Australian Government
Clean Energy Regulator

RENEWABLE ENERGY TARGET

TRACKING TOWARDS 2020:

Encouraging renewable energy in Australia

2016

Letter of transmittal

The Hon Josh Frydenberg MP
Minister for the Environment and Energy
Parliament House
CANBERRA ACT 2600

Dear Minister

I am pleased to submit *Tracking towards 2020: Encouraging renewable energy in Australia*, the 2016 administrative report of the Renewable Energy Target.

The report is submitted for presentation to the Parliament in accordance with section 105 of the *Renewable Energy (Electricity) Act 2000*.

It covers the operations of the *Renewable Energy (Electricity) Act 2000* for the 2016 calendar year and includes the annual statement and supporting information about progress towards meeting the 2020 Large-scale Renewable Energy Target.

Yours sincerely

Chloe Munro

Chair, Clean Energy Regulator
30 March 2017

Contents

Chair's review

2016 was a memorable year for the Renewable Energy Target and for the renewables sector more generally. While the role of renewables in the energy mix was never far from the headlines, investment in both small and large-scale renewable installations continued. Both ended the year strongly, with a noticeable uplift in commercial and industrial scale solar, and increased confidence in the large-scale target.

The context for this report

The purpose of the annual administrative report is to account for the performance of the two schemes that make up the Renewable Energy Target and to explain how it is administered in accordance with legislation.

Like all policy instruments, the Renewable Energy Target operates in a context. External factors such as financial market conditions affect the investment decisions of scheme participants. New business models and new technologies, notably battery storage, also create opportunities and occasionally new challenges for the administration of the schemes. This year we have taken a fresh approach to the format of this report to explain the influence of these trends. In particular, as a backdrop to our data, we have included some commentary from a range of players in the sector.

On the other side of the coin, investments incentivised by the scheme, while meeting the objectives of the *Renewable Energy (Electricity) Act 2000*, occur in the wider context of the electricity market. In 2016, more starkly than in any previous year, questions came to the fore about integration of renewables into the grid, and the alignment of energy and emissions reduction policies. Discussion also commenced about policy options to meet Australia's 2030 emissions reduction target, including incentives for renewables beyond the 2020 Renewable Energy Target.

These weighty questions are beyond the scope of this report. While these matters are debated and analysed, it is especially critical that all parties have access to the facts. In that sense, this report and other data published periodically by the Clean Energy Regulator have added significance.

Investment trends

The Small-scale Renewable Energy Scheme continued the trends observed since 2013 of a gradual decline in numbers of installations coupled with a rise in average system size. This rise reflects strong growth in commercial-sized solar panel systems of between 10 and 100 kilowatt capacity. Overall installation rates were particularly strong in the last quarter of the year, perhaps stimulated by the knowledge that the deeming period would drop from 15 to 14 years from 1 January 2017.

While Australia has the highest penetration of rooftop solar of any country in the world[1], the market does not yet appear to have reached saturation. Our postcode data show continued demand for small-scale solar panel systems and solar water heaters in regional and outer metropolitan households and developers frequently include solar as a standard option in new build. New financing models such as solar leasing and the Clean Energy Finance Corporation's Community Housing Program will make rooftop solar accessible to new segments of the community.

By the middle of 2016, we were still concerned that, despite a strong pipeline of potential projects, investment in the Large-scale Renewable Energy Target had not fully recovered from the uncertainty of 2014 and 2015. We commissioned Ernst & Young (EY) to examine market constraints and assess opportunities to secure finance for large-scale renewable energy projects. EY's report, *Meeting the Renewable Energy Target: Innovative approaches to financing renewables in Australia*, highlighted that Australia had returned to the top 10 most attractive countries in the world to invest in renewables. There were grounds for optimism that the pace of investment would pick up.

Looking back on the last few months of 2016, and with knowledge of announcements in early 2017, it is clear this optimism was justified. As discussed in the annual statement, new build worth over $4 billion according to Bloomberg New Energy Finance[2] was committed in 2016, more than in any single previous year. Major institutions have backed new vehicles for funding renewables, retailers have signed up to new power purchase agreements and costs continue to fall, particularly for utility scale solar.

Regulatory challenges

2016 was also a year in which the Clean Energy Regulator faced some new tests in the application of our legislation. Changes in technology, changes in market conditions, and the emergence of business models not anticipated in the drafting of the *Renewable Energy (Electricity) Act 2000* and regulations all presented challenges. In addition, some provisions in the legislation that had not previously been applied came into force for the first time.

To give one example, our decision on the application of the liability provisions to a particular power station was referred to the Administrative Appeals Tribunal. The matter hinged on the statutory interpretation of some technical terms that had not previously been a matter of contention. The Tribunal affirmed our decision while commenting 'we doubt the policy makers or the drafters foresaw the circumstances that emerged in this matter'.

1 International Energy Agency, Renewable Energy Medium-Term Market Report 2016.

2 Bloomberg New Energy Finance, Clean Energy Investment End of Year 2016, January 2017.

Market conditions gave rise to another unprecedented test for our application of the legislation. For their own reasons, two major retailers decided to pay the shortfall charge rather than surrender sufficient large-scale generation certificates to cover their full liability.

Anticipating tightening supply and rising certificate prices, we had expressed a clear position on compliance in our 2015 report and through extensive engagement with liable entities (electricity retailers) in the lead up to the surrender date of 14 February 2017. Attention now turns to the application, for the first time, of the make-good provision. Commonly known as the 'three-year rule', this allows entities to surrender the missing certificates and apply for the shortfall charges to be repaid in certain circumstances.

Looking forward

With only a short runway left to achieve the 2020 target, 2017 will be a critically important year for investment under the scheme. Our judgement remains that the target is achievable. We will monitor developments closely throughout the year and plan to introduce new data products to assist transparency regarding liquidity in the certificate market.

2017 will also be a critically important year to set the scene for the 2020–2030 period and beyond. The public spotlight will again be on the role of renewables in a wider policy context, with the final report of the National Electricity Market Security Review[3] due in mid-2017 and the Government's review of climate change policies expected to be complete by the end of the year. We have a role in assisting the Department of Environment and Energy with data and operational expertise where relevant to both these reviews.

These reviews will be profoundly significant for the future of renewables in Australia. It is possible the tenor of public discussion around these reviews may unsettle investor confidence before any policy decisions are made. However, that was not the experience of 2016, and on balance we consider investors are more likely to remain positive.

This is my final report as Chair of the Clean Energy Regulator as my five-year term comes to an end. During that period above baseline renewable generation has increased by 44 per cent. Over 1.2 million households benefitted from the small-scale renewable energy scheme. The industry has matured and technology has moved ahead by leaps and bounds. It has been a fascinating and rewarding period to play a part in Australia's transition to a lower emissions economy.

I wish the new Chair every success in leading this institution through the next phase of development.

Chloe Munro
Chair
Clean Energy Regulator

3 The Independent Review into the Future Security of the National Electricity Market, chaired by the Chief Scientist, Dr Alan Finkel AO.

