CLEAN ENERGY COUNCIL

CLEAN ENERGY AUSTRALIA

REPORT 2015

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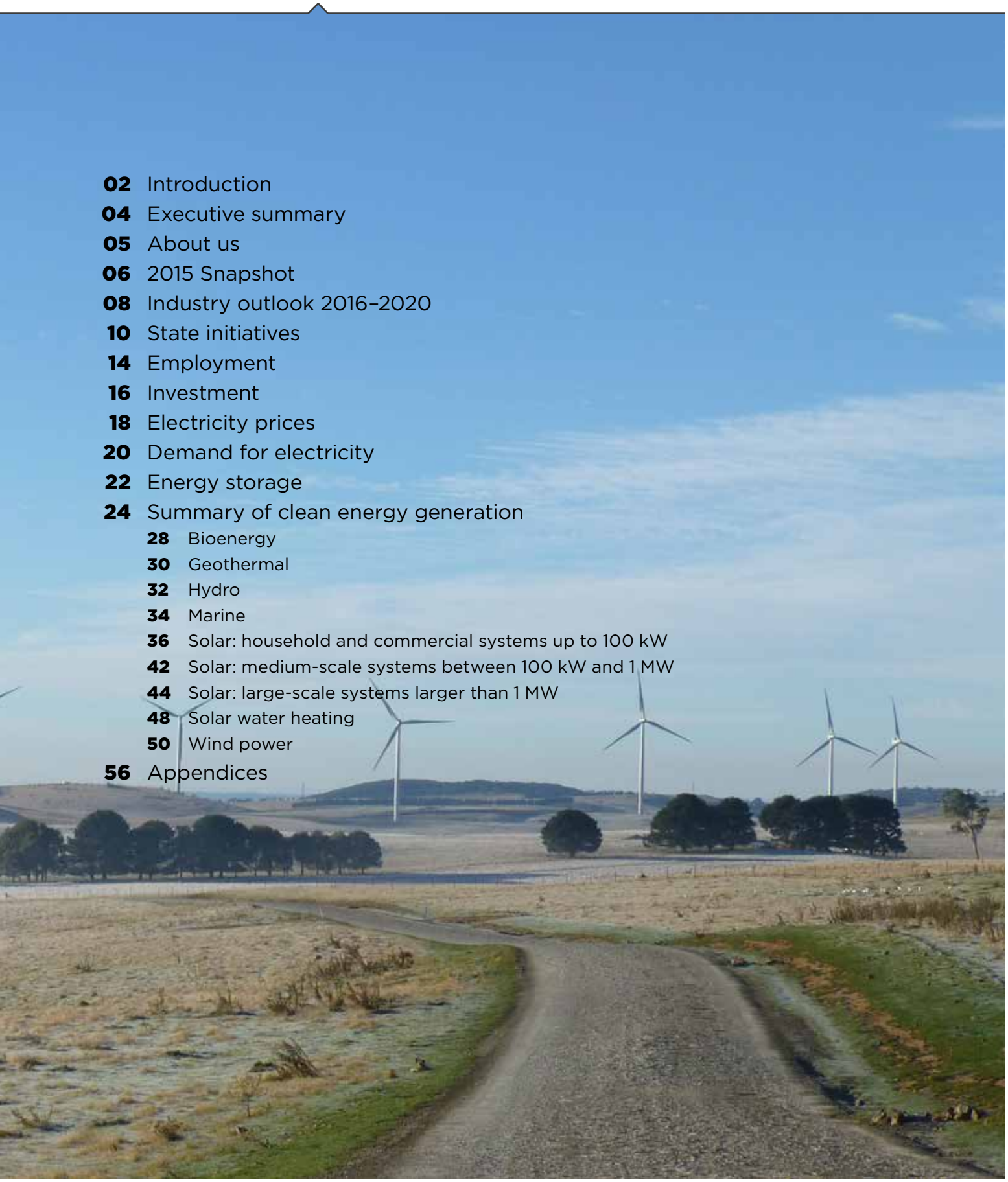


INTRODUCTION

Kane Thornton
Chief Executive,
Clean Energy Council

While 2015 was a challenging year for the renewable energy sector, continued reductions in the cost of renewable energy and battery storage, combined with some policy stability, meant the year ended with much optimism.

Image: Boco Rock Wind Farm, New South Wales

As the costs of renewable energy and battery storage continue to plunge, the long-term outlook for our industry remains extremely positive. The International Renewable Energy Agency released analysis at the beginning of this year that found a mix of renewable energy and energy efficiency would be enough to meet the global commitments made in Paris – while growing the economy and creating millions of jobs.

We now have an international climate agreement. Exactly how Australia will meet its longer-term commitments remains unclear but, no matter which policy mechanisms are chosen, it's clear that renewable energy will play an important role in delivering them.

The national Renewable Energy Target is now locked in until 2020 and confidence is gradually returning to the sector. But with only four years until most large-scale projects need to be delivered under the scheme, there is no time for navel-gazing.

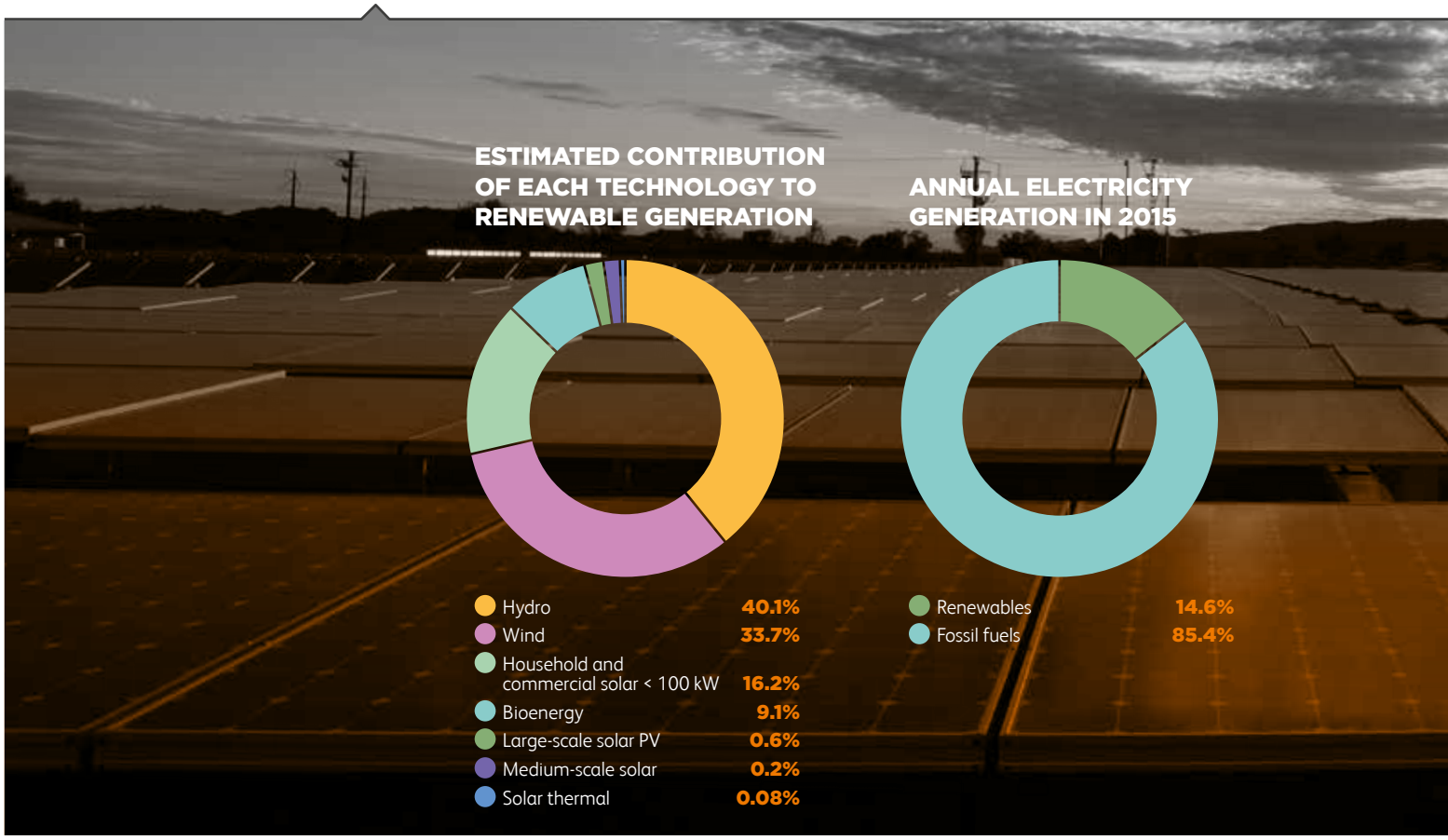
Prime Minister Malcolm Turnbull and his government are focused on leading the nation into a new era of technological innovation. This aligns perfectly with the rise of renewable energy, which has disrupted the traditional ways of doing business in the last decade across the energy industry.

The energy industry has been used to working with decades-long investment horizons, where change happens at a glacial rate. But like the taxi and telecommunications industries, the energy sector has found itself blindsided by rapid change, and is now scrambling to get back ahead of the curve. The result will be a more competitive market, and a broader range of increasingly attractive options to help consumers save money on their power bills.

The buzz around storage and smart technology is building to a crescendo. As these options become more affordable, they will completely change the way we use and think about energy.

With so much change underway, there is lots of work for the Clean Energy Council to do on behalf of the industry, from safety and integrity to regulation, policy development, analysis and advocacy. Many challenges remain, but the future for renewable energy and battery storage has never looked brighter.

EXECUTIVE SUMMARY



In mid-2015, the Large-scale Renewable Energy Target (LRET) was reduced from 41,000 gigawatt-hours (GWh) to 33,000 GWh by 2020.

The positive for the industry was that the amended legislation ended almost two years of uncertainty and frozen investment. The amendment also removed the provision for a review of the scheme every two years, locking in certainty for the rest of the decade. While 2015 was a tough year, it ended with much optimism.

According to analysis by the Clean Energy Council and ROAM Consulting (now part of EY) , the revised target is expected to create more than $10 billion worth of investment and more than 6500 new jobs in large-scale renewable energy alone. Including the economic benefits from the small-scale scheme, the total benefit expected is $40.4 billion worth of investment and 15,200 jobs.

While investment confidence is gradually returning to the sector, state and territory governments have provided additional incentives to encourage renewable energy projects in the short term. The Australian Capital Territory Government led the way with a series of reverse auctions for wind and solar projects which have been effective at securing renewable energy at the lowest possible price.

Generation from hydro during 2015 was down on the year before due to low rainfall, but the contribution of wind and solar increased by 20 per cent each – more than enough to take up the slack. Consequently renewable energy's overall share of the national electricity mix was up during the year, making up 14.6 per cent of the national total.

More than 35,000 GWh of renewable energy was generated in 2015, of which 15,200 GWh of large-scale renewable energy generation counts towards the large-scale target of 33,000 GWh. This means the industry is just under halfway towards meeting the LRET.

More than 8000 megawatts (MW) of wind power and 2500 MW of solar power projects are either under construction or have planning approval. This is more than enough to meet the RET, and 1000 MW of projects were added to the pipeline in 2015 through government approvals processes.

Tasmania produced the most renewable energy overall, followed by Victoria and South Australia.

Employment in the renewable energy industry contracted by 3 per cent in the 2014-15 financial year, a decline of 470 jobs compared to the financial year before. According to the Australian Bureau of Statistics, the industry employed 14,020 people at the end of the year.

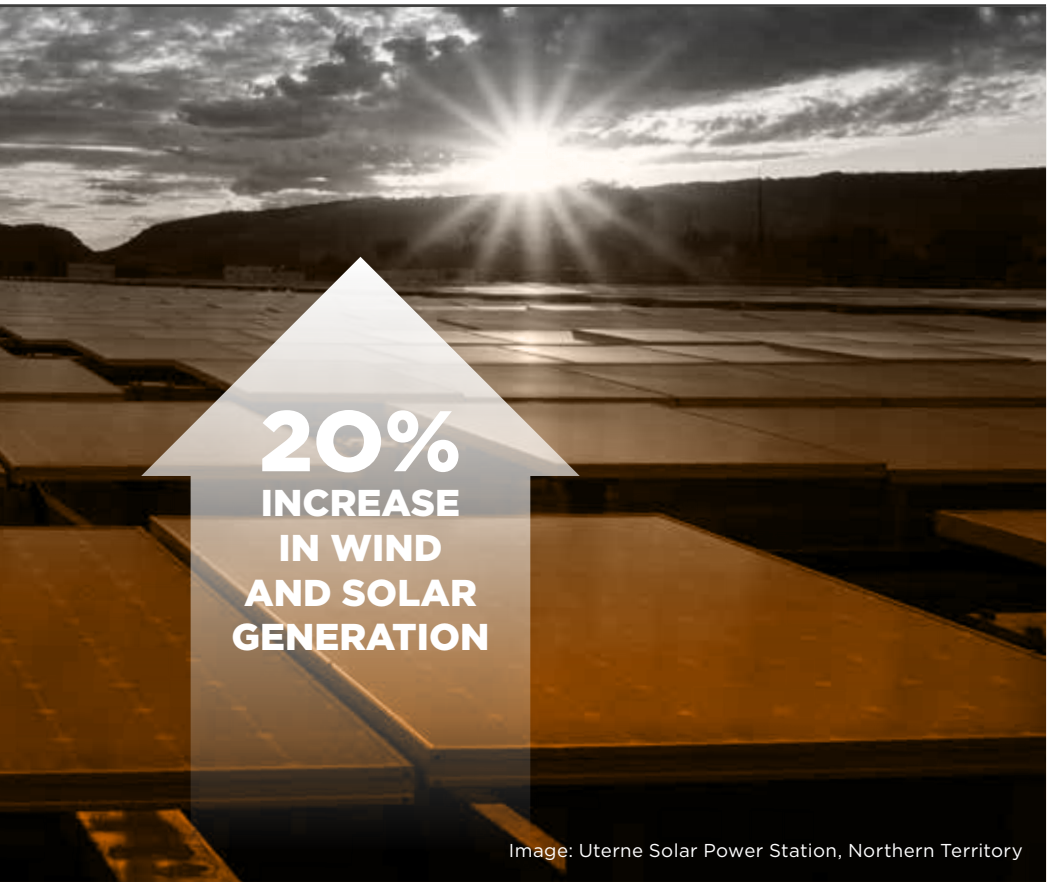


Image: Uterne Solar Power Station, Northern Territory

Investment in large-scale projects continued to languish due to the lingering investment uncertainty across the industry. Investment in major projects was $1.2 billion, but almost all of these had additional support from state or federal government programs. Small-scale renewables fared better, with $2.2 billion invested in technologies such as rooftop solar power.

The three largest solar power plants in the country were fully operational by early 2016 – the Nyngan (102 MW) and Broken Hill (53 MW) power plants developed by AGL and First Solar, and the Moree Solar Farm (56 MW) developed by FRV.

Marine energy is still at an early stage of development, but innovative Australian technologies showed promise during 2015. Carnegie Wave Energy met all the necessary funding milestones at its CETO 5 Perth project. BioPower Systems launched its bioWAVE generator off the coast of Port Fairy in Victoria in December.

Geothermal energy had a challenging year. While the technology has shown promise, it is expensive and complex to access the resource, and this challenge has so far proved difficult to overcome.

Energy storage is widely expected to create sweeping changes to the way energy is generated and used. While the cost of units is not yet at a level where battery storage is a mainstream consumer technology, a variety of pilot projects are being conducted across the country to demonstrate how storage can best be integrated into the power system.

ABOUT US

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.

CLEAN ENERGY COUNCIL

2015 SNAPSHOT

Renewable energy provided 14.6 per cent of Australia's electricity in 2015, enough to provide power for the equivalent of approximately 6.7 million average homes.

Low seasonal rainfall in key catchments serving hydro power plants in Tasmania meant substantially lower generation from these power plants than the previous year, with overall hydro generation falling by 3.5 per cent and water storages also very low.

Wind and solar power provided a sign of things to come, increasing enough to more than compensate for the drop in hydro power and push overall renewable energy generation higher than it was in 2014. This trend is expected to continue under the Renewable Energy Target (RET) between now and 2020.

The contribution of both wind and solar power grew by just over 20 per cent in 2015, while the demand for power across the country increased slightly, the first rise following six years of decline.

Investment confidence in the Australian renewable energy sector languished last year, during and beyond the end of the RET review. The review was finally resolved by a bipartisan legislative change in June, and interest from domestic and international investors has been growing throughout 2016.

A handful of new projects were delivered last year, but most of these were either committed before the review of the RET, or managed to attract additional funding support through sources such as the Australian Renewable Energy Agency and the ACT Government reverse auction process.

Five new wind farms were completed, along with eight solar farms larger than 1 megawatt of capacity.

Sales of rooftop solar and solar hot water were largely unaffected by the RET review, and solar power passed 5 gigawatts of capacity early in 2016. The output of these systems is equivalent to a virtual power station large enough to power all the homes in Brisbane and Perth[1].

State feed-in tariff rates have continued to reduce, leading to lower but more stable and sustainable sales figures. Some consolidation of solar businesses in this environment is inevitable. The commercial solar sector continues to show steady growth, and as more major brands install solar this inspires smaller players to consider the technology as a cost-saving measure to improve their bottom line.

