Point Cook	4,489	12,426
VIC	3023	Caroline Springs	3,213	8,455
VIC	3064	Craigieburn	3,040	8,736
VIC	3805	Narre Warren	2,973	8,271
VIC	3216	Belmont	2,710	7,462
VIC	3150	Glen Waverley	2,316	5,867
VIC	3806	Berwick	2,265	6,255
VIC	3037	Sydenham	2,241	6,449
WA	6210	Mandurah	8,378	17,884
WA	6065	Wanneroo	5,802	15,392
WA	6155	Canning Vale	5,372	12,998
WA	6164	Success, Jandakot	4,768	11,941
WA	6530	Geraldton	4,577	12,945
WA	6112	Armadale	4,345	10,703
WA	6163	Spearwood, Bibra Lake	3,932	9,425
WA	6169	Safety Bay, Warnbro	3,799	8,541
WA	6027	Joondalup	3,500	8,748
WA	6110	Gosnells, Huntingdale	3,455	7,959

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