SIGNIFICANT OUTCOMES 2016

2x

More than double the number of new large-scale renewable energy power stations were accredited in 2016 than in 2015

494 MW

The total capacity of new large-scale renewable energy power stations accredited was **494 megawatts** compared to 300 megawatts in 2015

A total of **2069** megawatts of committed and probable projects were announced

17.3 million large-scale generation certificates validated

5x

The committed and probable capacity was **five times** more than in 2015

19.7 million

19.7 million Large-scale generation certificates and **16.7 million** small-scale technology certificates were surrendered to meet obligations

98 New large-scale renewable energy power stations were accredited, **86 were solar energy**

182 173
small-scale systems were installed by households and businesses

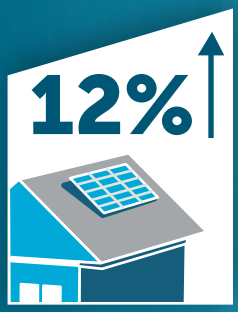
16.1
million small-scale technology certificates were validated

94%
compliance with certificate surrender obligations

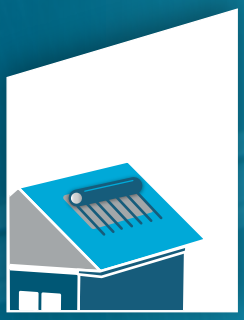
Small-scale systems can now generate or displace a total of **10 million** megawatt hours of electricity

There are now more than **2.6 million** small-scale systems in Australia

The average capacity of a small-scale solar panel system **increased 12%** in the past year

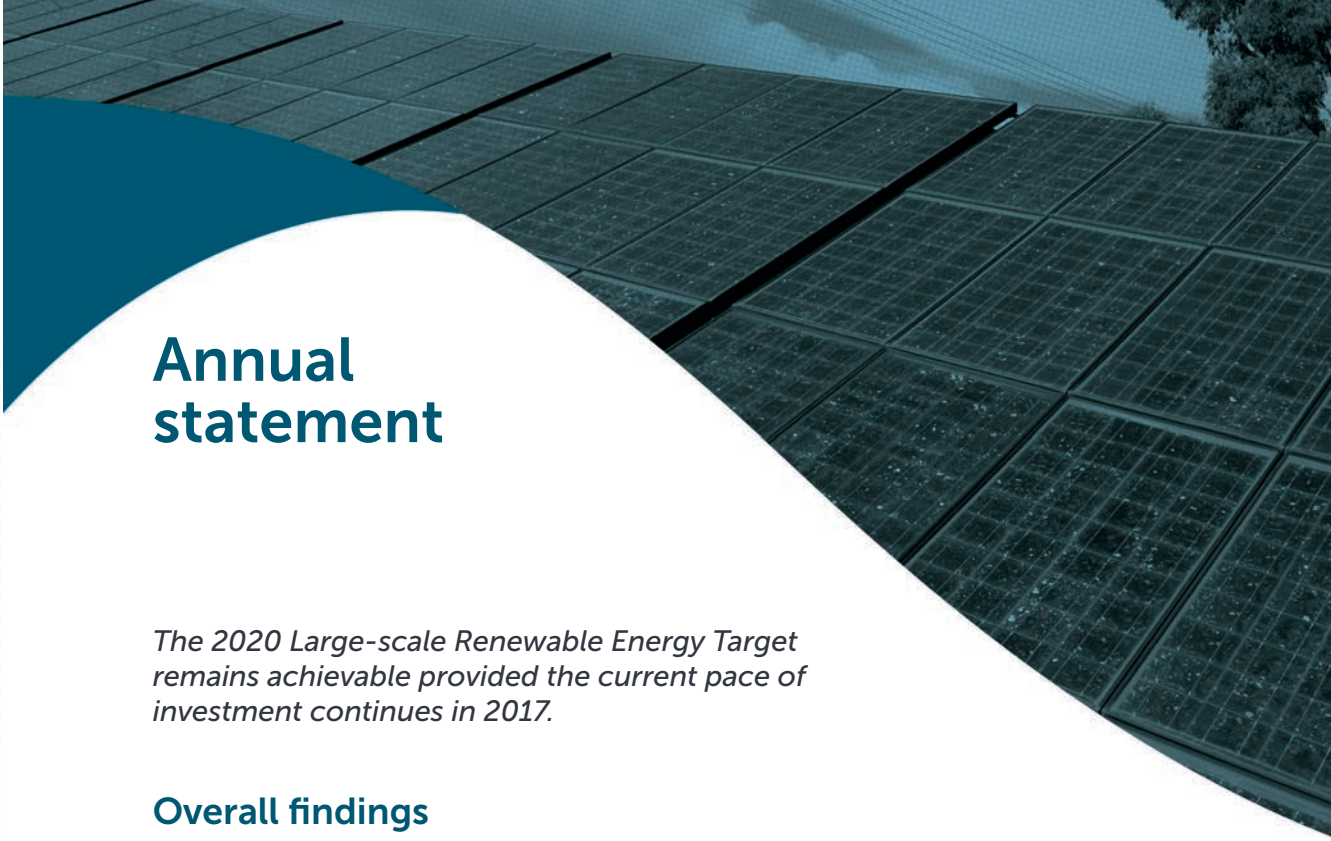


More than **one million** solar water heaters and air source heat pumps have been installed across Australia



‘From an Asia-Pacific perspective, Australia is certainly going to lead the way in renewable energy deals, driven by the 2020 renewable energy target.’

MATT RENNIE, EY



Annual statement

The 2020 Large-scale Renewable Energy Target remains achievable provided the current pace of investment continues in 2017.

Overall findings

Progress was better at the end of the year than at the start, with good momentum continuing into early 2017. The risk that future supply of certificates might fall below total demand diminished in the course of the year. However, supply and demand will be tightly balanced in the 2018 compliance year.

For the 2020 target to be reached, we estimate around 3000 megawatts will need to be committed in 2017 and a further 1000 megawatts in 2018.

The portion of household electricity bills attributable to the Large-scale Renewable Energy Target increased marginally in 2016.

2016 results

Capacity

In the 2015 annual statement we said that for progress to be satisfactory, the total capacity of committed new build in 2016 would need to be around 3000 megawatts. This level was not reached. Nevertheless, more new large-scale renewable power generation was financed during 2016 than in any other previous year[4].

The available information indicates that 1350 megawatts of new large-scale renewable power stations was committed[5] in 2016, with another 719 megawatts sufficiently advanced to count as probable[6]. Together, these projects represent around one-third of the new capacity required to deliver the 2020 target, and nearly a five-fold increase on the 409 megawatts capacity committed or probable in 2015.

4 Based on analysis of Clean Energy Australia reports 2012–2015.

5 & 6 See glossary for definition

The majority of new commitments were announced in the later part of 2016. The target remains achievable provided the pace of investment keeps up with this momentum in 2017.

The impact of the slow start of new commitments is offset to some extent by two positive factors. Our 2015 assessment anticipated that 230 megawatts of new capacity would be accredited in 2016. In fact, we accredited large-scale renewable energy power stations with a combined capacity of 494 megawatts.

In addition, we found a higher than anticipated proportion of proposed projects are solar power stations. Solar projects typically have faster construction times so the lag between final investment decision and commissioning is shorter. This means that generation can begin sooner and large-scale generation certificates are available to the market earlier.

Certificate prices

The slow start in 2016 will result in a tightening of certificate supply in the market in the short term. Certificates from new power stations will come on stream more slowly than the rise in demand from electricity retailers, resulting in a further decline in certificate surplus.

The spot price for large-scale generation certificates reflects the market's view that supply is getting tighter. It reinforces that additional build is needed. The spot price was $86.75 at the end of 2016. While significantly higher than the $72 at the end of 2015, it remained below the $93 tax-effective cost of the shortfall charge.

Liability

Following the February 2017 deadline for acquitting 2016 Large-scale Renewable Energy Target liability, a surplus of approximately 13.4 million large-scale generation certificates remained in REC Registry accounts. This highlights that more than sufficient certificates were available to cover the surrender obligations of the entire market.

Nevertheless, in 2016 the compliance rate fell to just over 89 per cent of the liability compared with over 99 per cent in 2015.

For commercial reasons, two large electricity retailers chose not to surrender sufficient certificates to cover their full obligation and instead paid the shortfall charge. Entities in shortfall can make good their position and apply for a refund by surrendering the missing number of certificates at a later date[7]. ERM Power[8] and Alinta Energy[9] have demonstrated their commitment to the Renewable Energy Target by indicating they will be taking steps to support new renewable build in the future.

Our position remains that payment of the shortfall charge does not fulfil the purpose of the *Renewable Energy (Electricity) Act 2000*.

7 Refer to Section 97 of the *Renewable Energy (Electricity) Act 2000*.

8 ERM Power announces renewables offtake agreements, www.ermpower.com.au/erm-power-announces-renewables-offtake-agreements/, 23 February 2017.