RENEWABLE ENERGY GENERATION[2]

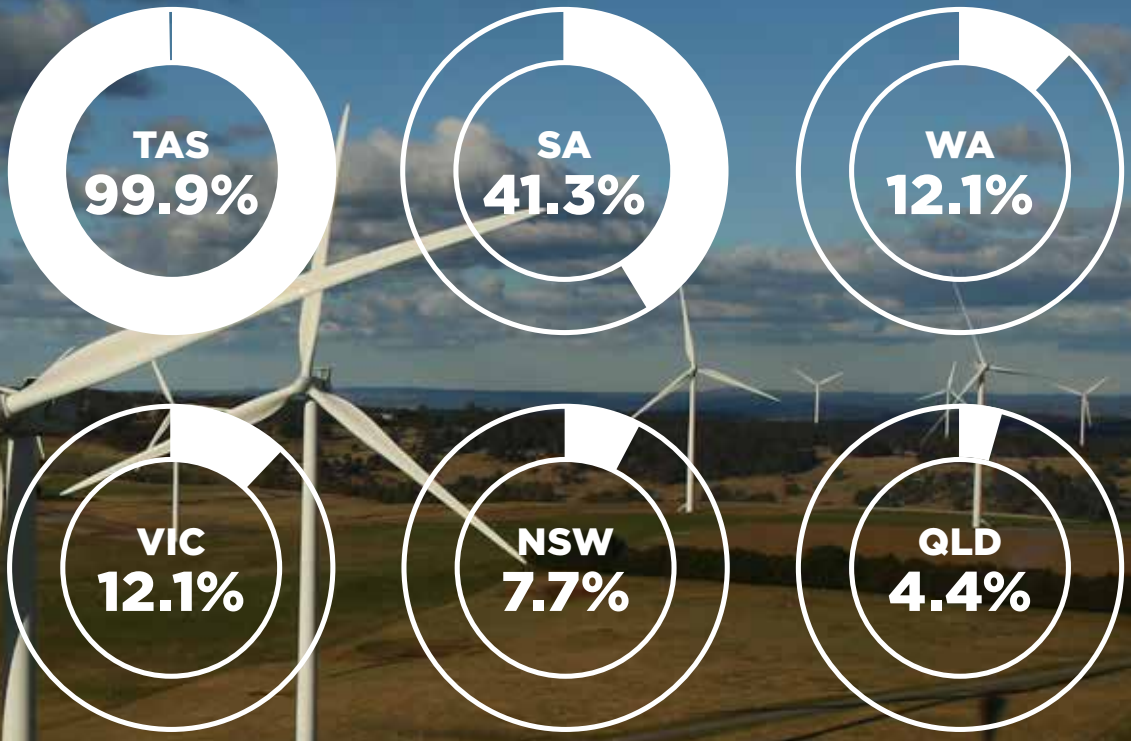
TECHNOLOGY	GENERATION (GWh)	PERCENTAGE OF RENEWABLE GENERATION	PERCENTAGE OF TOTAL GENERATION	EQUIVALENT NUMBER OF HOUSEHOLDS POWERED OVER COURSE OF THE YEAR[3]
Hydro	14,046	40.1%	5.87%	2,675,389
Wind	11,802	33.7%	4.93%	2,248,005
Household and commercial solar < 100 kW	5655	16.2%	2.36%	1,077,167
Bioenergy	3200	9.1%	1.34%	609,524
Large-scale solar PV	206	0.6%	0.09%	39,328
Medium-scale solar	70	0.2%	0.03%	13,315
Solar thermal	27	0.08%	0.01%	5143
Marine	0.50	0.001%	0%	95
Geothermal	0.50	0.001%	0%	95
TOTAL	**35,007**	**100%**	**14.63%**	**6,668,060**

1 Editorial, The Canberra Times, *Commercial benefits won't flow without commitment to long-term research*, 15 February 2016, available online: http://www.canberratimes.com.au/comment/ct-editorial/commercial-benefits-wont-flow-without-commitment-to-longterm-research-20160212-gmsdk6.html

2 Clean Energy Council renewable energy database, NEM Watch, Sunwiz; Bureau of Resources and Energy Economics, *Energy in Australia 2014*, Table 4.1 page 45; AECOM, *Australia's off-grid clean energy market* – research paper, 2014, Table 6 page 16

3 Based on a per household annual energy use of 5.25 MWh. Source: Australian Energy Market Commission 2015.

PENETRATION OF RENEWABLE ENERGY – BY STATE[4]



STATE	TOTAL GENERATION (GWh)	FOSSIL FUEL GENERATION (GWh)	TOTAL RENEWABLE GENERATION (GWh)	PENETRATION OF RENEWABLES
TAS	9505	11	9494	99.9%
SA	12,270	7199	5071	41.3%
WA	19,185	16,864	2321	12.1%
VIC	55,599	48,875	6724	12.1%
NSW	63,469	58,614	4856	7.7%
QLD	60,010	57,385	2625	4.4%

4 Total generation figures include data from National Energy Market, the West Australian wholesale electricity market and solar PV. The ACT is part of the NSW region and there is no data for the small NT grid. Some of the Snowy Hydro scheme in NSW is counted as Victorian generation by AEMO. Please note: These figures are not the same as the total electricity generation, as non-scheduled and off-grid generators are not included in this data (other than domestic solar). Source: NEM Watch, SunWiz

Image: Taralga Wind Farm, New South Wales

INDUSTRY OUTLOOK 2016 - 2020

PROGRESS TOWARDS THE LARGE-SCALE RENEWABLE ENERGY TARGET

BENEFITS OF THE RENEWABLE ENERGY TARGET

$40.4B
in investment

15,200
jobs

RENEWABLE ENERGY TARGET PROJECT PIPELINE

Between 30 and 50 large-scale wind and solar projects must be built by 2020 to meet the large-scale component of the Renewable Energy Target (RET). The 33,000 GWh target can be met by approximately 6000 MW of wind energy or 12,000 MW of solar power. The end result will see a mix of the two technologies employed, along with some hydro, bioenergy and marine energy, and predictions vary sharply on what the final proportions of each will be.

Additional programs run by the Australian Renewable Energy Agency (ARENA) to support large-scale solar will help to bridge the cost gap with wind energy, which is the lowest-cost renewable energy that can be rolled out on a large scale.

Over 8000 MW of wind energy and 2500 MW of solar power projects are under construction or have planning approval, and this pipeline is large enough to meet the RET. More than 6500 MW of projects are currently going through various state planning approval processes.

1000 MW of projects were added to the pipeline in 2015 after going through government approvals processes, made up by a combination of wind and solar power developments.

Not all of these will ultimately go ahead, and the competitiveness of particular projects is influenced by a combination of factors including resource quality, electricity market conditions and relevant state planning processes.

The large-scale component of the RET alone will generate approximately $10 billion in investment and create 6500 new jobs by the end of the decade.

PROGRESS TOWARDS THE RENEWABLE ENERGY TARGET

Total renewable energy generation in 2015 was just over 35,000 GWh, but not all of this counts towards the achievement of the RET. At the end of 2015, the industry was just under halfway towards achieving the legislated target.

The policy is split into two parts – the Large-scale Renewable Energy Target (LRET) and the Small-scale Renewable Energy Scheme (SRES).

The small-scale scheme is uncapped and has no target as such. The LRET is now set at 33,000 GWh of renewable energy generation following a legislative change in mid-2015.

The aim of the policy is to encourage new renewable energy to be built, and stimulate the economic activity that accompanies these new projects.

Existing hydro generation was baselined when the first Mandatory Renewable Energy Target was introduced by the Howard Government. Any hydro generation in excess of this annual generation baseline counts under the target[5].

In 2015, approximately 14,000 GWh of hydro generation was below the baseline and about 5600 GWh of renewable energy was produced under the SRES. About 15,000 GWh[6] of renewable energy was generated under the LRET.

5 *Renewable Energy (Electricity) Act 2000, part 17*
6 Clean Energy Regulator, *2015 Administrative Report and Annual Statement*, May 2016, page 6

OUTLOOK FOR SMALL-SCALE RENEWABLE ENERGY

The Australian Energy Market Commission is predicting that power prices will remain flat out to 2019, but sharp rises about a decade ago mean the average power bill is high by world standards. This should act as enough of an incentive for homes and businesses to install solar power and solar hot water systems as a cost-saving measure out to 2017 and beyond.

The installation levels of solar power systems from the last few years are expected to continue, although most are tipping that installation levels of commercial systems will increase relative to residential systems over the next few years.

Retail regulations have made it easier for third parties to sell solar-generated electricity to tenants. New opportunities await companies that can provide property owners, managers or real estate agents with low-cost solar solutions integrated with simple metering and billing systems.

The generous feed-in tariff rates enjoyed by some solar customers in New South Wales will finish at the end of 2016, and transitional feed-in tariffs in South Australia and Victoria will also be phased out towards the end of the year.

STATE RENEWABLE ENERGY POLICIES

Following the conclusion of the RET review in 2015, most state governments have come to recognise the job and investment opportunities that the policy represents.

With $10 billion of investment and 6500 jobs up for grabs from large-scale renewable energy alone, the flow-on benefits for economic development in rural towns are hard to ignore.

State and territory governments have introduced a variety of measures to maximise their chances of attracting investment under the RET, or in some cases have long-standing and more ambitious policies that go above and beyond the level and duration of the national target. Some of these have been effective in providing additional incentives for renewable energy projects while investment stability and confidence returns to the RET.

While the days of high feed-in tariffs for solar power systems are long gone, studies continue into setting a fair value for the energy produced by rooftop solar. Different states have taken very different approaches to small-scale renewable energy technologies, with some clearing the way for more competition and others considering barriers to try and reduce the disruption from newer technologies. Storage trials have been conducted in many areas of the country.

STATE INITIATIVES

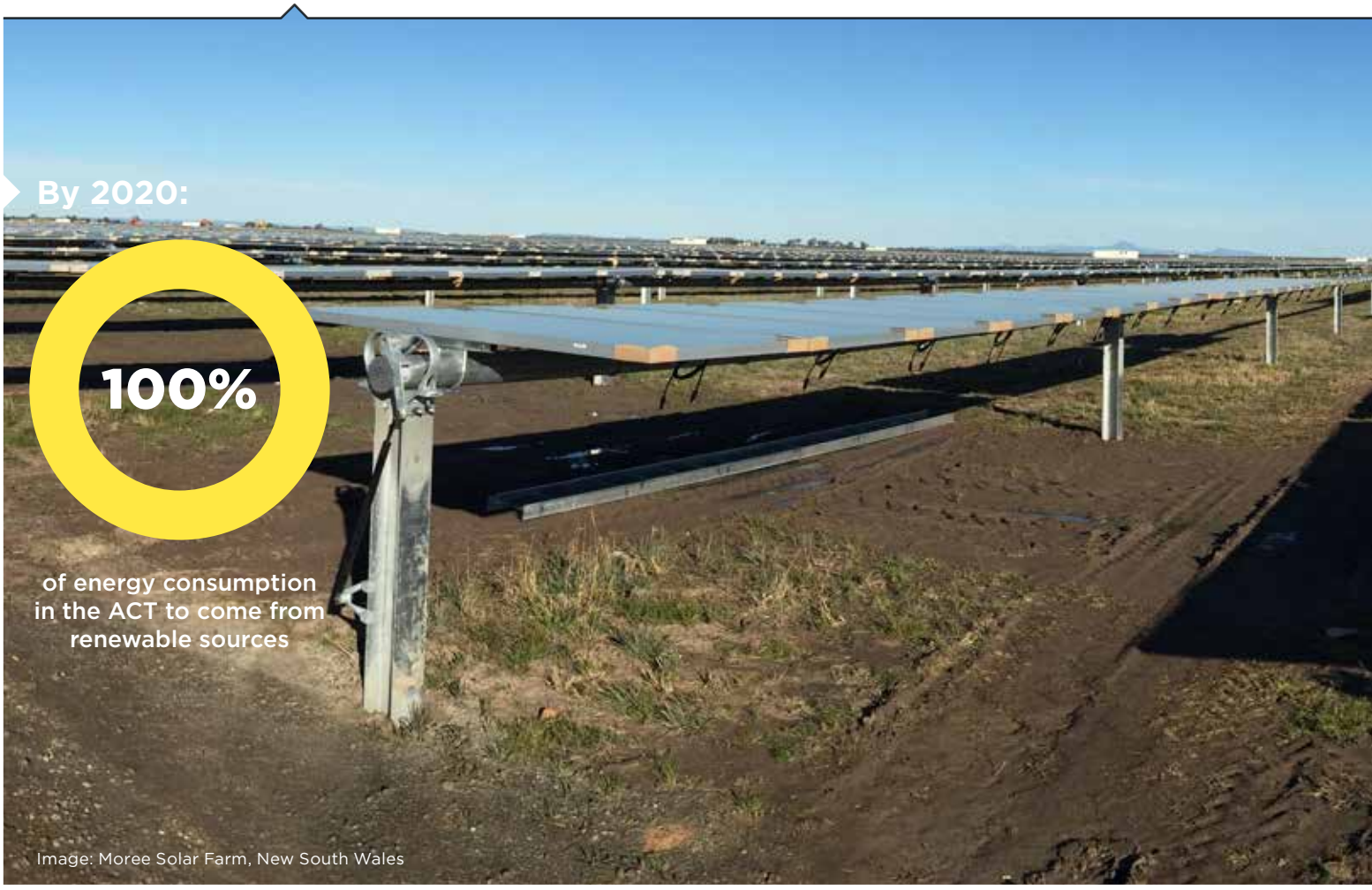


Image: Moree Solar Farm, New South Wales

AUSTRALIAN CAPITAL TERRITORY

In 2013 the ACT Government legislated its own renewable energy target of 90 per cent by 2020. It has since expanded this to 100 per cent, and announced in April 2016 that it would meet the target by 2020.

The ACT has the most ambitious renewable energy target of any jurisdiction in Australia.

The major initiatives the ACT has taken to achieve the target include:

- A 40 MW large-scale solar auction held in 2012 and 2013
- A 200 MW wind auction held in 2014
- A second 200 MW wind auction held in 2015
- A 1 MW Community Solar Scheme that opened for proposals in 2015

Additional wind power investments will meet about 45 per cent of Canberra's electricity needs by 2020. This is more than enough to power all Canberra residences.

The winners of the ACT's first 200 MW wind auction were announced in February 2015:

- Ararat Wind Farm Pty Ltd for a 80.5 MW proposal to be located north-west of Ballarat, Victoria
- Coonooer Bridge Wind Farm Pty Ltd for a 19.4 MW proposal to be located north-west of Bendigo, Victoria
- Hornsdale Wind Farm Pty Ltd for a 100 MW proposal to be located south-east of Port Augusta, South Australia

A second 200 MW wind auction was held later in 2015. Two successful projects have been announced: A 100 MW project which will form the second stage of the Hornsdale Wind Farm in South Australia, and the 100 MW Sapphire Wind Farm to be developed by CWP Renewables in north-east New South Wales near Glen Innes.

The ACT Government is also supporting 36 MW of energy storage to be rolled out across more than 5000 Canberra homes and businesses between 2016 and 2020.

SOUTH AUSTRALIA

The South Australian Government has set a state renewable energy target of 50 per cent by 2025.

More than 40 per cent of South Australia's electricity generation came from renewable energy in 2015, primarily wind and solar. More than a quarter of the state's homes have installed solar power, and it has one of the highest rates of solar installation per capita in the country.

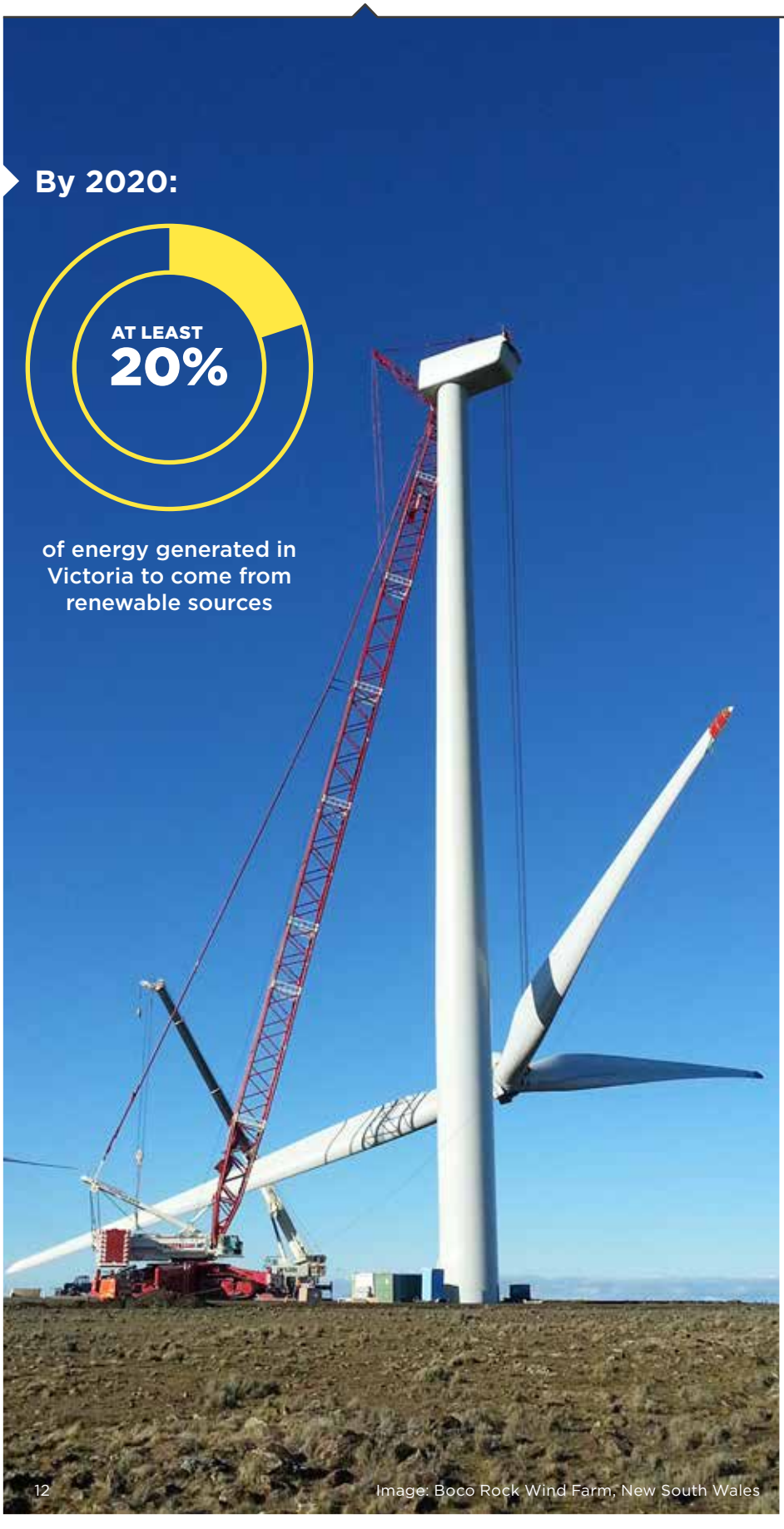
South Australia has an attractive policy suite for renewable energy investors. For wind energy, planning policies are careful to balance the interests of developers and the community. Payroll tax rebates and legislation allowing renewable energy projects on pastoral land send clear signals to the market that the government values renewable energy investment.

State policies such as these have translated into investment of $6.6 billion to date. Approximately 40 per cent of this has gone into regional areas – a windfall of $2.4 billion. The state has committed to an investment target of $10 billion in low-carbon generation by 2025.

The South Australian Government released a Low Carbon Investment Plan in December 2015 with ambitions to become a net exporter of renewable energy. It has also set a target to achieve net zero emissions by 2050. In doing so, it aims to establish Adelaide as the world's first carbon neutral city and improve the energy efficiency of government buildings by 30 per cent by 2020.

Last year South Australia released an expression of interest for a $1.1 million battery storage demonstration project in government buildings such as the State Library, the Museum and the Art Gallery of South Australia.

STATE INITIATIVES CONTINUED



VICTORIA

Victoria's Renewable Energy Roadmap was released in 2015, with an objective to re-establish the state as a leader in this field. Public consultation on the roadmap will be fed into the development of the Victorian Renewable Energy Action Plan, which will set long-term actions to drive renewable energy investment in Victoria. The government has committed to a minimum of 20 per cent renewable energy by 2020, and a new $20 million New Energy Jobs fund.

In August, the Victorian Government announced an initiative to source renewable energy certificates from new projects in Victoria, bringing forward around $200 million of new investment in at least 100 megawatts of renewable energy projects. The tender was open from early February to late March 2016.

The Victorian Government has introduced legislation that is expected to open up solar power to the rental market. The changes allow a solar company to install a solar power system at a rental property and provide cheaper power for the tenants at no cost to the landlord. The government has also introduced fairness provisions to ensure that retailers must offer households with solar the same cheap electricity deals as those without.

WESTERN AUSTRALIA

Government-owned Western Australian retailer Synergy has tendered for around 500,000 Large-scale Generation Certificates (LGCs). These LGCs will help the retailer to meet its obligations under the RET. They can be sourced simply as certificates from anywhere in the country, or as a combination of certificates and electricity if within the main power grid in Western Australia.

Image: Boco Rock Wind Farm, New South Wales

Image: Capital Wind Farm, New South Wales

QUEENSLAND

The Queensland Government will support up to 60 MW of large-scale solar power generation to drive growth in renewable energy investment.

The initiative, in conjunction with the large-scale solar PV competitive funding round being conducted by the Australian Renewable Energy Agency (ARENA), will provide an incentive to attract large-scale solar energy projects to Queensland.

Queensland already leads the nation in rooftop solar power installation, but so far has no large-scale solar power plants built to capitalise on its world-class sunshine.

Ergon Energy, the regional Queensland government-owned retailer and network operator, released a tender for 150 MW of new renewable energy capacity and was inundated by more than 2000 MW of applications.

The Queensland Government has also pledged a target of 50 per cent renewable energy by 2030.

NEW SOUTH WALES

New South Wales was widely tipped to be a big winner under the Renewable Energy Target, and has introduced a Renewable Energy Action Plan to capitalise on the benefits on offer. The three largest solar power plants in the country are located in New South Wales at Nyngan, Moree and Broken Hill.

The state has a Renewable Energy Advocate and a system of precincts for encouraging renewable energy projects and building community support. However, its wind power guidelines have been in draft form for more than four years.

In early 2016 the New South Wales Government tendered for renewable energy projects as part of the Sydney Metro North West rail link. Expressions of interest were sought for the supply of about 137 GWh per annum of electricity from a renewable energy project in New South Wales.

TASMANIA

Tasmania produced the most renewable energy in 2015 of any state in Australia. The island has a long history as a renewable energy leader, due to the network of hydro power plants that have provided most of its electricity for the last century.

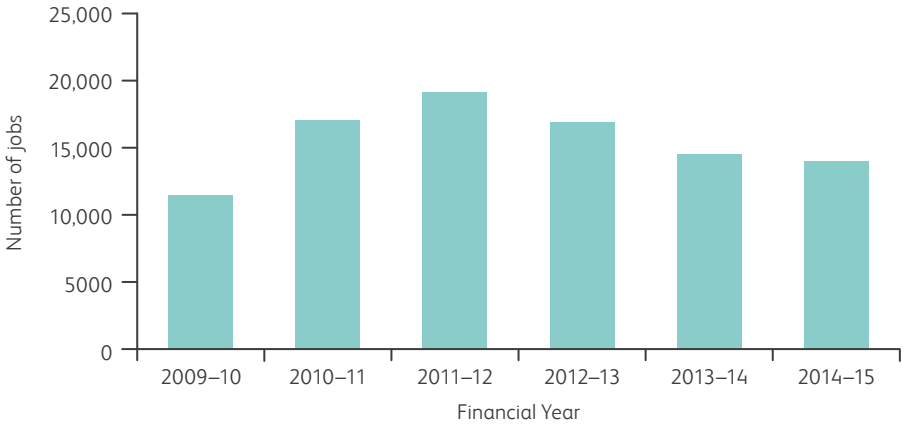
The state government unveiled the Tasmanian Energy Strategy in May 2015, with a stated aim to take further advantage of the excellent renewable energy resources that it has available.

Historic low rainfalls and an extended outage of the Basslink cable connecting Tasmania to the National Electricity Market via Bass Strait has created challenges in 2016.

EMPLOYMENT

The Australian renewable energy industry directly employed just over 14,000 people in the 2014-15 financial year, which is a decline of 27 per cent since the peak of 19,000 recorded in 2011-12[7].

TOTAL JOBS BY YEAR



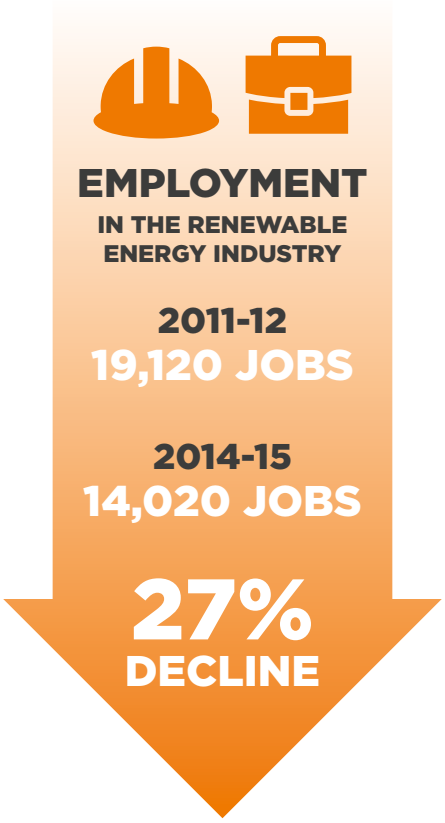
The 2014-15 job figures released by the Australian Bureau of Statistics (ABS) were down 3 per cent on those in 2013-14, reflecting a period of industry uncertainty while the Renewable Energy Target (RET) was being reviewed.

The gradual scaling back of solar feed-in tariffs has led to a corresponding decline in solar power and solar hot water installations, and fewer jobs in this part of the sector. Following some consolidation, the solar industry is now at more stable and sustainable levels.

Activity in large-scale renewable energy remained muted during the RET review, apart from the large-scale projects supported by the Australian Renewable Energy Agency (ARENA).

RET legislation supported by both major parties was passed in June 2015, which is right at the end of the period the ABS figures are tracking. A lot has changed since then, and confidence is growing across the sector after a challenging few years.

The mood across the industry is upbeat in 2016, and it is expected that job figures will begin to grow once project development begins in earnest again under the RET in the coming years.



7 Australian Bureau of Statistics. *4631.0 - Employment in Renewable Energy Activities, Australia, 2014-15*

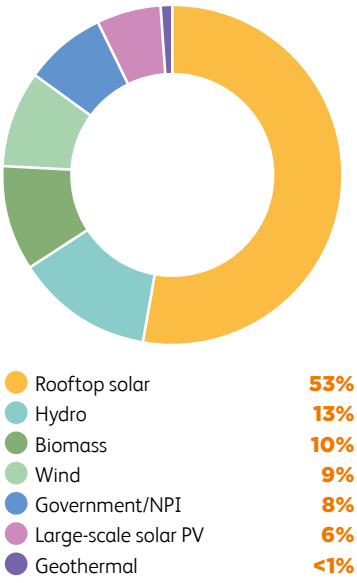
8 Note on definition of Government/NPI: The scope of this publication includes activities undertaken by employees of government agencies and NPIs to support the operation of renewable energy systems, for example, administration, legal, policy or advocacy. Therefore, employment in regulatory bodies such as the Clean Energy Regulator is in scope. Some government agencies and NPIs provide support that is critical to the go-ahead of many renewable energy projects and the employees of these units are also considered to be renewable energy employees. Examples of the latter include the Clean Energy Finance Corporation (CEFC) and ARENA. Employees engaged in renewable energy advocacy are also included, for example, employees of various renewable energy peak bodies.

DIRECT FTE EMPLOYMENT IN RENEWABLE ENERGY ACTIVITIES BY RENEWABLE ENERGY TYPE[7]

ENERGY TYPE	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Rooftop solar PV (a)	7020	11,970	14,300	11,060	7880	7480
Large-scale solar PV	10	10	50	140	370	830
Wind	1140	1620	1110	1440	1720	1230
Hydro	1430	1450	1480	1760	1810	1820
Biomass	1360	1360	1380	1370	1510	1470
Geothermal	100	80	70	60	60	40
Govt/NPI[8]	460	520	730	1100	1140	150
TOTAL	**11,520**	**17,010**	**19,120**	**16,930**	**14,490**	**14,020**

(a) includes hot water systems

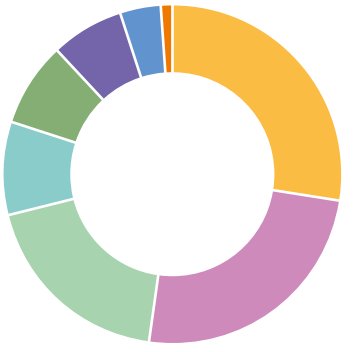
2014–15



DIRECT FTE EMPLOYMENT IN RENEWABLE ENERGY ACTIVITIES BY STATE/TERRITORY[7]

STATE	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
NSW	3270	4340	3790	3280	3230	3990
VIC	1810	2930	3510	3000	2770	2630
QLD	2750	4120	5580	5010	3840	3570
SA	1450	2290	2360	1870	1380	940
WA	1070	2080	2230	1600	1090	1100
TAS	960	950	1200	1540	1470	1200
NT	70	60	70	70	90	80
ACT	140	240	380	560	620	510
TOTAL	**11,520**	**17,010**	**19,120**	**16,930**	**14,490**	**14,020**

2014–15



INVESTMENT

Background image: Nyngan Solar Farm, New South Wales

The total investment in Australian clean energy was $4.3 billion in 2015, a modest increase on the year before but a long way short of the investment between 2010-13, according to analysis from Bloomberg New Energy Finance (BNEF).

Global clean energy investment surged to record levels in 2015, with international leaders such as China, the United States and Latin America driving the world total to US$329 billion.

However, the Federal Government's ongoing review of the Renewable Energy Target (RET) and the lingering uncertainty following its conclusion contributed to another subdued year for large-scale renewable energy Down Under.

Overall, $1.18 billion was invested in large-scale renewable energy in 2015[9]. BNEF figures published in early 2016 suggested that only $15 million had been invested in large-scale renewable energy since the beginning of the RET review that was not otherwise supported by government programs such as the ACT Government reverse auction or the Australian Renewable Energy Agency (ARENA).

As with the year before, investment in small-scale renewable energy such as solar power performed strongly, with Australia's $2.17 billion of investment placing it fifth in the world in 2015. As has been the case every year this decade, the steadily declining cost of renewable energy means that more can now be built for less.

With interest from international and domestic investors increasing substantially following the resolution of the RET review, the industry is confident of a much-improved year in 2016.

9 P Hannam, The Sydney Morning Herald, *Confidence in renewable energy sector 'evaporated' after Abbott cut: Bloomberg*, January 2016. Available online: www.smh.com.au/environment/climate-change/confidence-in-renewable-energy-sector-evaporated-after-abbott-cut-bloomberg-20160114-gm5qbo.html

$329B

total worldwide investment in renewable energy, driven largely by international leaders such as China, the United States and Latin America.

Image: Ararat Wind Farm, Victoria

$4.3B
the total investment in Australian renewable energy in 2015 (including energy efficiency and other enabling technologies)

$1.18B
the total investment in Australian large-scale renewable energy in 2015

$2.17B
the total investment in Australian small-scale renewable energy (such as solar power) in 2015

5th
Australia's place in the worldwide league table for investment in small-scale renewable energy

AUCTIONS HELP TO REVERSE INDUSTRY FORTUNES

It may sound like a backwards way of doing things, but reverse auctions have been a highly successful way to maximise the bang for every buck that governments invest in renewable energy.

Instead of seeking the highest bidder, a reverse auction rewards the lowest one. In the case of a renewable energy reverse auction, this means that those who offer the lowest-priced clean energy will be successful.

In order to meet its ambitious renewable energy target, the Australian Capital Territory Government launched a series of reverse auctions to encourage new renewable energy projects.

It has since run three auction rounds – a 40 MW solar auction held in 2012 and 2013 and a pair of 200 MW wind auctions. The 20 MW Royalla Solar Farm was constructed with support from the ACT reverse auction, and when Windlab's Coonooer Bridge Wind Farm became fully operational in 2016 it was the first of the successful wind farms to be completed.

The ACT program generated major interest across the renewable energy industry, and was the basis for subsequent large-scale solar funding programs offered by the Australian Renewable Energy Agency and the Queensland Government.

ELECTRICITY PRICES

Power prices have flattened out substantially since the price spikes of a few years ago, but electricity prices remain a politically-charged battleground. The Australian Energy Market Commission expects residential power prices to be mostly unchanged over the next three years, with the possibility of slight increases.

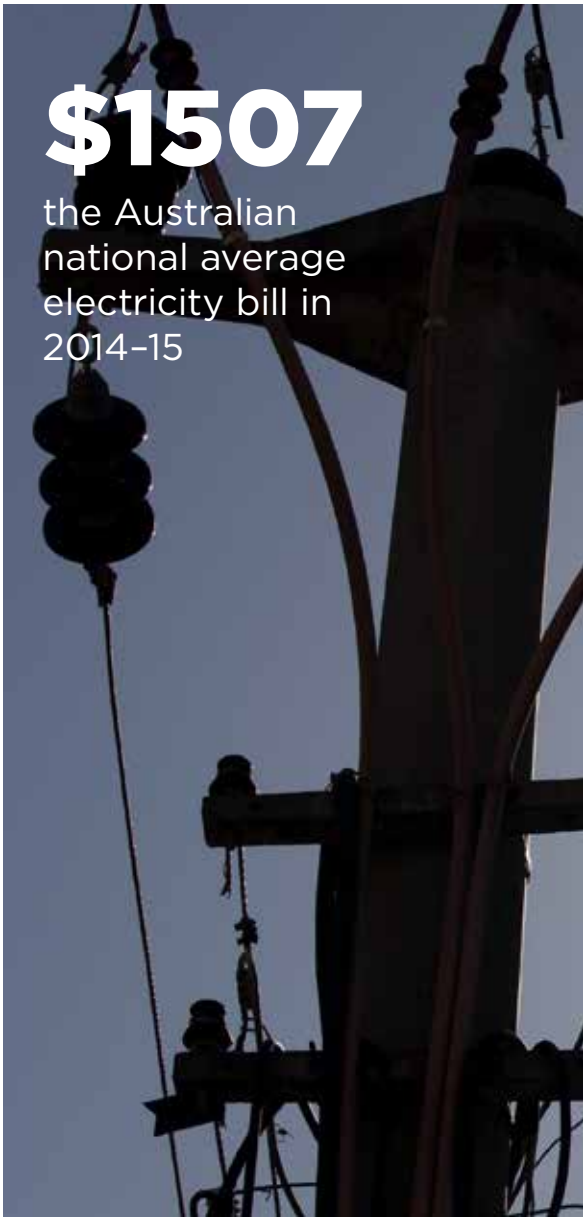
The majority of the previous cost rises were driven by investment in the poles and wires of the electricity network. How much of this was necessary investment and how much was network 'gold plating' as suggested by some commentators is unclear. But with the benefit of hindsight, a six-year stretch of falling demand for electricity meant that more was invested in our poles and wires than was ultimately required.

As storage becomes cheaper and more mainstream, it is expected that the interaction of solar and battery storage will help to shave off some of the expensive demand peaks, such as on very hot days when air-conditioning is being widely used. This will help to reduce overall costs for consumers.

The cost of transporting electricity across the country via the poles and wires network has made up more than half of power bills in recent years. However, in 2016 power prices may actually fall slightly in some states due to decreasing network costs in the short term. This is in response to new economic regulation rules and determinations by the Australian Energy Regulator.

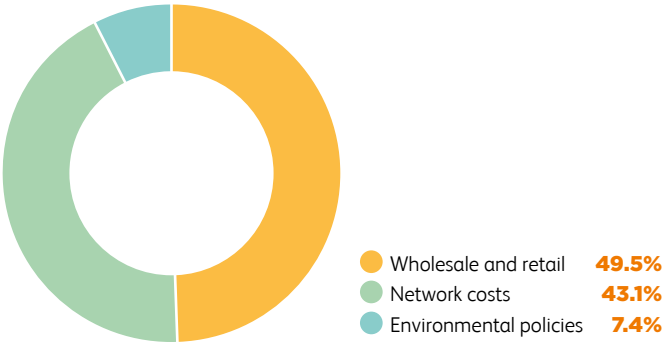
The cost of actually generating power, whether from renewable energy, coal or gas, makes up only about a quarter of the average power bill[10]. These wholesale electricity costs are expected to rise from historically low levels due to the retirement of old power plants, such as Alinta's two coal-fired power stations in South Australia.

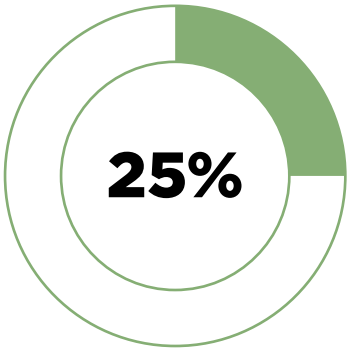
The national average annual residential electricity bill in 2014-15 was $1507.



10 Origin Energy, *Energy Bill Charges: Know the Facts*, February 2015, www.originenergy.com.au/blog/lifestyle/understanding-the-ins-and-outs-of-your-electricity-bill.html

BREAKDOWN OF CHARGES IN DOMESTIC ELECTRICITY BILLS, 2014–15





approximate percentage of the average power bill that goes towards actually generating electricity

NATIONAL SUMMARY OF POWER PRICE COMPONENTS[11]

	2014–15 BASE YEAR		2015–16 CURRENT YEAR		2016–17		2017–18	
	c/kWh	**$/year**	**c/kWh**	**$/year**	**c/kWh**	**$/year**	**c/kWh**	**$/year**
Environmental policies	1.79	94	2.10	110	2.16	113	2.09	110
LRET	0.49	26	0.59	31	0.74	39	0.91	48
SRES	0.47	25	0.46	24	0.42	22	0.42	22
FIT schemes	0.73	38	0.91	48	0.84	44	0.61	32
Other state schemes	0.10	5	0.13	7	0.15	8	0.15	8
Regulated networks	13.53	710	12.32	647	12.01	630	12.03	631
Transmission	1.80	95	2.14	113	2.13	112	2.13	112
Distribution	11.73	615	10.18	534	9.88	518	9.90	519
Competitive market Wholesale and retail	13.40	703	14.13	742	14.67	770	15.53	815
TOTAL	**28.72**	**1507**	**28.55**	**1499**	**28.83**	**1513**	**29.65**	**1556**

11 Australian Energy Market Commission, 2015, Residential Electricity Price Trends Final Report, page 8.

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, increased slightly in 2015 following six years of decline to 2014.

The Australian Energy Market Operator (AEMO) predicts that electricity use will recover by about 1.8 per cent per annum for the next three years[12]. Some of the factors leading to more power use include the ramp-up of Liquefied Natural Gas (LNG) projects in Queensland and an increase in residential and commercial consumption in New South Wales. Energy efficiency initiatives and the closure of the Point Henry Aluminium Smelter are pushing electricity use down.

Rooftop solar power is starting to change the patterns of supply and demand across the country. Maximum demand for power in South Australia previously occurred around 5.30 pm, but the increased use of solar power means this has been pushed back an hour to around 6.30 pm. Queensland and Victoria are expected to follow a similar trend.

Analysis by pitt&sherry found that solar power made a major contribution to helping South Australia meet its energy needs during a heatwave in December 2015. Even with solar power, the use of electricity during this time was 70 per cent above the same period the year before, highlighting the importance of energy efficiency initiatives for buildings, air-conditioning and refrigeration.

Solar power is significantly reducing the demand for power in South Australia on sunny days. Based on the expected future installation of solar power, by 2023-24 the technology is expected to be capable of generating enough electricity to power the whole state when the sun is shining.[13] AEMO is investigating this scenario and its effects on system security and reliability.