9 Alinta Energy's Commitment to Renewable Energy, https://alintaenergy.com.au/nsw/about-us/news/alinta-energy%e2%80%99s-commitment-to-renewable-energy, 21 February 2017.

Household electricity prices

According to the Australian Energy Market Commission[10] the Large-scale Renewable Energy Target accounted for an estimated 2.8 per cent (or an average $9.38 per quarter) of the average household electricity bill in 2016. This is an increase of $2.25 per quarter from 2015. This increase is in line with the trajectory towards the 2020 target and takes into account the Australian Energy Market Commission's estimate of the effect of 2016 certificate prices.

Looking forward

For satisfactory progress towards the 2020 target, we consider that 3000 megawatts will need to be committed in 2017, in addition to the 2069 megawatts that was committed or probable in 2016. A further 1000 megawatts will be needed in 2018. The earlier this capacity is built, the more certificates that will be available to electricity retailers to meet their obligations in future years.

Settled policy for the 2020 target has contributed to an improved investment environment, and the pipeline of potential projects remains in excess of the level required to meet the target. The large-scale generation certificate spot price may remain relatively high until sufficient committed projects are announced to give the market confidence in an adequate supply of certificates through to 2020.

The total holdings of surplus certificates will continue to fall, although supply should be adequate for 2017. Supply and demand for certificates is likely to be tightly balanced for the 2018 compliance year. However, the recent series of new project announcements leads us to consider that the market is most likely to remain in surplus overall. There is time for sufficient build to come on for the operating surplus to return to adequate levels for 2019 and 2020 compliance years.

The actual surplus will depend on variables including the profile of new commitments, actual electricity demand, the amount of voluntary surrender[11], and the level of generation from accredited power stations, specifically hydro (which can vary significantly depending on rainfall).

It is in the hands of electricity retailers to mitigate their risk of shortfall by making prudent commercial arrangements to cover their future obligations. This will have the benefit of bringing forward new build towards the 2020 target and should also moderate certificate prices.

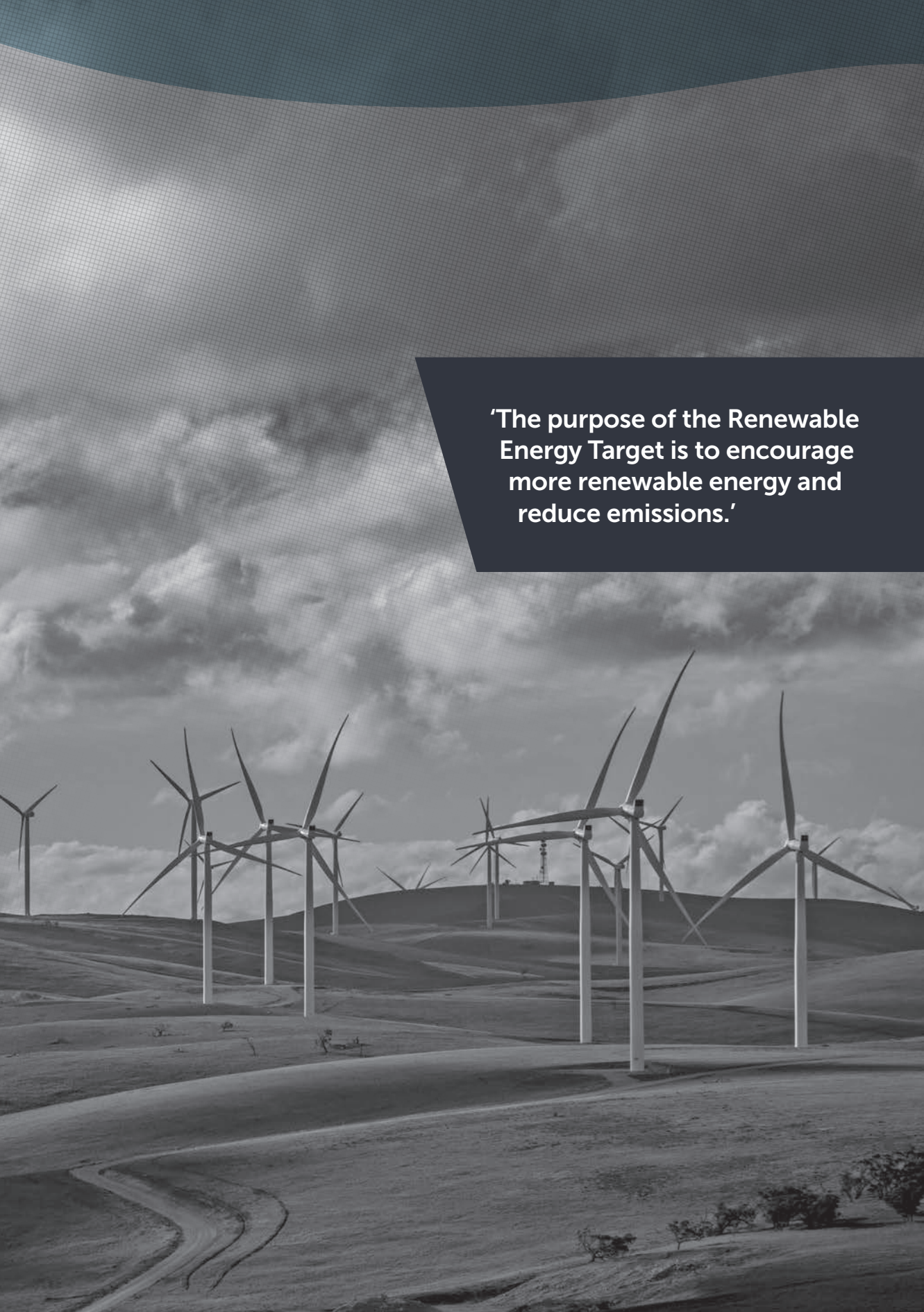
In our assessment, there is still time for the necessary new capacity to be built to provide the required supply of large-scale generation certificates through to 2020 and beyond.

This year ended strongly with major players in the market—investors, financiers, developers and retailers—expressing positive intentions, notwithstanding the ongoing public debate about the role of renewables in the electricity market and the post-2020 climate policy environment. If this investment momentum continues into 2017, the 2020 Renewable Energy Target can be achieved.