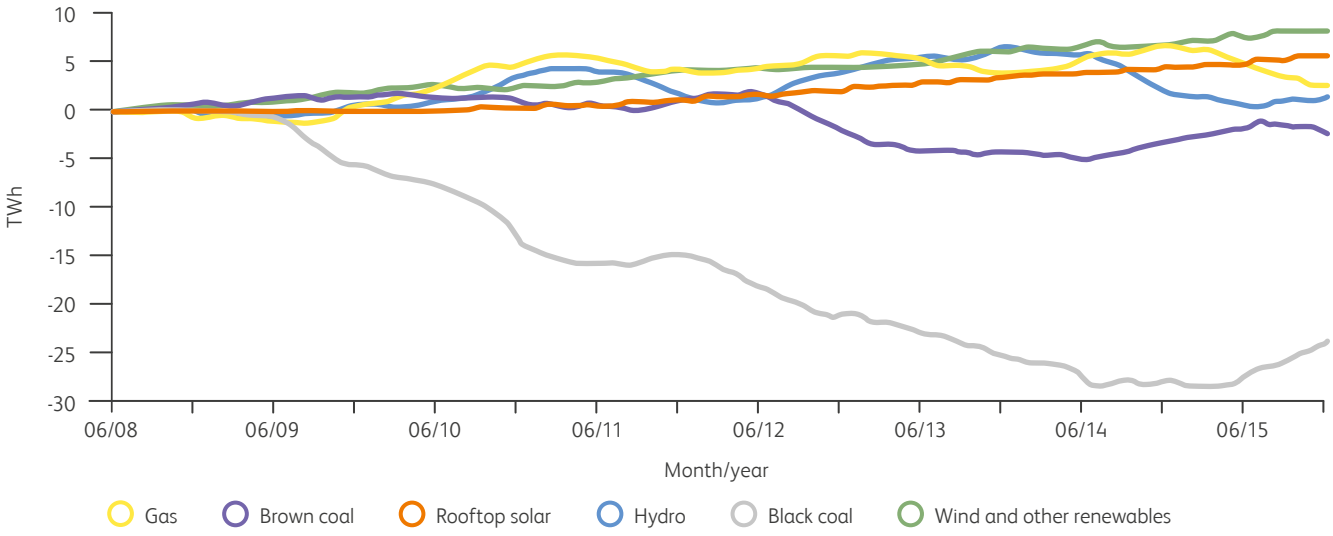
Approximate time when power demand is at its maximum in South Australia

1.8%

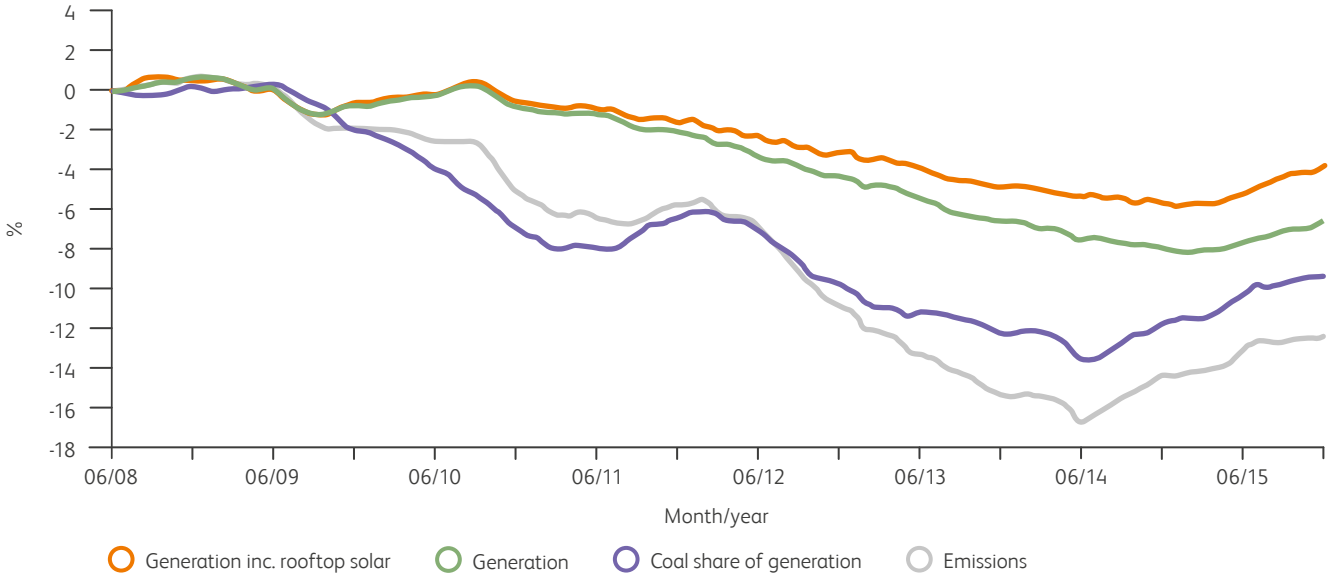
EXPECTED GROWTH IN DEMAND FOR ELECTRICITY PER ANNUM FOR THE NEXT THREE YEARS

12 Australian Energy Market Operator, *Update – National Electricity Forecasting Report*, December 2015, page 7 and Australian Energy Market Operator, *National Electricity Forecasting Report*, June 2015, page 7
13 Australian Energy Market Operator, *National Electricity Forecasting Report*, June 2015, page 19
14 pitt&sherry, *CEDEX Carbon Emissions Index*, February 2016, Figure 1, page 2

CHANGES IN ELECTRICITY GENERATION BY FUEL TYPE[14]



CHANGES IN ELECTRICITY GENERATION, EMISSIONS, AND COAL'S SHARE OF GENERATION[14]



ENERGY STORAGE

There seems little doubt that energy storage technology is the missing piece that will transform the way Australians use and think about energy, once it becomes affordable for average Australians.

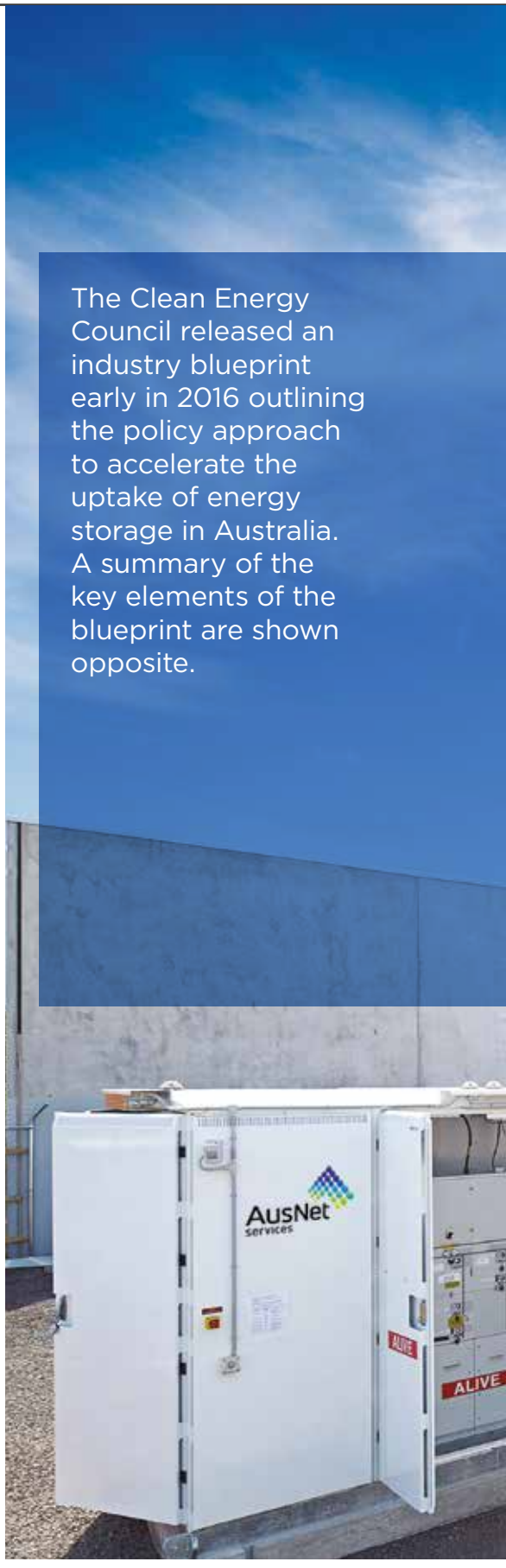
The US$5 billion Gigafactory being built by Tesla in the United States will substantially drive down the cost of lithium ion batteries overall, and competition from the manufacturing powerhouses in China will only accelerate this process. Meanwhile, a variety of pilot projects have been launched across the country to investigate the best way to integrate storage with the power system – and in some cases whether new developments need to be connected to the power grid at all.

A variety of brands launched their own storage products in 2015, including Clean Energy Council members such as Panasonic, AGL and ZEN Energy.

New and innovative business models similar to mobile phone plans will help to put storage technology in more households, in some cases without the need to fund the upfront purchase cost.

The Clean Energy Council has undertaken substantial work in collaboration with its members to lay the policy and regulatory foundations for the mass uptake of energy storage. As well as the launch of the Australian Energy Storage Roadmap 2015, the Clean Energy Council launched Australia's most comprehensive study into energy storage safety, which was completed by CSIRO as part of the Future Proofing in Australia's Electricity Distribution Industry project.

The Clean Energy Council released an industry blueprint early in 2016 outlining the policy approach to accelerate the uptake of energy storage in Australia. A summary of the key elements of the blueprint are shown opposite.



UNLOCK THE FULL VALUE OF STORAGE

Ensure that network distribution tariffs are designed in a way that allows customers to realise the full value of installing storage and that future structural changes to tariffs are not at the detriment of these consumer investments.

INTEGRITY AND SAFETY

Householders and businesses who purchase battery storage systems must have confidence in the performance, quality and safety of these systems. Products should meet Australian Standards and be installed by a qualified professional. While the Clean Energy Council is establishing these product and installations standards, governments must play a role to ensure that an appropriate and nation-wide regulatory framework is established.

CONSUMER INFORMATION

Consumers need access to better information to empower them to make decisions that best meet their circumstances, and to guide the appropriate installation and ongoing operation of battery systems.

SUPPORT DEMONSTRATION PROJECTS

While the long-term business case for battery storage is compelling, doing anything for the first time is difficult, time-consuming and often expensive. Government support for demonstration battery storage projects can identify barriers, growing confidence and familiarity with battery storage solutions, finding innovative business and financing models, and building capability and capacity within the industry.

ENSURE SUPPORTIVE REGULATIONS

There are a range of regulations relating to the electricity network, building codes, planning regimes, and fire and environmental safety that were designed long before battery storage was anticipated. It is important that regulators work with the storage sector to identify and overcome these barriers.

Image: Grid Energy Storage System, Victoria

ENERGY GENERATION DIGEST

STATE BY STATE

NORTHERN TERRITORY

5242 domestic solar systems
25 MW domestic solar capacity

WESTERN AUSTRALIA

12% of generation from renewables
21 wind farms
491 MW wind capacity
308 wind turbines
196,232 domestic solar systems
539 MW domestic solar capacity

SOUTH AUSTRALIA

41% of generation from renewables
17 wind farms
1475 MW wind capacity
651 wind turbines
193,436 domestic solar systems
642 MW domestic solar capacity

$10 billion clean energy investment target and 50 per cent renewables target by 2025
Most wind power

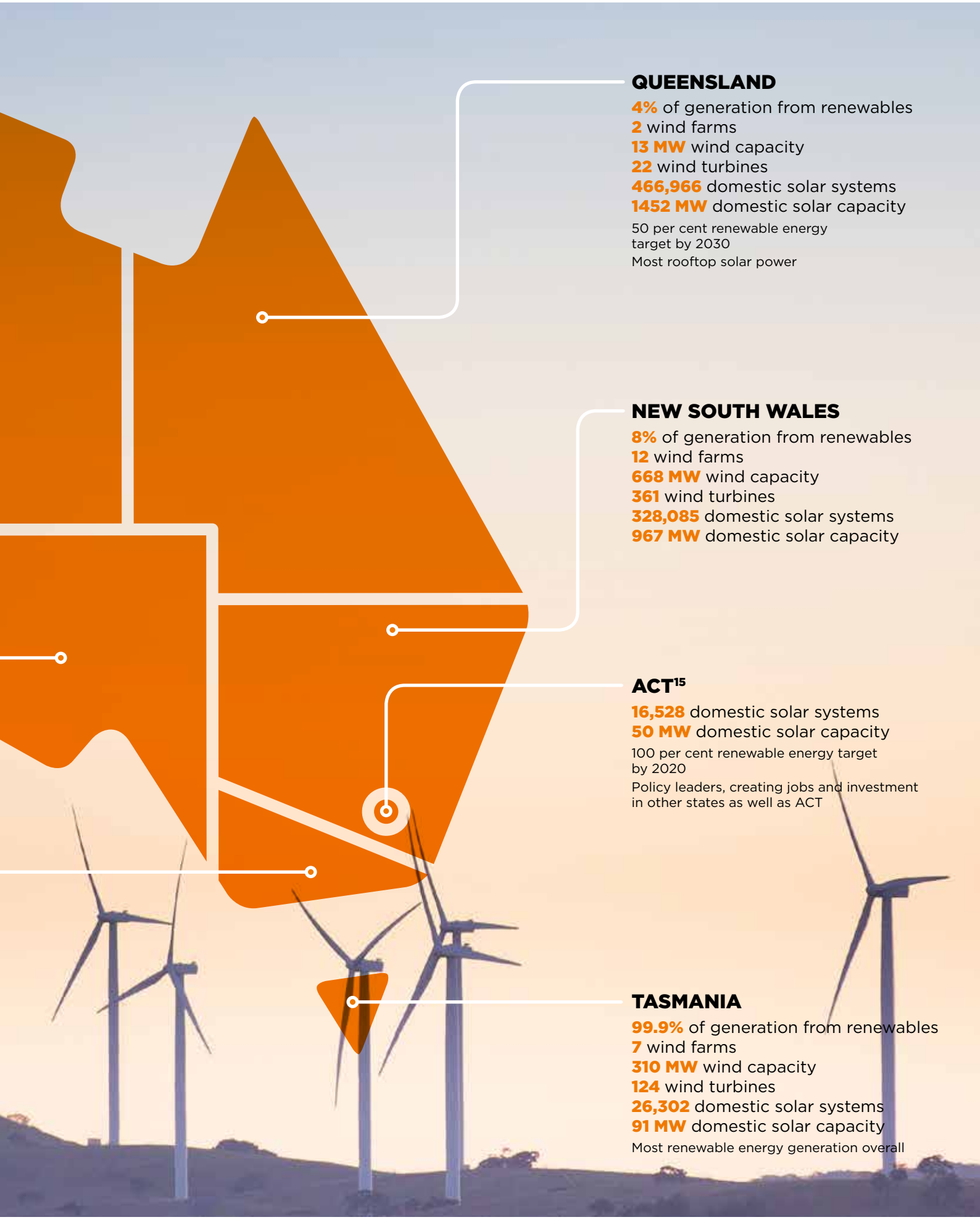
VICTORIA

12% of generation from renewables
17 wind farms
1230 MW wind capacity
596 wind turbines
282,059 domestic solar systems
860 MW domestic solar capacity

At least 20 per cent renewable energy by 2020

15 Considered part of NSW under the NEM in regard to percentage of energy generated from renewable sources

Image: Capital Wind Farm, New South Wales



QUEENSLAND

4% of generation from renewables
2 wind farms
13 MW wind capacity
22 wind turbines
466,966 domestic solar systems
1452 MW domestic solar capacity

50 per cent renewable energy target by 2030

Most rooftop solar power

NEW SOUTH WALES

8% of generation from renewables
12 wind farms
668 MW wind capacity
361 wind turbines
328,085 domestic solar systems
967 MW domestic solar capacity

ACT[15]

16,528 domestic solar systems
50 MW domestic solar capacity

100 per cent renewable energy target by 2020

Policy leaders, creating jobs and investment in other states as well as ACT

TASMANIA

99.9% of generation from renewables
7 wind farms
310 MW wind capacity
124 wind turbines
26,302 domestic solar systems
91 MW domestic solar capacity

Most renewable energy generation overall

BIOENERGY

Bioenergy is renewable energy produced from agricultural or biological sources. In Australia bioenergy is most commonly produced using agricultural waste or by-products.

Many different fuel sources are used to produce bioenergy. Sugar cane waste, or bagasse, is the most common form of Australian bioenergy generation, and is used to simultaneously produce both electricity and heat in many parts of the country.

Other common sources of fuel for bioenergy operations include landfill gas, sewage gas, agricultural waste and wood waste. Landfill gas is among the lowest cost of all energy sources. Australia's industrial sector has the potential to make much better use of its waste streams using incentives from either the national Renewable Energy Target or the Federal Government's Emissions Reduction Fund.

Garden product supplier Richgro connected its 2 MW waste-to-energy plant to the power grid in Western Australia in October 2015. It expects a payback of less than four years on its $8 million investment on the plant at Jandakot in the south of Perth. The by-product from the power generation process can be used as a raw material in Richgro's products.

A woodchip burner at an abattoir in Albany, Western Australia, also became operational in 2015. Woodchips from pine plantations are used to run two boilers, producing the hot water necessary for cleaning each day at the business. According to the manager of the abattoir, it has stopped using oil altogether and has reduced its LPG use by 95 per cent.

Several projects will be constructed in 2016, including a 700 kW digester at Mindarra north of Perth by Quantum Power Limited, which will produce power from biogas created by piggery manure.

Yarra Valley Water is developing a 1 MW biogas plant at Wollert, north of Melbourne. About 100 tonnes of waste will be trucked to the facility from markets and food manufacturing operations each day, producing biogas which will be used to generate electricity. Construction is expected to be finished by the end of the year.

<4

number of years garden product supplier Richgro expects to take to pay back an $8 million investment on a 2 MW waste-to-energy plant at Jandakot, south of Perth

100%

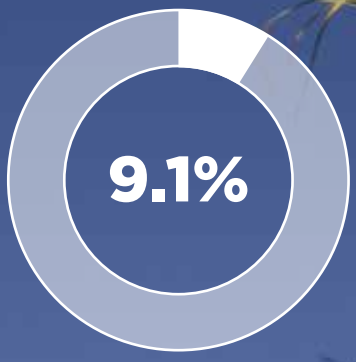
reduction in oil use at an abattoir in Western Australia after a woodchip burner was installed to heat water for cleaning

BIOENERGY PLANTS COMMISSIONED IN 2015

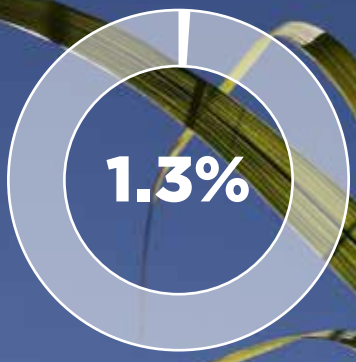
FUEL SOURCE	LOCATION	OWNER	STATE	CAPACITY (MW)
Organic waste	Jandakot	Richgro	WA	2

BIOENERGY PLANTS UNDER CONSTRUCTION AT END 2015

FUEL SOURCE	LOCATION	OWNER	STATE	CAPACITY (MW)
Landfill waste	Wollert	Yarra Valley Water	VIC	1



of total clean energy generated in Australia in 2015



of total Australian electricity generated in 2015

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

GEOTHERMAL

While Australia has excellent geothermal resources, they are mostly located a long way from either the power grid, or from large industrial customers which could buy the power they produce.

Recent efforts have focused on developing a new technology called Enhanced Geothermal Systems, which are a way of harnessing the power of hot rocks and super-heated water reservoirs up to 5 km under the surface of the Earth. Geodynamics successfully ran a trial of its Habanero geothermal pilot plant several years ago, and reported that the results exceeded expectations.

However, with the resource located in outback South Australia and no major energy users nearby, Geodynamics and other geothermal pioneers have been looking to diversify their operations towards other types of renewable energy. In 2016 Geodynamics will plug all its remaining geothermal wells in the Cooper Basin and complete remediation activities.[16]

The Australian Renewable Energy Agency (ARENA) has been involved with seven projects, most of which ended in the early investigation phase. Five of these are now closed and two were completed.

ARENA's international geothermal expert group found that utility-scale generation from geothermal projects was not expected to be commercially viable by 2020. The technology was only expected to become competitive with traditional fossil fuel power generation by 2030 with the help of a high carbon price and in the most favourable scenario for cost reductions.[17]

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

GEOTHERMAL PLANT OPERATING IN 2015

LOCATION	OWNER	STATE	CAPACITY (MW)
Birdsville	Ergon Energy	QLD	0.12

16 Australian Renewable Energy Agency, *Cooper Basin Enhanced Geothermal Systems Heat and Power Development*, project closed December 2015. http://arena.gov.au/project/cooper-basin-enhanced-geothermal-systems-heat-and-power-development/

17 ibid

ERGON TO PUT HEAT ON GEOTHERMAL IN CENTRAL QUEENSLAND

Ergon Energy's Birdsville Geothermal Power Station is the only commercial geothermal power station in Australia and the business has ambitious plans to upgrade it.

Planning is advanced on a project to replace the existing system at the power station with new plant expected to increase net output to between 150 and 200 kilowatts.

The project will challenge Ergon Energy to integrate the new geothermal power station with the existing diesel power station.

Ergon Energy expects the higher geothermal energy output from the plant to reduce Birdsville's annual 500,000 litre diesel consumption by up to 80 per cent – saving $340,000 each year on fuel and more on engine maintenance.

An estimated 20 personnel are expected to live and work in Birdsville during construction.

Image: Habanero Pilot Plant, South Australia

HYDRO

Australia's hydro power plants generated the largest share of Australia's renewable energy during 2015, mostly from the network of power plants in Tasmania and the Snowy Hydro Scheme.

The amount of hydro power generated in 2015 was lower than 2014 due to low rainfall in key hydro catchments. Hydro Tasmania's network endured the driest period on record between September and November, and storages dropped to a quarter of capacity (25.7 per cent). These issues continued into 2016, exacerbated by problems with the Basslink interconnector that links Tasmania's electricity system with the mainland.

Water storages in the Snowy Hydro network were about half full in the early part of 2016. Snowy reportedly held back water flows in parts of 2015 due to low prices in the market.

Hydro Tasmania completed two refurbishment projects during 2015: A $34 million machine refurbishment at Cethana Power Station in north-west Tasmania and a $13.4 million excavation project on Rowallan Dam in the north of the state. The dam excavation was conducted on a live dam which was holding back Lake Rowallan, using a flood detection and warning system.

AGL completed the $32 million modernisation of four turbines, along with the main inlet valves and control systems at its West Kiewa Power Station, located 140 metres underground in the north of Victoria.

CONTRIBUTION TO AUSTRALIAN ELECTRICITY GENERATION

YEAR	GENERATION (GWh)	CONTRIBUTION TO RENEWABLES	CONTRIBUTION TO TOTAL ELECTRICITY
2013	19,243	55.4%	8.2%
2014	14,567	45.9%	6.2%
2015	14,046	40.1%	5.9%

TOP PLANTS BY GENERATION IN 2015

STATION	STATE	OWNER	GENERATION (GWh)
Murray	VIC	Snowy Hydro	1493
Gordon	TAS	Hydro Tasmania	1344
Poatina	TAS	Hydro Tasmania	1330
Upper Tumut	NSW	Snowy Hydro	1039
Liapootah-Wayatinah-Catagunya	TAS	Hydro Tasmania	858

DIG THIS: SOLAR AND PUMPED HYDRO PROPOSED FOR OLD MINE SITE

Genex Power is investigating the viability of using an old gold mine site in North Queensland to build a pumped hydro storage facility and a large-scale solar plant.

First things first: The company is working with the Australian Renewable Energy Agency (ARENA) on a feasibility study into the 330 MW pumped hydro project at the old Kidston Gold Mine.

If it proceeds, the project would be the first time two disused mine pits have been used for hydro power generation.

In a pumped hydro system, water is pumped uphill to a higher reservoir when demand for power is low. This water can be called on when required, running downhill and powering a turbine to generate electricity. With the solar and pumped hydro plants working together, water could be pumped from the lower mine pit to the higher one when the sun is shining, creating a renewable energy storage system.

It would be able to provide power at times of high power use.

The proposed 150 MW solar power plant adjoining the hydro facility is larger than any single solar plant currently built in Australia. A combined solar and storage project of this size would be a world first.

The company says the facility would offer renewable energy generation and storage at the fringe of the power grid, which will help to open up North Queensland to future development.

Image: Gordon Hydroelectric Power Station, Tasmania

MARINE

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

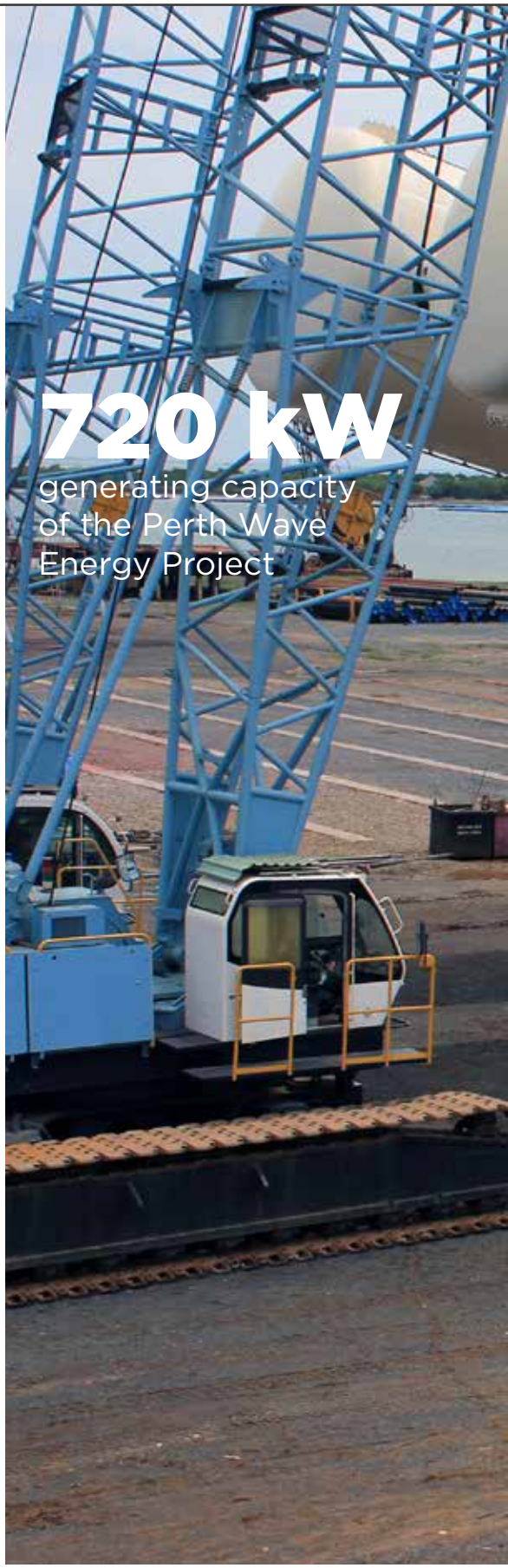
While Australian marine energy technology is at an early stage of development, the strength of the wave and tidal resources across the country has exceptional promise.

Late in 2015, BioPower Systems installed its bioWAVE unit off the coast of Port Fairy in south-west Victoria. The 250 kW unit had been in development for three years.

Carnegie Wave Energy added two CETO 5 units to its Perth Wave Energy Project off Garden Island for the Department of Defence in early 2015, bringing the total up to three units with a total generating capacity of 720 kW. All of these had been removed from the water by early 2016 after trialling the technology in the marine environment.

The company is working on its next-generation CETO 6 technology, which will have a substantially higher capacity of 1 MW per unit. The new units can be located almost three times further out to sea, up to a range of about 10 km. The Garden Island project will feature several CETO 6 units located 8 to 15 km offshore. It is expected to be fully operational in 2017.

Marine energy shows extraordinary potential for the future, but is still at a very early stage of development in Australia and across the globe. CSIRO research suggests that the south-west coast of Victoria, the southern tip of Western Australia and the western side of Tasmania could be some of the nation's hot spots for wave energy.[18]



WAVE AND TIDAL PLANTS OPERATING IN 2015

TECHNOLOGY	OWNER	LOCATION	STATE	CAPACITY (kW)
Wave	Carnegie Wave Energy	Garden Island	WA	240
Wave	BioPower Systems	Port Fairy	VIC	250

18 CSIRO and Australian Renewable Energy Agency, *Australian Wave Energy Atlas project*, available online: http://nationalmap.gov.au/renewables/

BIOPOWER SYSTEMS SURGES AHEAD

An Australian renewable energy business installed Victoria's first wave power unit in December 2015, off the coast near Port Fairy in the state's west.

The distinctive 26-metre bioWAVE prototype sways back and forth in the ocean swell and converts the energy into electricity which can be fed back into the power grid through an undersea cable.

BioPower Systems developed the 250 kW bioWAVE unit, and the prototype will be trialled in a one-year $21 million pilot project with support from the Australian Renewable Energy Agency (ARENA) and the Victorian Government.

BioPower Systems Chief Executive Timothy Finnigan described the project as a major step forward for the business and for marine energy in general.

Image: Wave power unit, Victoria

SOLAR HOUSEHOLD AND COMMERCIAL SYSTEMS UP TO 100 kW

The number of solar power installations dropped to the lowest level since 2009 as the solar industry continued to consolidate during 2015.

While the average size of each system continued its upward trend to just under 5 kW, the total capacity of all new solar systems installed dropped 11 per cent on the year before. The intense competition among solar companies is good for consumers, but challenging for those in the industry.

Changes by the Victorian Government late in 2015 have eased restrictions on the use of solar power purchase agreements (PPAs), potentially opening up the rental market for the solar industry and setting an example for other states to follow. Under a PPA, a solar company installs a solar power system at a property and then sells the solar electricity to tenants at a cheaper rate than they can buy it from the power grid.

Bundaberg in Queensland continued to shine on as the nation's top solar postcode, followed by Mandurah in Western Australia. Eight of the top 10 national solar postcodes were in Queensland.

The ongoing consolidation of the sector led to a second straight contraction in the number of installers accredited with the Clean Energy Council. More than 4140 accredited installers were operating across the country at the end of 2015, a modest drop of 6 per cent on the year before.

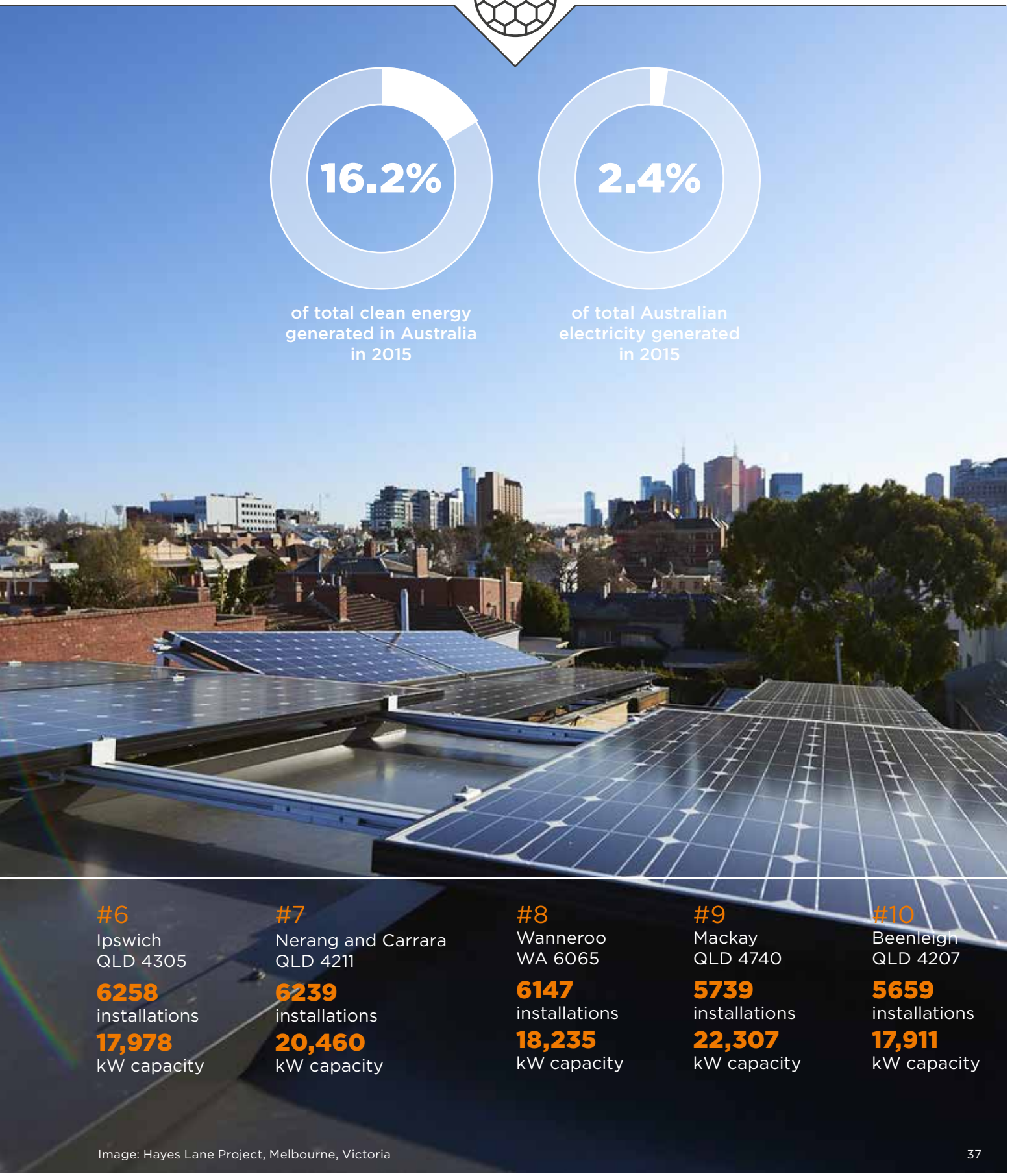
The safety and quality of solar power systems continued to be a focus of scrutiny by state and federal governments in 2015, and there is every indication that this will continue into the future. Clean Energy Council accreditation for solar installers has helped to ensure the quality of installations is constantly improving.

The Clean Energy Council Solar 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.

Victoria's Renewable Energy Roadmap includes provisions for using signatories to the Code of Conduct for government tenders, and other state governments across the country have also expressed interest in adopting this model. At the end of 2015, 24 companies across the country were Approved Solar Retailers under the program.

TOP TEN SOLAR POSTCODES IN AUSTRALIA

#1	#2	#3	#4	#5
Bundaberg QLD 4670	Mandurah WA 6210	Hervey Bay QLD 4655	Caloundra QLD 4551	Toowoomba QLD 4350
9578 installations	**8458** installations	**8126** installations	**7596** installations	**6912** installations
30,305 kW capacity	**20,959** kW capacity	**24,095** kW capacity	**20,731** kW capacity	**22,314** kW capacity



#6
Ipswich
QLD 4305
6258
installations
17,978
kW capacity

#7
Nerang and Carrara
QLD 4211
6239
installations
20,460
kW capacity

#8
Wanneroo
WA 6065
6147
installations
18,235
kW capacity

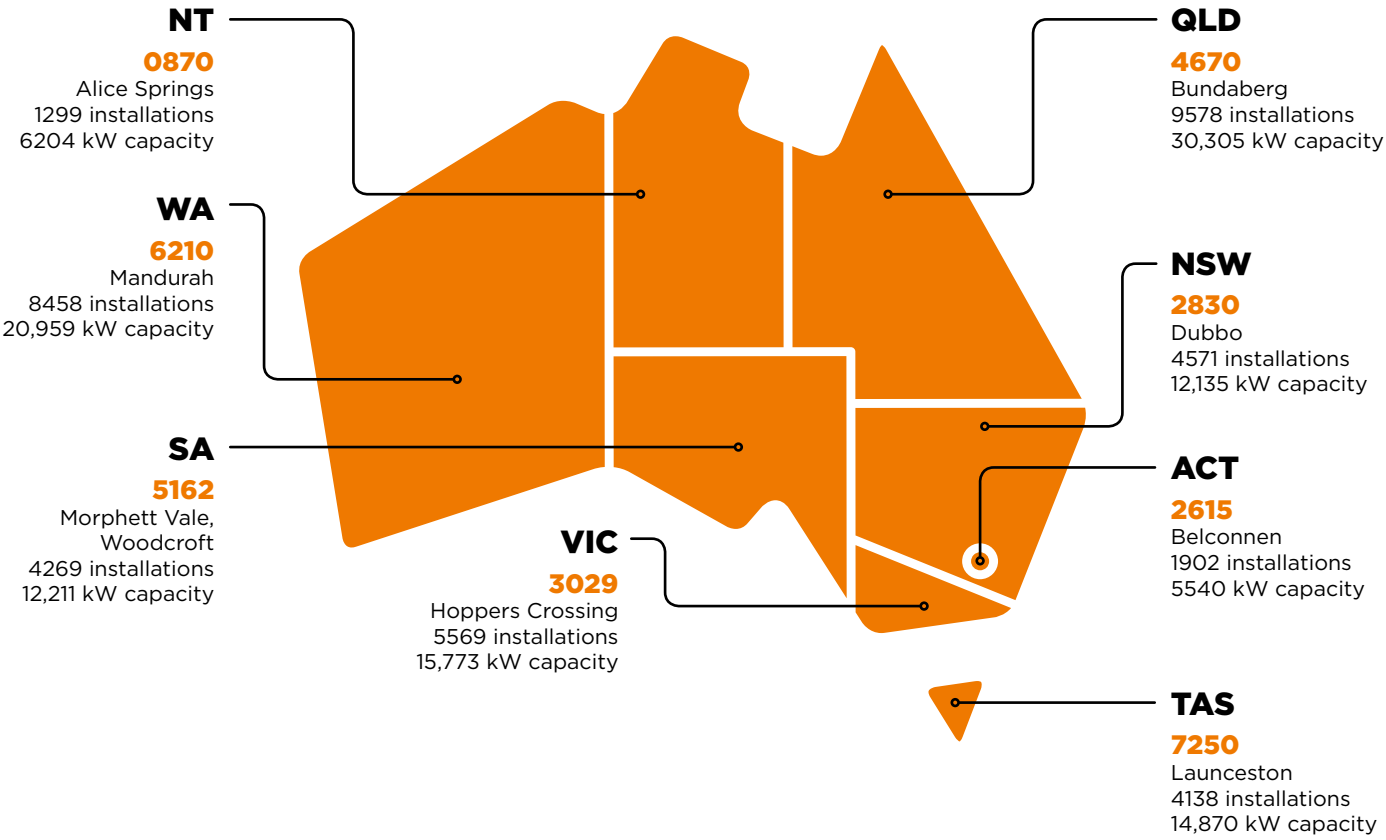
#9
Mackay
QLD 4740
5739
installations
22,307
kW capacity

#10
Beenleigh
QLD 4207
5659
installations
17,911
kW capacity

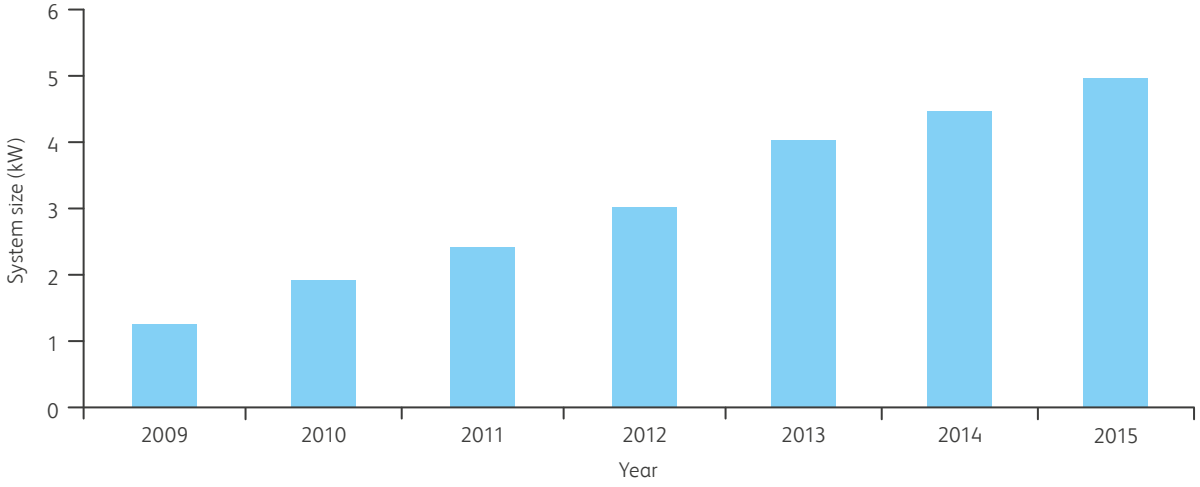
Image: Hayes Lane Project, Melbourne, Victoria

SOLAR HOUSEHOLD AND COMMERCIAL SYSTEMS UP TO 100 kW (CONTINUED)

TOP SOLAR POSTCODE IN EACH STATE



NATIONAL AVERAGE SOLAR PV SYSTEM SIZE (kW)[19]



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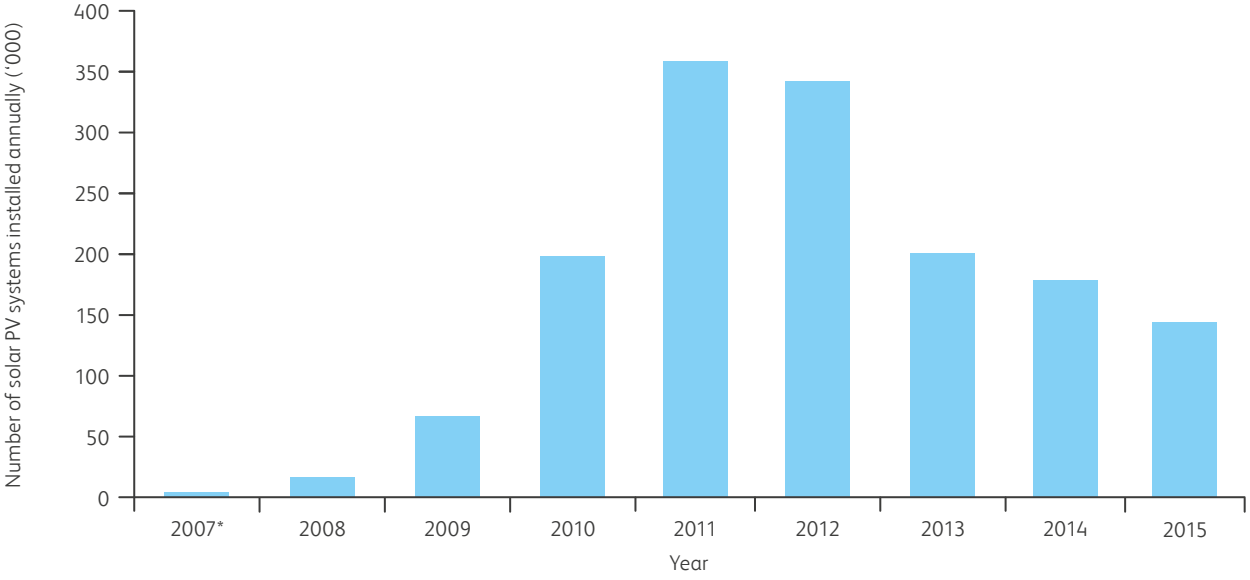
ANNUAL SOLAR PV INSTALLATIONS[19]