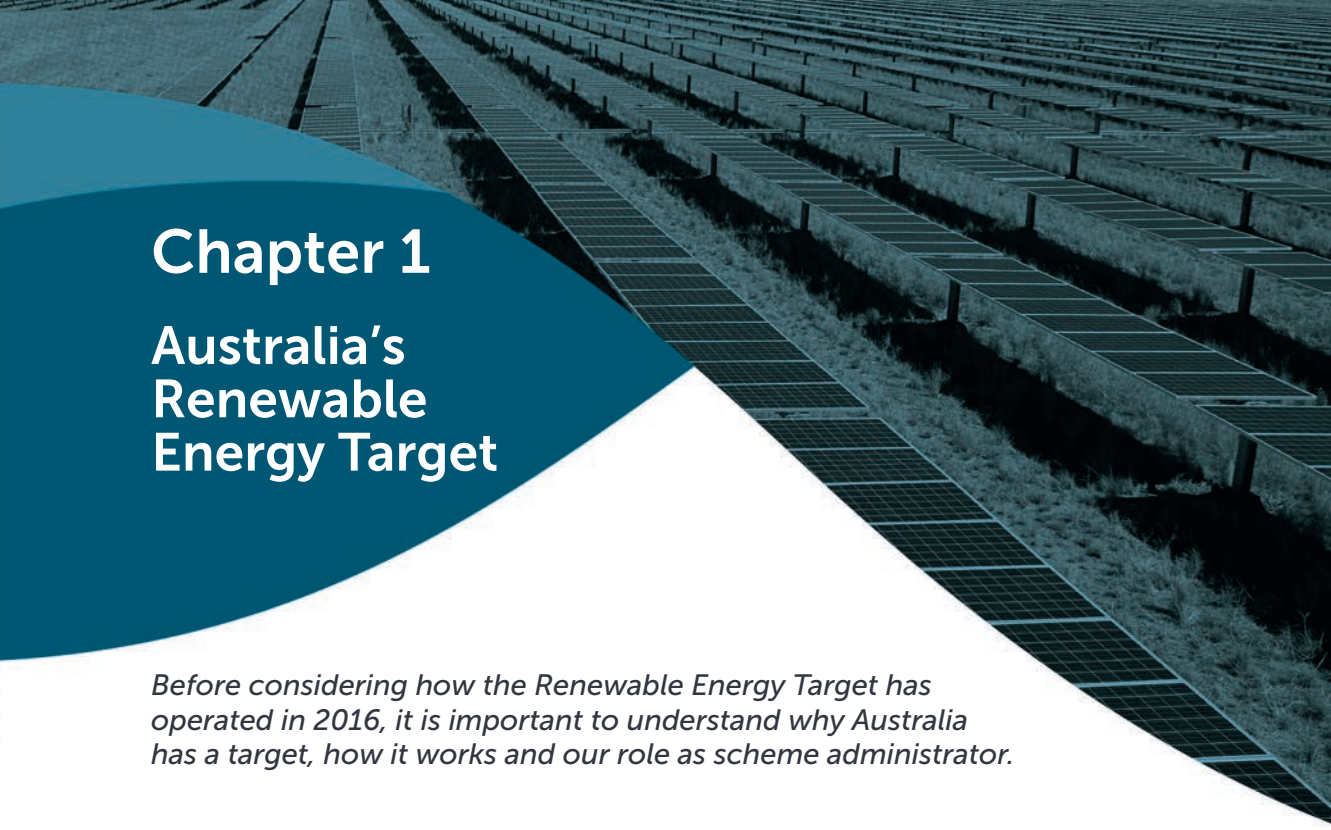
We provide more detailed analysis of our assessment of progress towards the target, including the indicators we use to make this assessment, in *Chapter 3. Progress towards 2020* on page 45.

10 Australian Energy Market Commission Report, 2016 Residential Electricity Price Trends. Estimates for 2016 price impacts are an average of the 2015–16 and 2016–17 financial year estimates.

11 Voluntary surrenders are currently associated with GreenPower and some desalination plants. The Australian Capital Territory government's 100% Renewable Energy Target proposes that all large-scale generation certificates will be transferred from generators to the Territory and voluntarily surrendered to the Clean Energy Regulator. However, no surrenders have been made to date.



'The purpose of the Renewable Energy Target is to encourage more renewable energy and reduce emissions.'



Chapter 1

Australia's Renewable Energy Target

Before considering how the Renewable Energy Target has operated in 2016, it is important to understand why Australia has a target, how it works and our role as scheme administrator.

A way to reduce emissions from the electricity sector

About one-third of Australia's greenhouse gas emissions are a result of using electricity to power homes and businesses[12].

Almost 83 per cent of Australia's electricity comes from burning coal and gas[13]. The rest comes from other sources, including renewables such as wind, hydroelectric (hydro) and solar. Australia has used clean sources of energy for many decades, particularly hydro.

The Renewable Energy Target was introduced in 2001 as an incentive to further increase the amount of electricity generated from ecologically sustainable renewable sources (renewable source electricity). It is one of a number of policies that contribute to Australia's emissions reduction target.

The Large-scale Renewable Energy Target is to generate an additional 33 000 gigawatt hours of electricity from renewable sources in 2020, compared with 1997 levels[14]. This will be enough to power around five million houses per year[15].

In 2011, the single scheme was split into two: the Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme. This creates stronger incentives for large-scale renewable energy, while still providing support for householders and businesses to install small-scale systems.

12 Electricity generation emissions projections 2016, Department of the Environment and Energy.

13 Generation capacity and output by fuel source data, Australian Energy Regulator, www.aer.gov.au/wholesale-markets/wholesale-statistics/generation-capacity-and-output-by-fuel-source [as at 8 March 2017].

14 The existing generation of renewable source electricity in 1997 is referred to as 'baseline'.

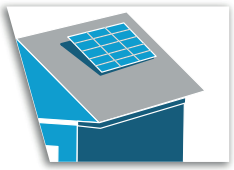
15 Based on average household electricity consumption. Source: *Household Energy Consumption Survey: Summary of Results* 2012, Australian Bureau of Statistics.

The Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme are set in law, through the *Renewable Energy (Electricity) Act 2000* (see *Appendix B: Relevant Legislation* on page 69).

The objectives of the *Renewable Energy (Electricity) Act 2000* are to encourage additional generation of electricity from renewable sources, reduce emissions of greenhouse gases from the electricity sector and ensure that renewable energy sources are ecologically sustainable.

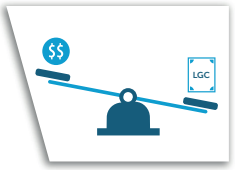
How it works at a glance

The Renewable Energy Target is an Australian Government scheme to **increase the amount of electricity generated from sustainable, renewable sources and reduce emissions of greenhouse gases**.



The **Small-scale Renewable Energy Scheme** creates incentives for households and businesses to install small-scale systems.

The **Large-scale Renewable Energy Target** is for an additional 33 000 gigawatt hours to be generated from renewable sources in 2020.

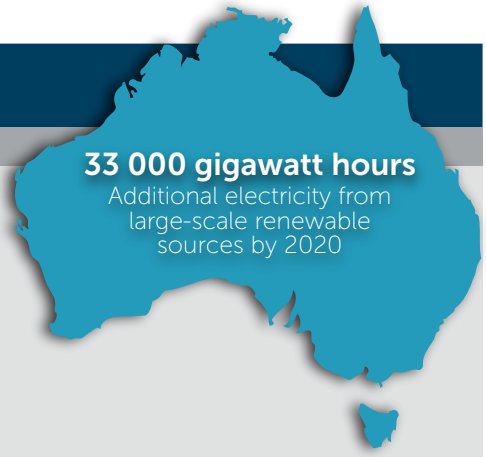


It works by creating a **market for renewable energy certificates**, which drives investment in the renewable energy sector.

On the **supply** side of the market, participants create certificates for each megawatt hour of renewable source electricity generated or displaced (no longer required from the grid).

On the **demand** side, electricity retailers source these certificates to meet their renewable energy obligations.

Renewable Energy Target



Renewable Energy (Electricity) Act 2000

Clean Energy Regulator

SUPPLY

Homes and small businesses (small-scale)

Agent

REC Registry

Small-scale technology certificates

Large-scale generation certificates

Power stations (large-scale)

DEMAND

%

Small-scale technology percentage

Liable entities

exemption certificates

%

Renewable power percentage

Emissions intensive trade-exposed activities

How the Renewable Energy Target works

Australia generates renewable energy at both a large and small scale. The Renewable Energy Target is an Australian Government scheme that provides a financial incentive for companies, households and businesses to invest in both.

Companies are encouraged to invest in new large-scale renewable energy power stations—including solar farms, wind farms, hydro or waste power stations—through the Large-scale Renewable Energy Target. This scheme delivers the renewable electricity needed to meet the target of an additional 33 000 gigawatt hours generated from renewable energy sources in 2020.

Households and businesses are encouraged to install small-scale systems—including solar panel systems, solar water heaters, small-scale wind or hydro systems, and air source heat pumps[16]—through the Small-scale Renewable Energy Scheme. This scheme delivers additional electricity from renewable energy sources or displaces electricity (this is electricity that is no longer required from the grid).

SPOTLIGHT...
What is a watt?

Electricity is often measured in watts and watt hours.

A **watt** is a unit of power. Power is the rate at which energy is produced or consumed at a point in time.

A **watt hour** is a unit of energy, used to measure the amount of electricity generated or consumed over a specified time. For example, one watt hour is the amount of electricity generated or consumed during one hour.

When reporting on the Small-scale Renewable Energy Scheme, we generally use kilowatts and kilowatt hours. One **kilowatt** is 1000 watts and one **kilowatt hour** is 1000 watt hours. For example, a three kilowatt household solar panel system, operating under optimum conditions for one hour, should produce three kilowatt hours of electricity.

When reporting on the Large-scale Renewable Energy Target, we generally use megawatts and megawatt hours. One **megawatt** is 1000 kilowatts and one **megawatt hour** is 1000 kilowatt hours. For example, a three megawatt large-scale renewable energy power station, such as a landfill gas power station, operating at full capacity for one hour will produce three megawatt hours of electricity.

The Renewable Energy Target for 2020 is expressed as 33 000 **gigawatt hours**, which is 33 million megawatt hours.

In both the small and large-scale schemes, you can obtain one certificate for every megawatt hour of generation or displacement.

16 See glossary for definitions.

A market for renewable energy certificates

The Renewable Energy Target provides an incentive for additional generation of electricity from renewable sources through the creation of tradable renewable energy certificates.

Each certificate represents a megawatt hour of renewable source electricity generated or a megawatt hour of electricity displaced.

Creating demand

Under the large-scale scheme, large wholesale purchasers of electricity must source certificates to meet their renewable energy obligations. These are known as 'liable entities' and are mainly electricity retailers[17]. They are responsible for driving demand in the market for renewable energy certificates.

The number of certificates each electricity retailer needs to source and then surrender each year is in proportion to the amount of electricity they acquire to use or sell.

One option is to enter into a power purchase agreement with a renewable energy power station, where an electricity retailer secures a future supply of certificates from a large-scale renewable energy power station for a set period of time. See *Spotlight...Power purchase agreements* on page 19 for more information.

This can also assist in providing the necessary financing for such large-scale projects. Electricity retailers can also directly invest in developing large-scale renewable energy power stations, to generate certificates to meet their obligations under the scheme.

In this way, electricity retailers support more electricity coming from renewable sources, and play an integral part in achieving the 2020 Renewable Energy Target.

2016 FAST FACT

About **50 per cent** of certificates surrendered come from Australia's three biggest retailers.

17 See glossary for definition.

SPOTLIGHT...
Extra demand for renewable energy certificates

Most demand for large-scale generation certificates comes from electricity retailers meeting their Renewable Energy Target obligations. However, demand for certificates also comes from other sources.

For example, some facilities that consume a significant amount of electricity are required to source and surrender large-scale generation certificates to partially offset their consumption with renewable energy. An example is desalination plant operators, who surrender certificates to meet state requirements to offset the emissions from their electricity consumption.

Some retailers and organisations also voluntarily surrender certificates, in particular for GreenPower, a state and territory accredited program that enables electricity providers to purchase certificates on behalf of households or businesses.

Certificates accepted for voluntary surrender are permanently removed from the market and cannot be transferred to another party or used to acquit a mandatory surrender liability under the *Renewable Energy (Electricity) Act 2000*.

This creates additional demand from organisations sourcing large-scale generation certificates from the same market as electricity retailers.

As a result, to meet the full demand from the market and still achieve the target, there must be more than 33 000 gigawatt hours of renewable source electricity generated in 2020. Depending on total demand, this could be as high as 37 000 gigawatt hours.

Encouraging supply

The Renewable Energy Target encourages investment in large-scale renewable energy power stations and small-scale systems, which supply the certificates needed to meet demand.

Large-scale supply

One of the functions of the Clean Energy Regulator is to accredit large-scale renewable energy power stations. A power station may be eligible for accreditation under the Large-scale Renewable Energy Target if it meets all the eligibility requirements outlined in the *Renewable Energy (Electricity) Act 2000*. This includes ensuring that:

- some, or all of the electricity the power station generates is from an eligible renewable energy source, and
- the power station complies with all Commonwealth, state, territory and local government planning and approval laws.

Accredited large-scale renewable energy power stations can create large-scale generation certificates for each megawatt hour of renewable source electricity they generate above their 1997 baseline. Power stations with baselines typically include those using hydro, bagasse and landfill gas as their eligible renewable energy sources.

These certificates can be sold to electricity retailers who need them to comply with their obligations under the scheme.

SPOTLIGHT...
Power purchase agreements

A power purchase agreement is typically a contract between an electricity retailer and the developer of a large-scale renewable energy power station, to source the electricity or large-scale generation certificates created by that power station.

Parties can sign a power purchase agreement before the power station is built, as a way to underpin and secure financial backing for the project, or at a later stage.

Contracted large-scale generation certificate prices are generally much lower than the current spot price. Recent public statements suggest that some 'bundled' prices for both electricity and certificates ranged from $65 to $85 per megawatt hour, while the spot price of certificates alone finished 2016 at $86.75.

Small-scale supply

Individuals and businesses who have installed eligible small-scale systems, such as solar panel systems, can create small-scale technology certificates.

To be eligible, small-scale systems[18] must:

- use approved components where relevant, such as the Clean Energy Council list of approved components for solar panel systems or the components listed in the register of solar hot water heaters
- meet Australian and New Zealand standards
- for solar panel systems, use a Clean Energy Council accredited designer and installer, and meet the Clean Energy Council design and install guidelines
- comply with all local, state, territory and federal requirements, including electrical safety
- be classified as a small generation or displacement unit (for example, wind, hydro, solar panels/ solar water heaters or air source heat pumps), and
- not exceed the capacity limits for a small-scale system.

18 For more details about small-scale system eligibility, see www.cleanenergyregulator.gov.au.

Small-scale technology certificates are created upfront for small-scale systems based on location, size, installation date and the deeming period (see page 42).

Individuals and businesses can create and trade their own certificates. However, most assign their right to do so to registered agents in return for a discount on the system they are installing.

Administering the scheme

Our role as Clean Energy Regulator is to administer the scheme. This includes providing the supporting structure for the Renewable Energy Target, making recommendations on renewable energy certificate requirements, providing the secure system for registering and trading certificates, validating renewable energy certificates, reporting to the public and Parliament, engaging with market participants and undertaking education and compliance activities to help ensure the efficiency and integrity of the market.

Setting the certificate surrender requirement

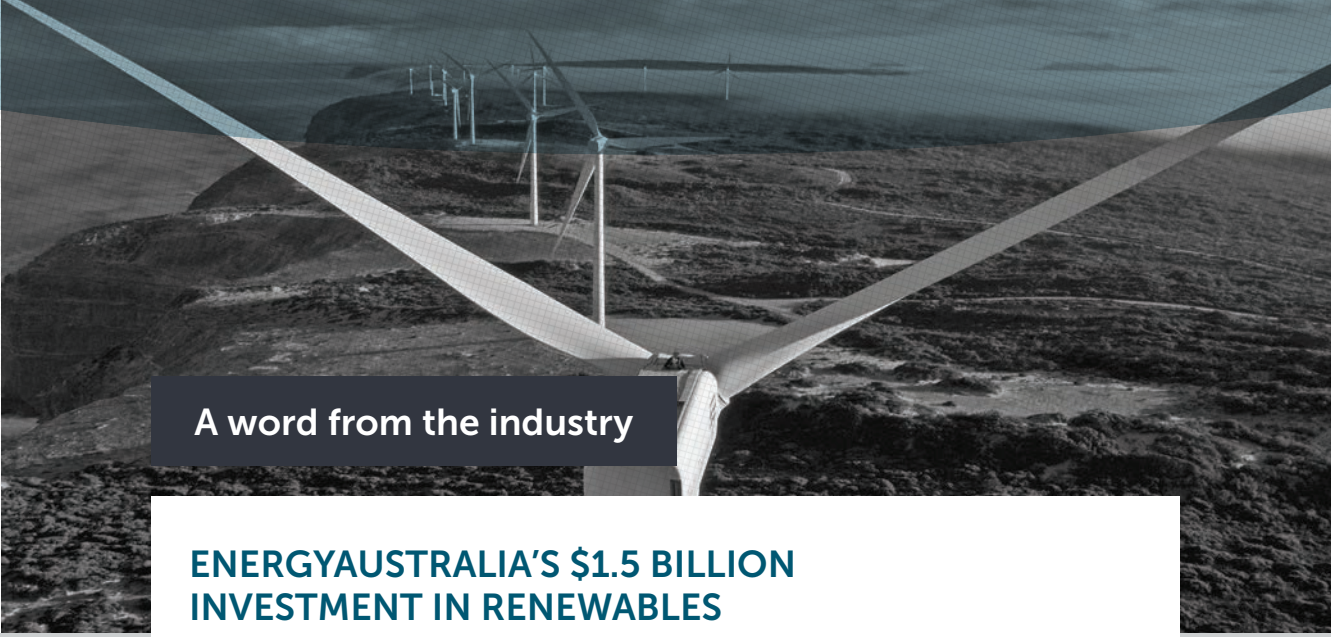
The amount of certificates that electricity retailers need to surrender is determined each year by the renewable power percentage (for large-scale generation certificates) and the small-scale technology percentage (for small-scale technology certificates). The percentages are set in regulation under the *Renewable Energy (Electricity) Act 2000* each year[19].