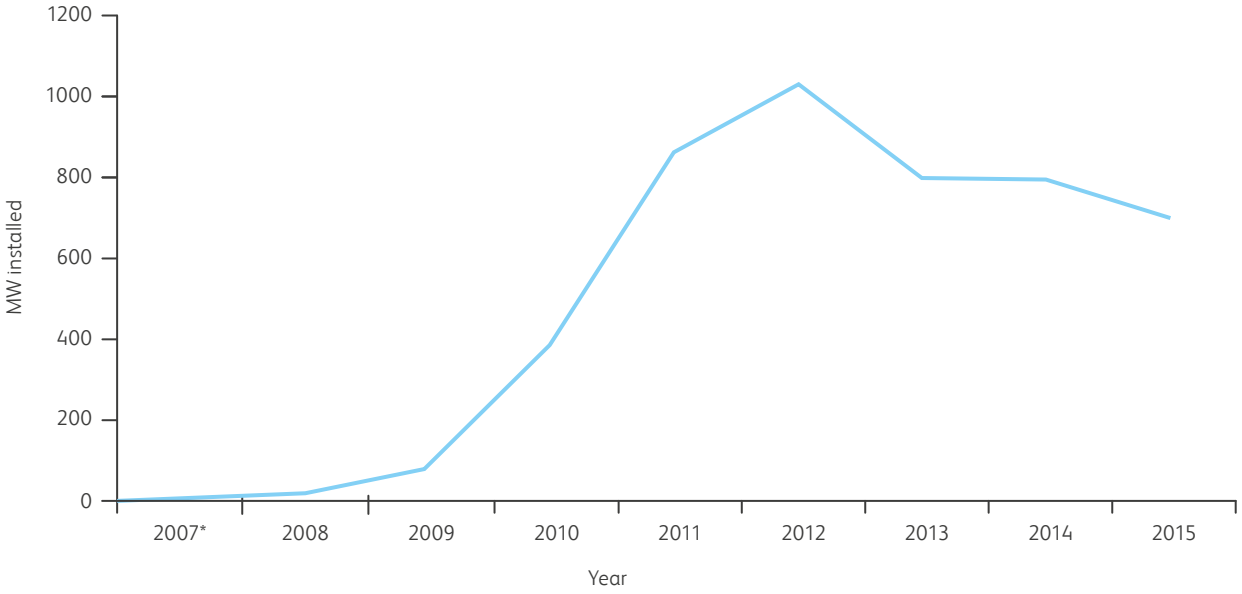


INSTALLATION YEAR	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	NATIONAL
2007*	102	779	26	475	1037	26	828	262	**3535**
2008	278	2890	88	3087	3456	161	2036	2068	**14,064**
2009	803	14,008	215	18,283	8569	1452	11,847	11,157	**66,334**
2010	2323	69,988	637	48,697	16,705	1889	35,676	22,293	**198,208**
2011	6860	80,272	401	95,303	63,553	2475	60,214	51,667	**360,745**
2012	1522	53,961	513	130,252	41,851	6364	66,204	42,653	**343,320**
2013	2411	33,998	1024	71,197	29,187	7658	33,332	21,600	**200,407**
2014	1224	37,206	1026	57,745	15,163	4207	40,059	23,493	**180,123**
2015	975	33,931	1208	40,809	12,259	2020	30,950	20,803	**142,956**
TOTAL	**16,528**	**328,085**	**5242**	**466,966**	**193,436**	**26,302**	**282,059**	**196,232**	**1,514,851**

*Total includes pre-2007 installations

SOLAR HOUSEHOLD AND COMMERCIAL SYSTEMS UP TO 100 kW (CONTINUED)

ANNUAL INSTALLED CAPACITY OF SOLAR PV (MW)[20]



INSTALLATION YEAR	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	NATIONAL
2007*	0.20	1.15	0.17	0.65	1.66	0.04	1.09	0.63	**5.57**
2008	0.48	4.12	0.42	4.08	4.84	0.23	2.84	2.89	**19.90**
2009	1.22	18.27	0.48	23.90	12.09	1.68	13.33	13.62	**84.60**
2010	5.25	146.08	1.36	90.27	33.01	6.03	57.82	45.25	**385.06**
2011	17.24	186.47	1.56	220.66	161.88	11.77	137.04	135.26	**871.88**
2012	5.05	138.36	2.10	409.27	136.59	40.24	202.72	104.42	**1038.75**
2013	10.83	127.72	4.82	262.11	140.06	62.61	128.03	71.34	**807.52**
2014	5.08	163.76	5.80	242.28	81.87	37.74	167.91	97.23	**801.66**
2015	5.70	178.99	8.51	198.33	67.08	9.50	148.34	95.54	**712.00**
TOTAL	**45.38**	**786.83**	**16.91**	**1253.85**	**574.54**	**160.37**	**711.90**	**470.92**	**4020.70**

*Total includes pre-2007 installations

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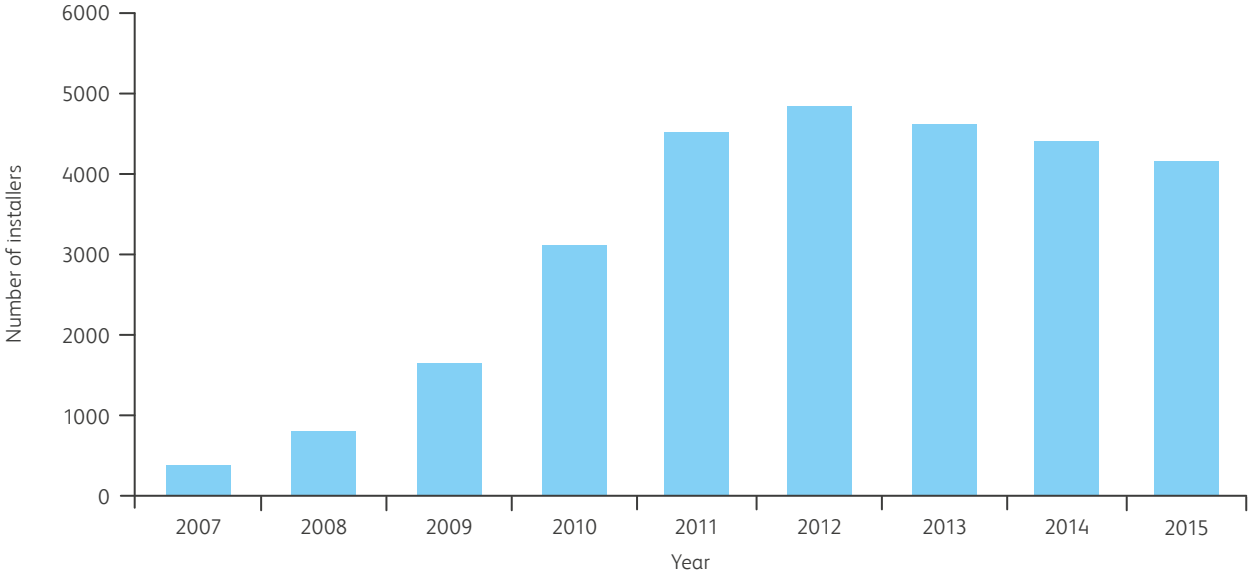
TOTAL NUMBER OF ACCREDITED INSTALLERS AND DESIGNERS



YEAR	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	TOTAL
2007	6	95	13	73	25	14	66	46	**338**
2008	11	192	11	143	57	24	245	95	**778**
2009	28	360	16	349	130	43	473	220	**1619**
2010	46	879	16	675	252	45	754	414	**3081**
2011	53	1034	22	1187	593	71	1004	531	**4495**
2012	48	948	28	1391	650	120	1122	514	**4821**
2013	44	894	41	1336	604	144	1093	439	**4595**
2014	44	908	47	1263	521	137	1075	401	**4396**
2015	44	916	51	1151	490	109	998	384	**4143**

SOLAR MEDIUM SCALE: SYSTEMS BETWEEN 100 kW AND 1 MW

Solar projects larger than 100 kW fall under the Large-scale Renewable Energy Target (LRET).

26
new medium-scale solar projects commissioned in 2015

753 kW
the output capacity of the largest plant commissioned

8164 kW
the combined output capacity of all plants commissioned in 2015

Solar power systems that fall into the category of medium-scale solar power are over the 100 kW threshold and under the 1 MW mark that identifies a large-scale solar project.

Medium-scale solar projects are typically located on commercial premises with large rooftops, at businesses which are interested in reducing their power bills. Commercial solar aligns neatly with the power use of business operations which use a lot of energy during daylight hours.

In 2015, 26 new projects in this size range were commissioned. The largest of these was the 753 kW system in Dandenong South in Melbourne at Vawdrey Australia, a business that manufactures truck and semi-trailer bodies. The smallest was a 104 kW system in Kensington for the University of New South Wales.

The combined generating power of the 26 new systems was 8164 kW, or a little over 8 MW.

SOLAR-POWERED SHADE FOR SHOPPERS

Several developments have used solar panels either to provide shade for their customers' vehicles over the last few years, or on top of a larger carpark complex.

The largest of these was on the roof of The Pines Elanora at the southern end of the Gold Coast at the end of 2015. The 636 kW array installed by SunEdison uses technology from SolarEdge and Canadian Solar, and is expected to provide about 20 per cent of the shopping centre's air-conditioning needs.

Solar is something most people don't associate with knights or suits of armour, but roadside tourist attraction The Macadamia Castle in northern New South Wales installed a solar car shade at the end of 2014. The facility consists of 180 panels and an electric vehicle charge station.

Alice Springs Airport created almost 100 new undercover car park spaces with a 325 kW solar power system on top of steel parking structures, as part of the second stage of the airport's solar farm. In December 2015 construction began on the third stage of the facility, which will add another 240 kW of solar power on the roof of the long-term car park.

Also under construction at the end of 2015 was a 1.17 MW solar power system on the roof of the short-term car park at Adelaide Airport. The airport installed its first solar panels in 2007.

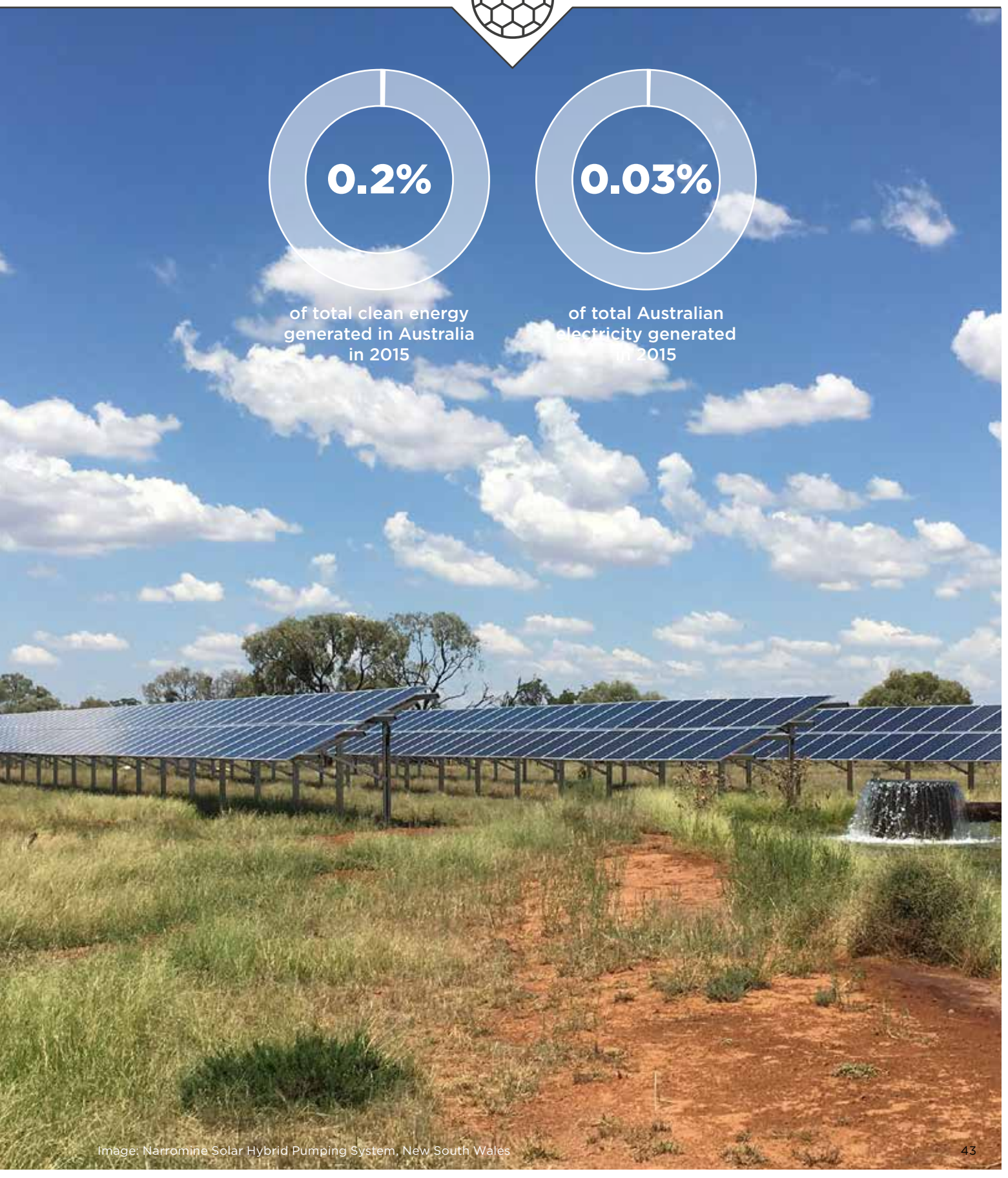


Image: Narromine Solar Hybrid Pumping System, New South Wales

SOLAR LARGE-SCALE: SYSTEMS LARGER THAN 1 MW

Eight new large-scale solar projects became operational in 2015, marking a breakthrough year for this extremely promising technology.

Eclipsing the field were the 102 MW Nyngan solar plant and the 53 MW Broken Hill plant, developed by AGL and First Solar in New South Wales. The combined 155 MW of generation capacity from the two power plants will provide enough electricity for the equivalent of about 50,000 Australian homes.

At the end of 2015, Australia had 19 operational solar projects larger than 1 MW in size, including 17 solar farms which use photovoltaic technology and two solar thermal plants – a total of 217 MW of potential generating power.

Another large project, the 56 MW Moree Solar Farm by FRV, was launched in early 2016.

The Australian Renewable Energy Agency (ARENA) announced a funding round in 2015 to encourage up to 200 MW of new large-scale solar projects. The intention is to drive down costs so that large-scale solar technology can begin to compete with more mature renewable energy technologies such as wind power.

A complementary $250 million funding program was launched by the Clean Energy Finance Corporation.

In January 2016, 22 finalists were selected from 77 applicants, seeking up to $30 million per project. Ten of these were in Queensland, eight in New South Wales, two in Victoria, and one each from Western Australia and South Australia.

19
operational solar projects larger than 1 MW in size

$250M
funding program for large-scale solar launched in 2015

77
applicants for funding for projects, seeking up to $30 million per project

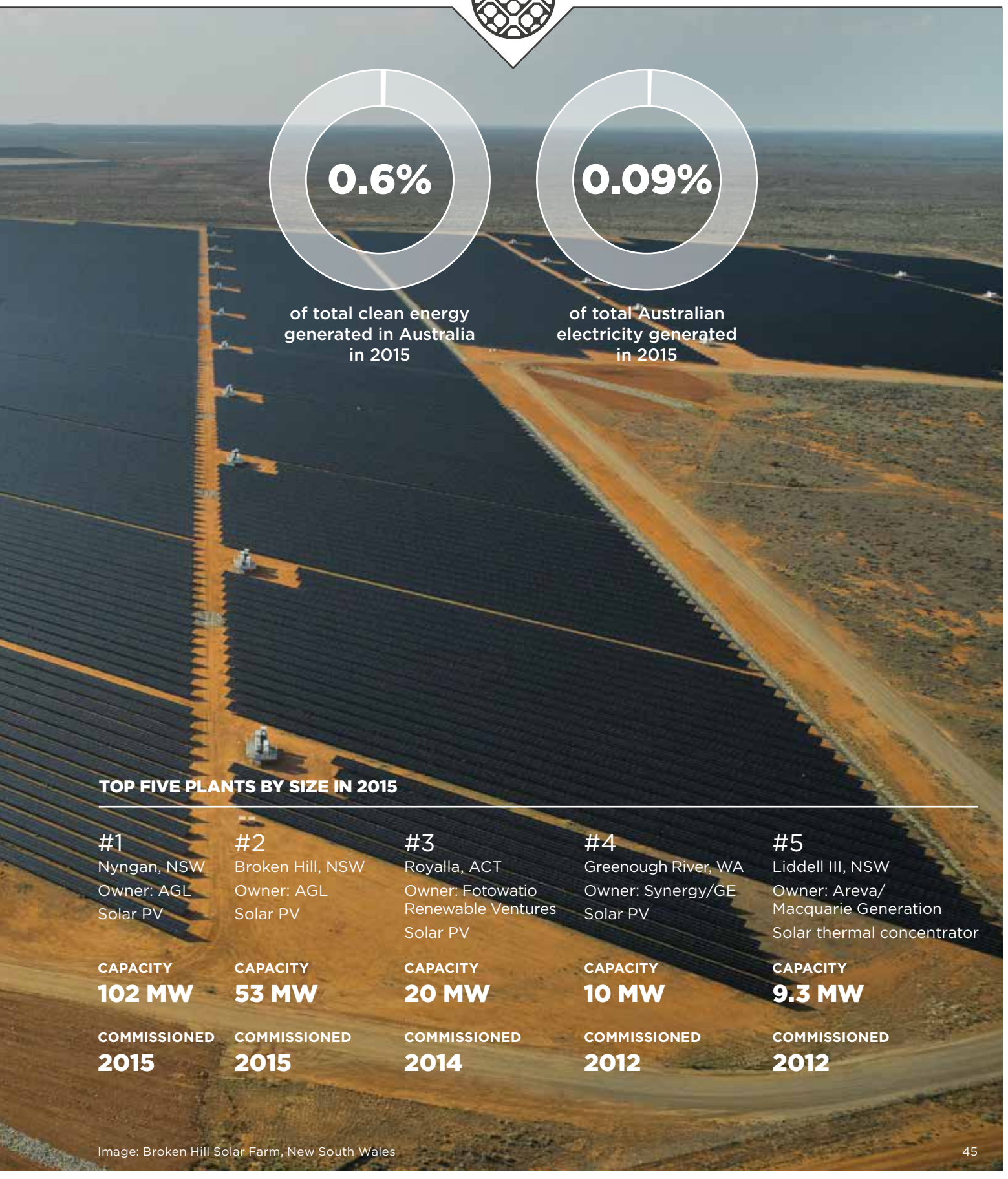
GOING LARGE WITH SOLAR IN 2015

The Nyngan and Broken Hill solar plants became operational in 2015, effectively doubling the amount of large-scale solar built in Australia at the time.

The projects were developed by AGL and First Solar using frames manufactured by IXL Solar, which formerly manufactured parts for the South Australian auto industry. About 400 jobs were created during construction, and a small number of permanent staff operate and maintain the facilities.

With 102 MW of generating power, the Nyngan solar plant easily passed the 20 MW Royalla solar plant near Canberra to become the largest in the country.