See *Spotlight...Setting market demand for renewable energy certificates* on page 22 for more information.

2016 FAST FACT

The renewable power percentage for 2016 was **12.75 per cent** and for 2017 is **14.22 per cent.** The small-scale technology percentage for 2016 was **9.68 per cent** and for 2017 is **7.01 per cent**.

19 For details about how the renewable power percentage and the small-scale technology percentage are calculated, see www.cleanenergyregulator.gov.au.



A word from the industry

ENERGYAUSTRALIA'S $1.5 BILLION INVESTMENT IN RENEWABLES

In December 2016, EnergyAustralia announced a $1.5 billion commitment to buy around 500 megawatts of power from new wind and solar energy projects in eastern Australia.

Managing Director Catherine Tanna said the program would provide support for the renewable energy developments to get built.

'These projects will come to underpin energy supply in Australia as coal-fired power plants are retired, so customers can continue to enjoy reliable, affordable energy,' said Ms Tanna.

The company has wasted no time making good on its commitment. Since the $1.5 billion program was announced, EnergyAustralia has signed 13-year power purchase agreements for:

- all the electricity from First Solar's 48.5 megawatt capacity Manildra solar farm in regional New South Wales.
- 80 per cent of the output from the Ross River Solar Farm, a 142 megawatt development in Queensland jointly owned by Palisade Investment Partners and ESCO Pacific
- all the electricity from what will be Victoria's first large-scale solar project, the 60 megawatt Gannawarra Solar Farm, developed by Edify Energy, and
- 60 per cent of the renewable energy generated from the 113 megawatt capacity Bodangora wind farm in New South Wales, being developed by Infigen Energy.

EnergyAustralia has now secured power purchase agreements for 285 megawatts of renewable energy in less than three months of the program, more than half way to its goal of 500 megawatts.

'As an owner of coal-fired power stations, EnergyAustralia has a responsibility to provide leadership on the best, most cost-effective means of reducing emissions and addressing climate change,' said Ms Tanna.

'For us, that means broadening Australia's energy mix by finding and supporting quality renewable projects on behalf of our customers,' she said.

EnergyAustralia's negotiations with other solar and wind projects are well advanced, with the full 500 megawatts expected to be committed within the next year.

EnergyAustralia provided this content.

Photo: EnergyAustralia has a 50% interest in the Cathedral Rocks wind farm in South Australia.

SPOTLIGHT...
Setting market demand for renewable energy certificates

An annual Large-scale Renewable Energy Target is set under the *Renewable Energy (Electricity) Act 2000* rising to 33 000 gigawatt hours in 2020. This creates demand for certificates in the large-scale scheme each year to 2030. In the Small-scale Renewable Energy Scheme, the goal is to keep demand in equilibrium with supply.

Each year we engage consultants to forecast several estimates for the future year. These include the total electricity to be consumed and total exemptions for emissions-intensive trade-exposed entities. Based on their reports, we estimate the target for the year.

Each electricity retailer is responsible for a proportion of the large and small-scale targets.

The targets are converted into percentages based on the total amount of electricity that is expected to be acquired in the coming year. Electricity retailers use the percentages to determine their liability.

The percentages calculated are:

- the renewable power percentage for the large-scale scheme, and
- the small-scale technology percentage for the small-scale scheme.

The Minister for the Environment and Energy sets these percentages in regulation each year before 31 March of the calendar year. Electricity retailers then apply this percentage to the amount of electricity they actually acquire from the grid to determine the number of certificates they are required to surrender to us to meet their obligations.

As we use estimates, the percentages must be adjusted each year. The adjustments account for the difference between the estimated values used to set the percentages in previous years and the final figures, once known in future years. Hence, rolling adjustments each year are required.

Providing the secure system for trading certificates

The secure system, known as the REC Registry, enables the renewable energy certificate market to operate. Market participants use the REC Registry for all certificate transactions including creating and transferring certificates to another party and surrendering certificates to meet their obligations.

As a tradeable commodity, renewable energy certificates attract a price on the secondary market. Financial institutions, brokers, traders, registered agents and electricity retailers are involved in buying and selling certificates in this market.

Small-scale system owners and registered agents also have the option to sell small-scale technology certificates through the Clearing House, which is accessible via the REC Registry, at a fixed price of $40 (excluding GST).

We provide the REC Registry as the framework for transferring and banking renewable energy certificates, but do not facilitate or regulate market trading in any other way. This includes large-scale generation certificate prices, which are market-driven, and reflect factors such as supply and demand.

SPOTLIGHT...
The Clearing House for small-scale technology certificates

Market participants can buy and sell small-scale technology certificates through the secondary market or the small-scale technology certificate Clearing House.

In 2016, electricity retailers needed to surrender 16 691 555 small-scale technology certificates to meet their obligations. 16 111 973 small-scale technology certificates were validated in 2016, which meant demand outweighed supply. This resulted in regular use of the Clearing House, which allows electricity retailers to source the small-scale technology certificates at a fixed price of $40 (GST exclusive).

When the Clearing House goes into deficit, we create 'Regulator created small-scale technology certificates'. Buyers can purchase, trade and surrender these certificates like other certificates. Over time, as more small-scale technology certificates become available, they are sold into the Clearing House and cancelled, until the deficit is cleared.

The Clearing House remained in deficit during most of 2016, reaching a high of 4 271 564 million certificates in deficit in July and ending the year with a deficit of 1 822 143 million certificates. Sales tend to be faster if the Clearing House is in deficit, but may take some time if it is in surplus.

During 2016, there were 266 purchases of 13 777 402 small-scale technology certificates, valued at $551 million. The largest purchase was worth $38.8 million.

This compares with 115 purchases of 6 964 491 small-scale technology certificates in 2015, valued at $278 million.

Engaging with participants to ensure market integrity

As the agency responsible for administering the scheme, our role involves ensuring integrity in both entitlements (creating certificates and obtaining exemptions) and obligations (surrendering the correct number of certificates or paying a penalty).

We register market participants, accredit large-scale renewable energy power stations, validate certificates, and issue exemption certificates for certain emissions-intensive trade-exposed activities.

We also undertake a range of communications, education and engagement activities to ensure participants understand how the Renewable Energy Target works and the requirements of participating in the scheme.

See *Chapter 4. Market integrity and scheme compliance* on page 57 for more information.

Reporting to the public

Under the *Renewable Energy (Electricity) Act 2000*, we are required to publish a range of information about the operation of the Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme.

We do this by reporting annually on the operation of the *Renewable Energy (Electricity) Act 2000* (this publication), including an annual statement on the progress towards the 2020 target. We release additional data periodically on our website.