Only a small number of genuinely large-scale solar plants have been built in Australia, and the focus of these early projects was on clearing the various hurdles that come from doing things for the first time, then sharing these lessons with the rest of the industry. The projects were supported by the Australian Renewable Energy Agency (ARENA) and the New South Wales Government.



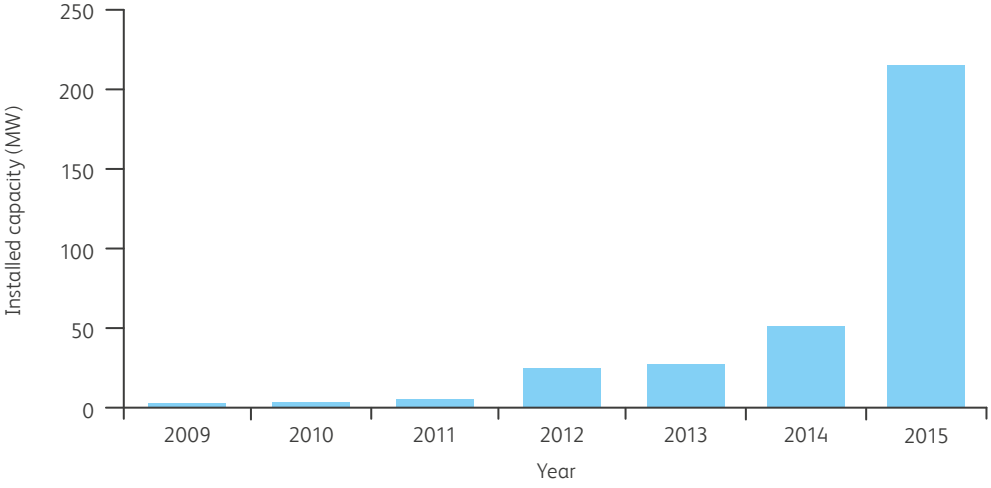
TOP FIVE PLANTS BY SIZE IN 2015

#1	#2	#3	#4	#5
Nyngan, NSW	Broken Hill, NSW	Royalla, ACT	Greenough River, WA	Liddell III, NSW
Owner: AGL	Owner: AGL	Owner: Fotowatio Renewable Ventures	Owner: Synergy/GE	Owner: Areva/ Macquarie Generation
Solar PV	Solar PV	Solar PV	Solar PV	Solar thermal concentrator
CAPACITY	**CAPACITY**	**CAPACITY**	**CAPACITY**	**CAPACITY**
102 MW	**53 MW**	**20 MW**	**10 MW**	**9.3 MW**
COMMISSIONED	**COMMISSIONED**	**COMMISSIONED**	**COMMISSIONED**	**COMMISSIONED**
2015	**2015**	**2014**	**2012**	**2012**

Image: Broken Hill Solar Farm, New South Wales

SOLAR LARGE-SCALE: SYSTEMS LARGER THAN 1 MW (CONTINUED)

CUMULATIVE INSTALLED CAPACITY (MW)



YEAR	CAPACITY (MW)
2009	4
2010	4
2011	6
2012	26
2013	29
2014	53
2015	216

LARGE-SCALE SOLAR PLANTS COMMISSIONED IN 2015

TECHNOLOGY	LOCATION	OWNER	STATE	INSTALLED CAPACITY (MW)
Solar PV	Nyngan	AGL	NSW	102
Solar PV	Broken Hill	AGL	NSW	53
Solar PV	Uterne 2	Epuron	NT	3.1
Solar PV	Weipa Stage 1	First Solar	QLD	1.7
Solar PV	Casuarina Shopping Centre	SunEdison	NT	1.2
Solar PV	Shellharbour Shopping Centre	Canadian Solar, Todae Solar, Stockland	NSW	1.2
Solar PV	Brisbane Markets	Brisbane Markets Limited, Todae Solar	QLD	1.1
Solar PV	Canberra	IKEA	ACT	1

LARGE-SCALE SOLAR PLANTS UNDER CONSTRUCTION AT END 2015

TECHNOLOGY	LOCATION	OWNER	STATE	INSTALLED CAPACITY (MW)
Solar PV	Moree Solar Farm	Fotowatio Renewable Ventures and Pacific Hydro	NSW	56
Solar PV	Barcaldine	Elecnor	QLD	25
Solar PV	De Grussa Mine	Sandfire Resources NL	WA	10
Solar PV	Yulara	Epuron	NT	1.8
Solar Thermal	Kogan Creek	CS Energy	QLD	44
Solar PV	Adelaide Airport	Solgen Energy	SA	1.2

Image: Stockland Shellharbour project, New South Wales

SOLAR WATER HEATING

Approximately 47,000 solar water heating systems were installed during 2015, taking the total installed across the country to more than 958,000.

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 insulated 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.

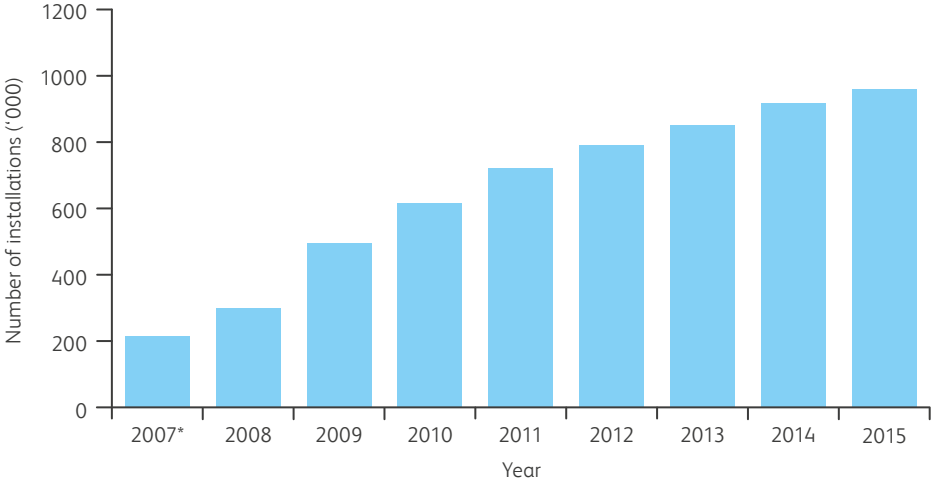
Solar water heating has continued to lose market share to solar power since the industry peaked in 2009, when Federal Government rebates helped to increase sales. Sales in 2015 were no exception, falling about 20 per cent down on the year before.

Based on these figures it was the worst year for the sector since before 2007. Sales declined in all regions of the country, as the sheer volume of solar power systems being produced by the manufacturing powerhouses of China and Europe drove down costs and made it difficult for solar hot water to compete.

The largest drops in installations were in the Northern Territory and Tasmania (installations fell 31 per cent in each). South Australia and the ACT had the smallest decline in sales (SA 3 per cent and ACT 4 per cent).

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

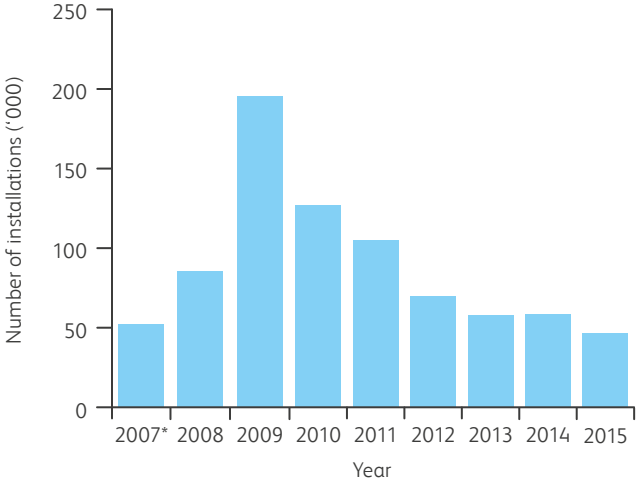
CUMULATIVE SOLAR WATER HEATER INSTALLATIONS IN AUSTRALIA[21]



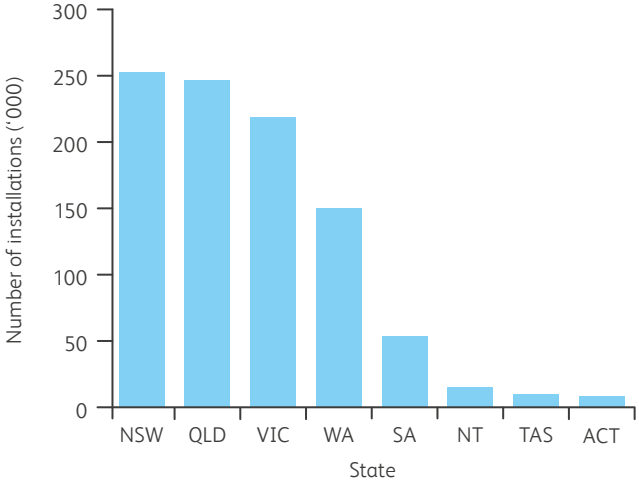
YEAR	CUMULATIVE INSTALLATIONS
2007*	212,423
2008	297,808
2009	492,503
2010	619,596
2011	724,646
2012	794,112
2013	852,411
2014	911,115
2015	958,081

21 Solar water heating data for graphs in this section provided by SunWiz, February 2016

ANNUAL INSTALLATIONS OF SOLAR WATER HEATERS



TOTAL INSTALLED SOLAR HOT WATER HEATERS BY STATE



ANNUAL INSTALLATIONS OF SOLAR WATER HEATERS

INSTALLATION YEAR	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	NATIONAL
2007*	453	8765	1414	16,830	2869	350	9157	11,139	**50,977**
2008	1001	20,203	1236	23,330	5103	906	21,208	12,398	**85,385**
2009	1974	85,456	1731	36,659	8794	2269	42,120	15,692	**194,695**
2010	960	38,525	1303	34,262	6812	1433	27,733	16,065	**127,093**
2011	1038	25,331	1267	30,937	5444	1725	26,446	12,862	**105,050**
2012	734	10,810	1171	18,973	3473	899	21,594	11,812	**69,466**
2013	453	9145	884	13,410	2983	827	19,608	10,989	**58,299**
2014	451	9631	1026	13,432	1930	961	20,601	10,672	**58,704**
2015	435	7049	707	10,263	1868	666	16,893	9085	**46,966**

*includes pre-2007 totals

WIND POWER

Wind power is the lowest-cost renewable energy that can be rolled out on a large scale and is widely expected to be the major contributor to Australia's Renewable Energy Target (RET).

Five wind farms became operational in 2015, adding 196 turbines and 380 MW of generating capacity. These additional projects took the Australian wind industry to a total of 76 wind farms with a combined capacity of 4187 MW, made up of 2062 turbines. These wind projects place Australia 16th in the world for installed wind capacity, according to the Global Wind Energy Council.[22]

South Australia continues to lead the nation with the most wind energy and 34 per cent of the state's generation came from the wind in 2015.

From a policy perspective, the uncertainty created by the review of the RET by the Federal Government's expert panel took the wind out of the industry's sails. But with bipartisan support restored to the policy in mid-2015 and a change of Prime Minister helping to deliver some much-needed investment confidence, Australia's wind sector is primed and ready for several extremely busy years.

As stability returns to the RET and interest ramps up from domestic and international investors, companies have worked behind the scenes to secure modifications to existing development approvals so they are prepared when activity picks up.

The biggest challenge for the wind sector has been securing agreements with energy retailers to purchase the electricity that proposed wind farms will produce. AGL announced the Powering Australian Renewables Fund early in 2016, which is designed to unlock up to $3 billion in investment, complete with power purchase agreements. However, most industry pundits do not expect the initiative to spur additional investment until early 2017.

Looming shortages of renewable energy certificates, and the requirement for retailers to meet their obligations under the RET or face penalty payments, provide hope to the industry that 2016 will be a big year.

In the meantime, additional incentives have been provided by state and territory governments to help overcome the lingering uncertainty of the RET review. The ACT Government's reverse auction scheme has generated considerable interest across the industry, and the three successful projects from the first round – Hornsdale, Ararat and Coonooer Bridge – were under construction as 2015 drew to a close.

The 100 MW second stage of the Hornsdale Wind Farm and the 100 MW Sapphire Wind Farm have been announced as the successful projects in the ACT auction's second round of funding.

A Wind Commissioner has been appointed by the Federal Government to assist with community complaints, along with a scientific committee which includes acoustic specialists, a sleep physician and a neuroscientist.

22 Global Wind Energy Council, *Global Wind Report 2015*, April 2015, page 11

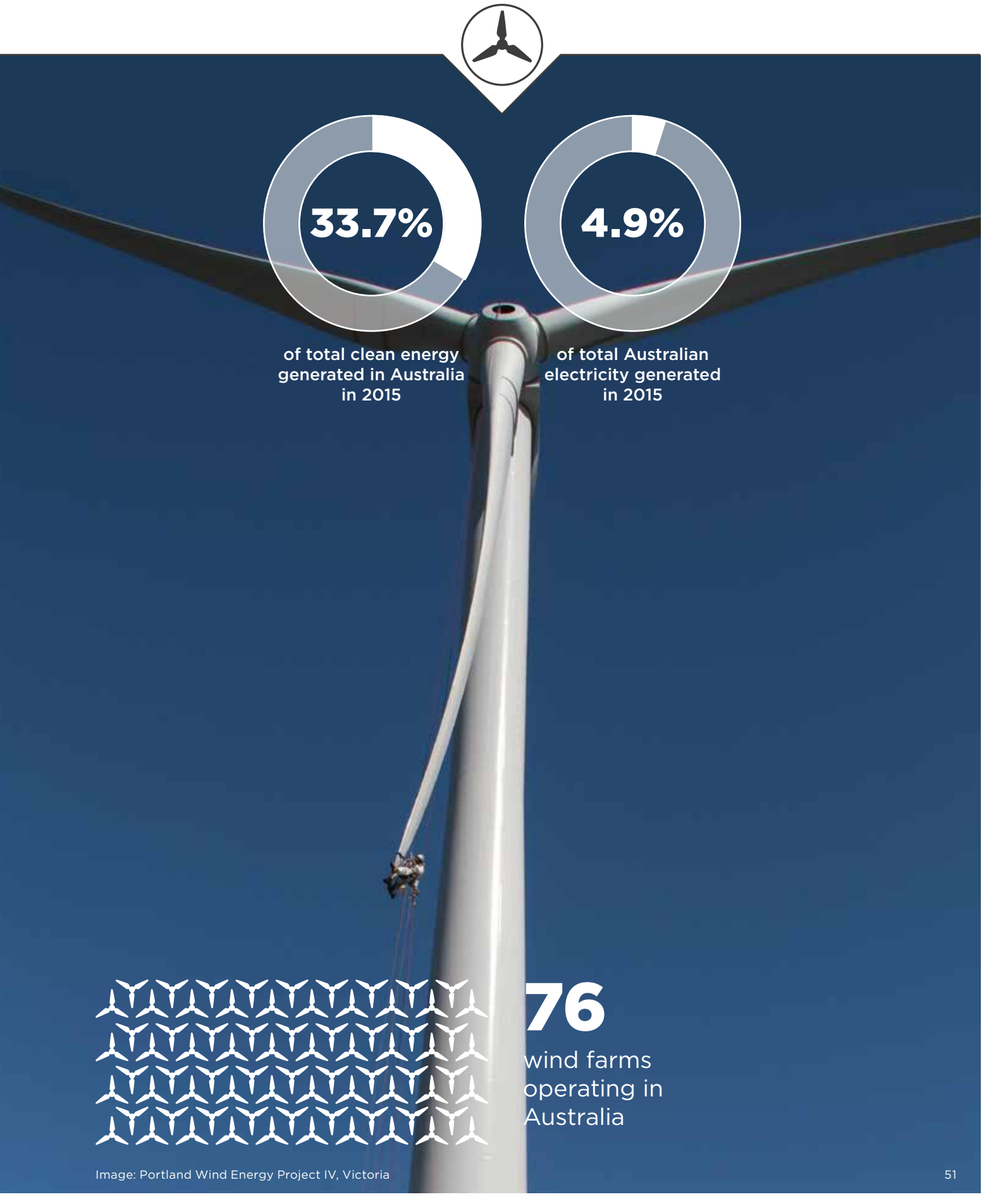


Image: Portland Wind Energy Project IV, Victoria

WIND POWER (CONTINUED)

WINDLAB PROJECT MANAGER MATTHEW PARTON GETS ENERGISED ABOUT THE COMPANY'S COONOOER BRIDGE WIND FARM.

Why is Coonooer Bridge different to other wind projects?
Windlab made a commitment to alleviate the concerns of project neighbours by engaging fully and openly with neighbours, acknowledging and addressing their concerns and allowing them to participate in important project decisions. This ultimately resulted in neighbours being offered direct financial benefit in the project through part ownership.

What were the benefits for the community of the approach you took to planning the wind farm?
The community was made fully aware of the project's details from its outset and developed a sense of ownership for the project: intellectually, emotionally and financially. The financial benefit for neighbours has taken the form of shared ownership, with project neighbours being given shares in the project company. These shares mean that, when the wind farm is operating, project neighbours will receive dividends in proportion with all other project investors.

Windlab took 18 months to negotiate a fair and acceptable distribution of shares among project neighbours, with significant input coming from the neighbours themselves.

What advice would you give to other wind companies?
Take the time to meet regularly with the local community and find a way to help nearby neighbours see a direct benefit for themselves. There is no silver bullet solution for how this benefit should be given but it needs to be transparent, perceived as being fair, and include input from the community.

Is there anything you would do differently next time you develop a wind farm?
Make an extra effort to make sure no one falls through the cracks. Sometimes people are waiting for you to make first contact and the earlier you make it, the better the chance you have of explaining the benefits of the project and making them a supporter.

Windlab developed the Coonooner Bridge Wind Farm and won the 2015 Clean Energy Council Community Engagement Award for its best practice community engagement strategy.