Chapter 2

Market developments in 2016

The past year saw growing momentum in the large-scale scheme with an increase in investor and market confidence. While the year started slowly, by the end of 2016 there was renewed enthusiasm, with a significant increase in large-scale projects being financed and commercial arrangements being finalised.

Investment in small-scale systems was steady throughout most of 2016, with the average system capacity increasing.

Momentum on a large scale—increasing investment in renewables

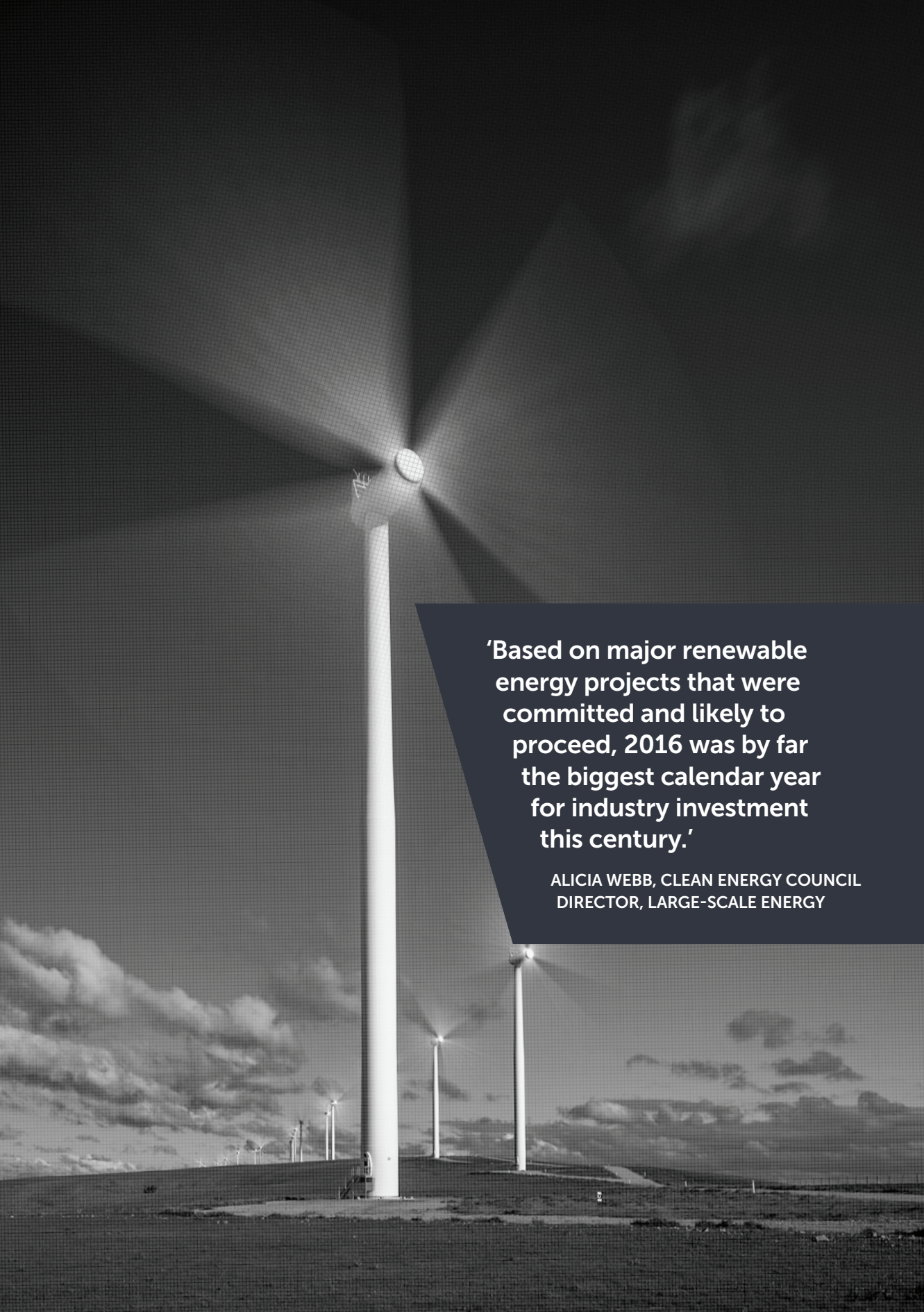
Following the passage of the legislative amendments locking in changes to the *Renewable Energy (Electricity) Act 2000* in June 2015, the market showed signs of increased optimism during 2016.

Increasing interest in investing in Australia's renewable energy industry resulted in heightened activity in the market, particularly towards the end of 2016.

One-third of the new project build required to meet the target of 33 000 gigawatt hours was either fully financed or supported by a power purchase agreement in 2016. Once built, this will increase large-scale generation to more than 23 000 gigawatt hours in 2018. This is a significant increase on the more than 18 300 gigawatt hours reported[20] for 2016 and shows that 33 000 gigawatt hours is clearly in sight for 2020.

Indications are that the momentum has grown and the industry is gearing up for another big year in 2017.

20 This number is expected to increase as large-scale renewable power stations have up to 12 months to report generation and create certificates. This number is at 21 February 2017.



‘Based on major renewable energy projects that were committed and likely to proceed, 2016 was by far the biggest calendar year for industry investment this century.’

ALICIA WEBB, CLEAN ENERGY COUNCIL DIRECTOR, LARGE-SCALE ENERGY

The increase in investment sees Australia now among the top 10 countries in the world for renewable energy investment[21]. Australia's clean energy investment in 2016 was the ninth highest, ahead of other resource-intensive economies such as Norway and Canada[22].

A total of $4.29 billion was invested nationally in clean energy in 2016[23]. At a time of declining general business investment in Australia and worldwide[24], this is a positive development for Australia's renewable energy industry, with more large-scale projects committed in 2016 than in any previous year.

There has also been a notable shift towards electricity retailers and financial institutions proactively seeking new ways to invest in the industry. For example:

- AGL's Powering Australian Renewables Fund (see *A word from the industry...AGL Energy's new renewables investment approach* on page 33 for more information), and
- the Clean Energy Finance Corporation's renewables fund (see *A word from the industry... Accelerating renewable energy investment with tailored finance solutions* on page 28 for more information).

In addition, new players entered the market, including significant offshore investment.

21 EY, *Meeting the Renewable Energy Target: Innovative approaches to financing renewables in Australia*, September 2016

22 Bloomberg New Energy Finance, *Clean Energy Investment End of Year 2016*, January 2017, https://about.bnef.com/clean-energy-investment/.

23 Bloomberg New Energy Finance, *Clean Energy Investment End of Year 2016*, January 2017, https://about.bnef.com/clean-energy-investment/.

24 Australian Bureau of Statistics, Private New Capital Expenditure and Expected Expenditure, Australia, December 2016, www.abs.gov.au/ausstats/abs@.nsf/mf/5625.0.

A word from the industry

ACCELERATING RENEWABLE ENERGY INVESTMENT WITH TAILORED FINANCE SOLUTIONS

The Clean Energy Finance Corporation (CEFC) works across the clean energy sector to catalyse private sector investment and innovation in renewable energy, energy efficiency and low emissions technologies.

In 2016, the CEFC launched a $250 million large-scale solar program to accelerate new project development and the swift generation of renewable source electricity to contribute to the grid.

The first of these projects to reach financial close involved the CEFC committing $150 million in debt finance to support the construction of 110 megawatt of new solar generation capacity at projects in Dubbo, Parkes and Griffith. This will increase large-scale solar capacity in New South Wales by more than 50 per cent.

When fully deployed, the CEFC large-scale solar program will represent the biggest lending commitment to the large-scale solar sector in Australia to date, with the program expected to deliver a significant reduction in the cost of solar energy to the point where large-scale solar is competitive with other forms of electricity generation.