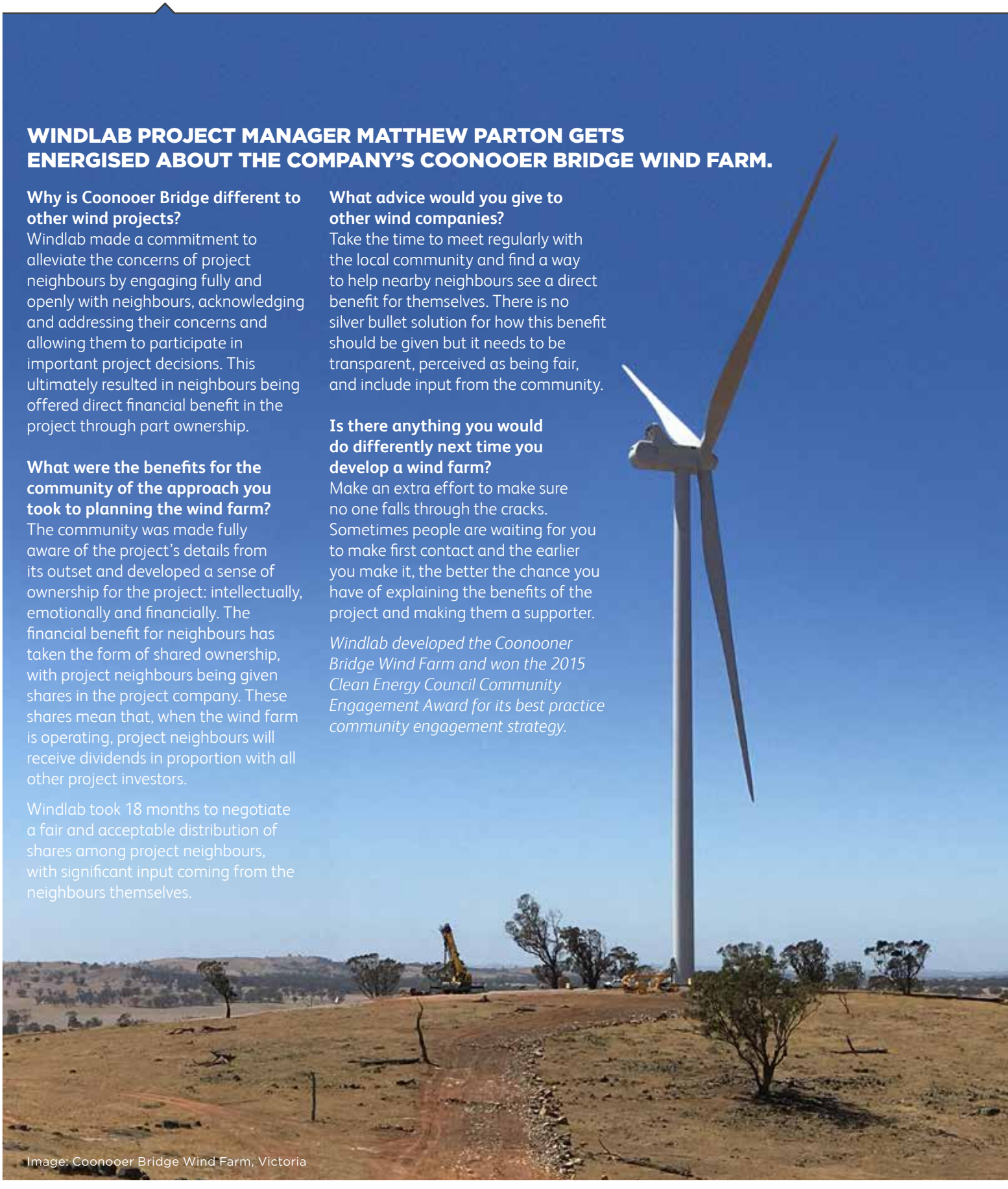


Image: Coonooer Bridge Wind Farm, Victoria

WIND FARMS COMMISSIONED IN 2015

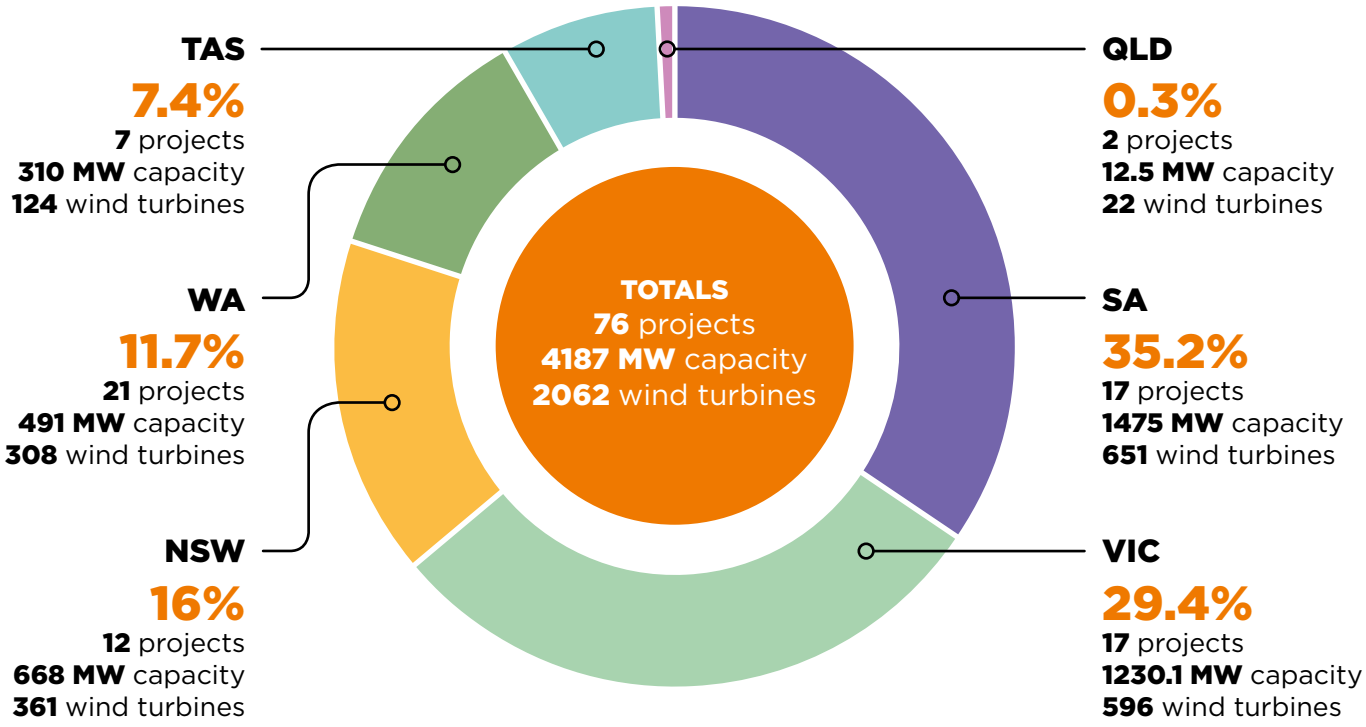
OWNER	LOCATION	STATE	CAPACITY (MW)
Banco Santander and BlueNRGY	Taralga	NSW	106.8
Pacific Hydro	Portland Stage 4 (Cape Nelson North and Cape Sir William Grant)	VIC	47.2
Mitsui & Co Ltd	Bald Hills	VIC	106.6
Electricity Generating Public Company (EGCO)	Boco Rock	NSW	113
Future Energy	Chepstowe	VIC	6

WIND FARMS UNDER CONSTRUCTION AT END 2015

OWNER	LOCATION	STATE	EXPECTED COMMISSION YEAR	CAPACITY (MW)
RES Australia	Ararat	VIC	2017	240
Neoen	Hornsdale Stage 1	SA	2017	105.6
Windlab	Coonooer Bridge	VIC	2016	19.8

WIND POWER (CONTINUED)

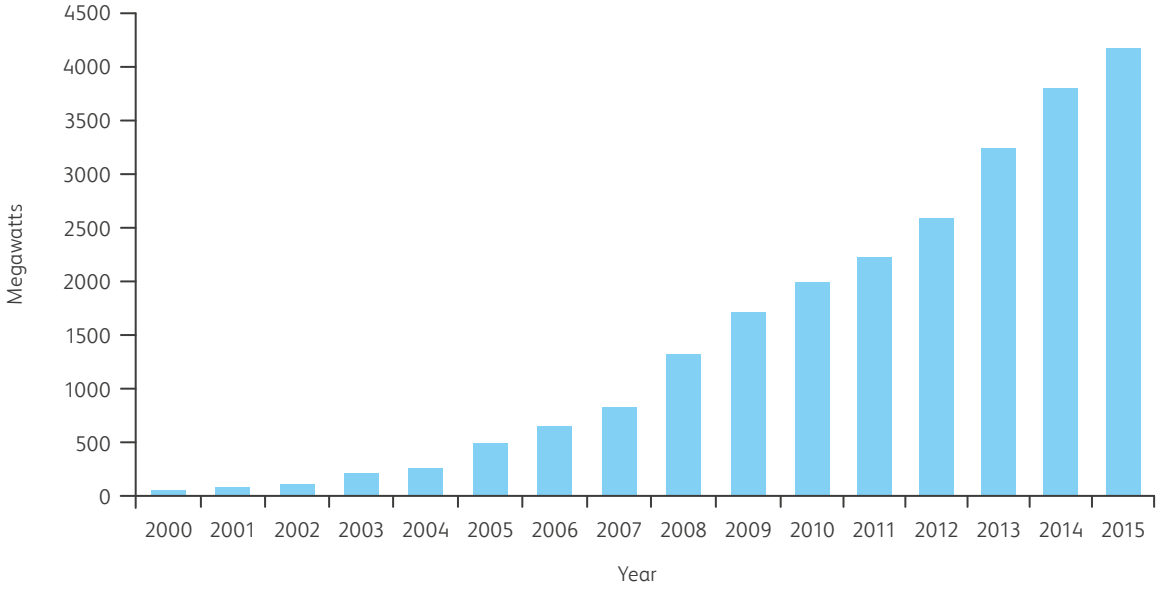
PERCENTAGE OF WIND CAPACITY BY STATE



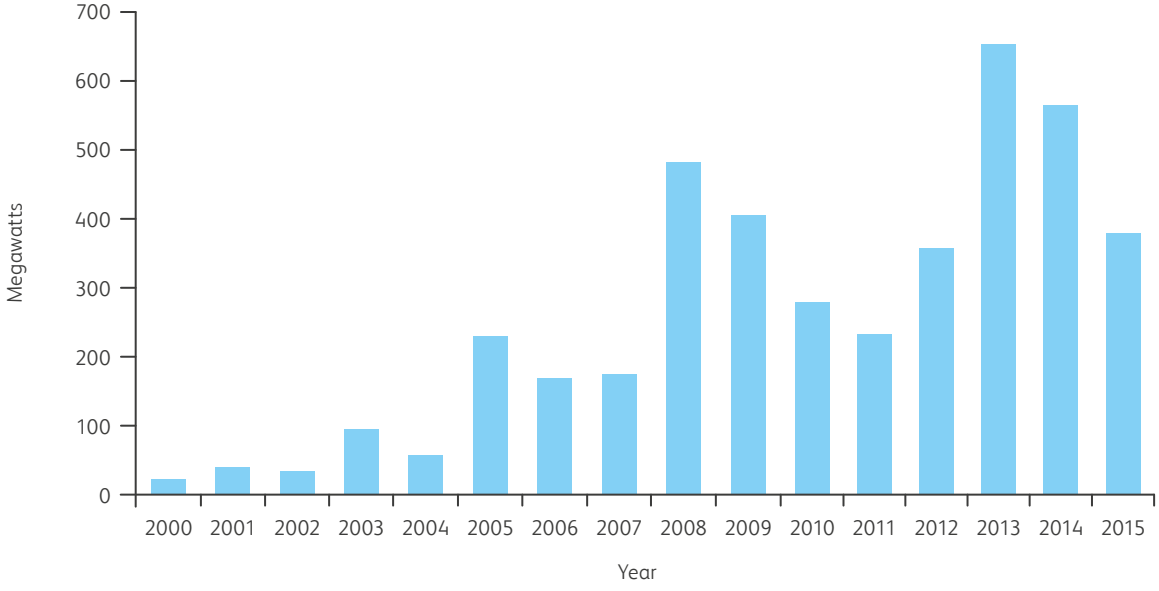
TOP FIVE PLANTS BY SIZE

#1	#2	#3	#4	#5
Macarthur, VIC	Snowtown 2, SA	Collgar, WA	Waubra, VIC	Musselroe, TAS
Owner: AGL	Owner: Trustpower	Owner: UBS IIF/ REST	Owner: Acciona Energy	Owner: Woolnorth Wind Farm Holdings
CAPACITY	**CAPACITY**	**CAPACITY**	**CAPACITY**	**CAPACITY**
420 MW	**270 MW**	**206 MW**	**192 MW**	**168 MW**
COMMISSIONED	**COMMISSIONED**	**COMMISSIONED**	**COMMISSIONED**	**COMMISSIONED**
2013	**2014**	**2012**	**2009**	**2013**

CUMULATIVE INSTALLED WIND CAPACITY IN AUSTRALIA

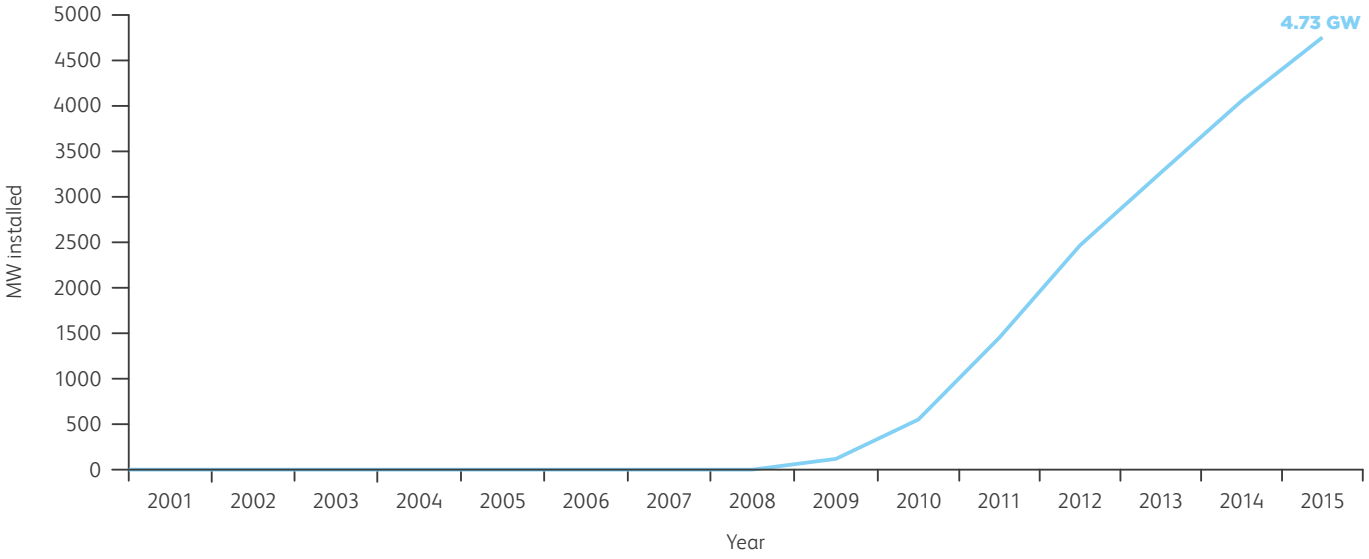


ANNUAL INSTALLED WIND CAPACITY IN AUSTRALIA



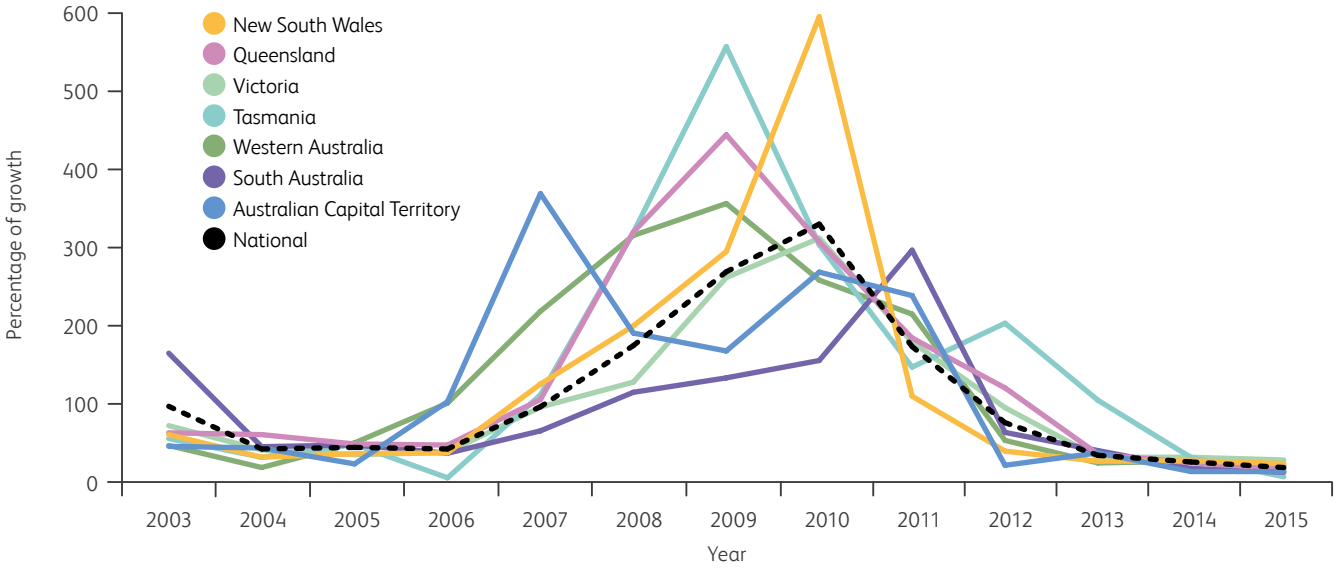
APPENDICES

CUMULATIVE INSTALLED CAPACITY OF SOLAR PV IN AUSTRALIA (MW)

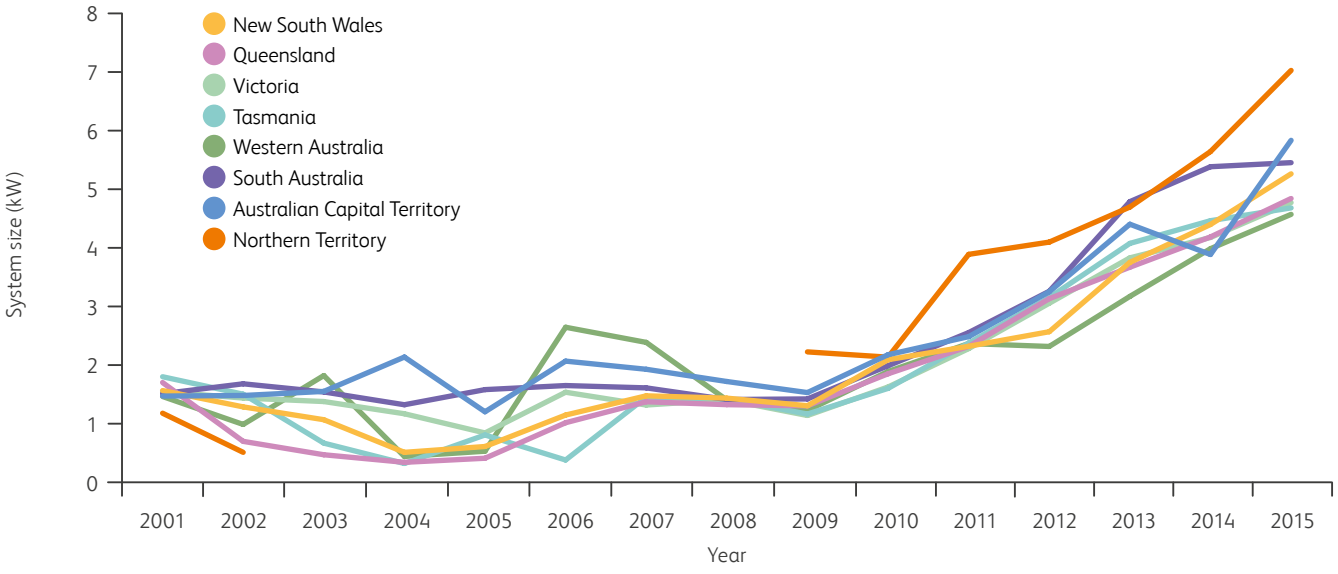


INSTALLATION YEAR	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	NATIONAL
2001	7	62	7	61	126	2	113	34	**412**
2002	10	236	11	110	330	11	255	55	**1018**
2003	15	378	21	178	876	17	439	81	**2004**
2004	21	495	38	285	1269	22	616	95	**2841**
2005	26	671	98	422	1865	32	827	142	**4082**
2006	53	917	202	619	2542	34	1133	285	**5784**
2007	249	2063	368	1271	4200	72	2219	910	**11,350**
2008	725	6185	791	5353	9036	301	5062	3798	**31,249**
2009	1944	24,454	1269	29,257	21,125	1981	18,396	17,421	**115,845**
2010	7192	170,530	2626	119,530	54,135	8011	76,216	62,666	**500,904**
2011	24,432	356,996	4186	340,191	216,014	19,783	213,256	197,926	**1,372,782**
2012	29,481	495,351	6289	749,465	352,604	60,023	415,971	302,346	**2,411,528**
2013	40,306	623,073	11,111	1,011,576	492,666	122,628	543,997	373,689	**3,219,044**
2014	45,383	786,834	16,906	1,253,855	574,539	160,367	711,903	470,919	**4,020,704**
2015	51,087	965,825	25,420	1,452,188	641,624	169,866	860,238	566,457	**4,732,704**
TOTAL	**51,087**	**965,825**	**25,420**	**1,452,188**	**641,624**	**169,866**	**860,238**	**566,457**	**4,732,704**

GROWTH RATES OF SOLAR PV CAPACITY BY STATE SINCE 2003



AVERAGE SOLAR PV SYSTEM SIZE BY INSTALLATION YEAR



Note. Missing data is a result of changing methodologies over time. The data shown is the most accurate possible.

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Image: Capital Wind Farm, New South Wales

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