In addition, the CEFC has developed innovative equity solutions to support large-scale renewable energy projects at the early stage of their development. In recent investments, the CEFC has taken its first direct equity stake in a large-scale solar project, through a $20 million investment in Australia's largest solar farm, at Ross River near Townsville. It has also made a $75 million cornerstone commitment to a specialist renewable energy fund, designed to attract mid-tier and large-scale institutional investors into project development.

The CEFC is also working to demonstrate the bankability of large-scale renewable energy projects, which have not achieved 100 per cent energy offtake agreements. This has included a debt finance commitment of up to $120 million, as one of the co-financiers in the development of the 270 megawatt Sapphire Wind Farm between Glen Innes and Inverell in northern New South Wales.

The **Clean Energy Finance Corporation** provided this content.

Photo: Nyngan Solar Farm, supplied by AGL Energy.

SPOTLIGHT...
Innovative financing in the Australian market

During 2016 we commissioned Ernst & Young (EY), to examine the market for investment in renewables in Australia. We released EY's report, *Meeting the Renewable Energy Target: Innovative approaches to financing renewables in Australia*, in September 2016.

The report finds the capacity of current renewable energy projects with development approval is more than enough to meet the 2020 target, and there is plenty of capital available to back projects, if the terms are satisfactory. However, innovative thinking is needed to bring together the existing demand, projects and finance.

The recent increase in committed projects and investment funding is encouraging, as is the use of non-traditional financial structures by projects already in construction, and new financial products and procurement processes in the market.

For example, some projects are being built on a merchant basis, where project sponsors take on the risk of development without a long-term power purchase agreement in place. This approach allows projects to proceed to construction without delay and with the option to negotiate an agreement at any time.

Corporations and government organisations are also starting to directly source their energy from renewable energy projects. Groups of corporates may also combine their energy procurement into one transaction and benefit from economies of scale, lower transaction costs and better priced electricity.

Other options available to project developers and investors include financing instruments for managing merchant risk, various hedging instruments and insurance products, and new approaches to appraising equity risks, such as on a portfolio basis rather than a project-specific basis.

Sharp rise in number of large-scale renewable energy power stations accredited

More than double the number of new large-scale renewable energy power stations were accredited in 2016 than in 2015—98 compared with 48[25].

This brings the overall total number of large-scale renewable energy power stations accredited under the Renewable Energy Target to 587.

In 2016, as shown in table 1 on page 30, solar dominated accreditation numbers for the third year running, accounting for 86 of the 98 large-scale renewable energy power stations accredited in 2016. However, accredited capacity of wind was higher than solar.

25 This was reported as 41 in the 2015 Renewable Energy Target Administrative Report. This has been revised to 48, as seven renewable power stations processed in 2016 had an accreditation start date in 2015.

Table 1: Types and number of large-scale renewable energy power stations accredited in 2016

Fuel source	2016 number	2016 capacity (megawatt)	2015 number	2015 capacity (megawatt)
Commercial and industrial-scale solar (less than 1 megawatt)	76	16.11	35	10.41
Utility-scale solar (more than 1 megawatt)	10	102.24	7	163.83
Wind	5	365.03	3	112.77
Hydro	3	2.90	0	0
Biomass	4	7.54	3	13.22
Total	**98**	**493.82**	**48**	**300.23**

There has also been a consistent increase in the number of commercial and industrial solar power stations. Generally, these commercial and industrial solar power stations have a capacity of less than one megawatt. Businesses typically use these systems to reduce their electricity bills.

2016 FAST FACT

Almost **88 per cent** of all power stations accredited in 2016 were solar.

The Small-scale Renewable Energy Scheme caps solar panel systems at 100 kilowatts (0.1 megawatts). Systems over this size can participate in the Large-scale Renewable Energy Target. We are noticing that participants who would traditionally enter the Small-scale Renewable Energy Scheme are now moving into the Large-Scale Renewable Energy Target with larger systems. This may be influenced by the increase in the price of large-scale generation certificates, currently more than double the price of small-scale technology certificates, and the reducing cost of technology.

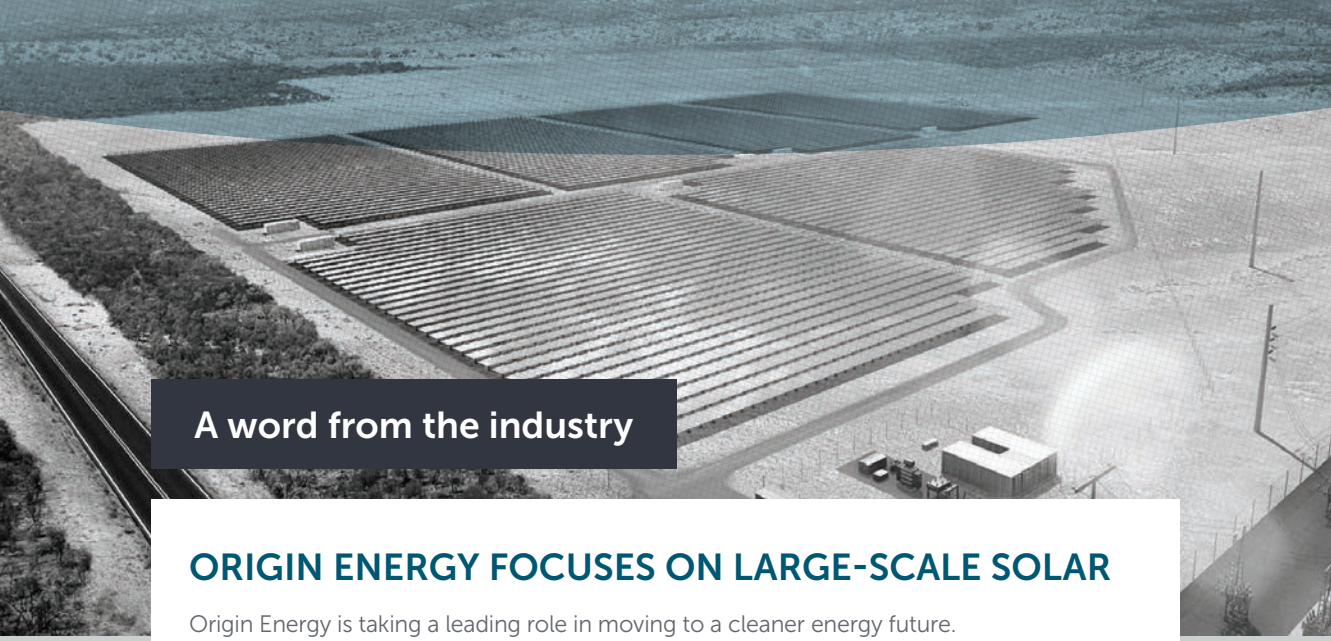
There was also an increase in the number of utility-scale solar power stations, which have a capacity of more than one megawatt.

2016 FAST FACT

There was a **43 per cent increase** in utility scale solar accredited in 2016 compared to 2015.

The cost of construction for solar projects is falling, and solar is predicted to be the most cost-effective technology in many countries by 2030[26]. Solar projects are also faster to build than other fuel sources, so more are coming online and starting to generate power more quickly.

26 Bloomberg New Energy Finance New Energy Outlook 2016, https://about.bnef.com/clean-energy-investment/.



A word from the industry

ORIGIN ENERGY FOCUSES ON LARGE-SCALE SOLAR

Origin Energy is taking a leading role in moving to a cleaner energy future.

With major advances in technology in recent years, solar has emerged as potentially the lowest-cost source of renewable energy—challenging wind energy in the Australian market for the first time. As a result, Origin Energy is focusing more attention on large-scale solar to complement its 700 megawatt wind energy portfolio.

In May 2016 Origin Energy announced a 15-year power purchase agreement with leading global solar company Fotowatio Renewable Ventures (FRV) for the electricity generated by the 56 megawatt Moree Solar Farm in northern New South Wales. Origin Energy also announced a power purchase agreement for the 100 megawatt Clare Solar Farm in north Queensland, which started construction in early 2017. Both the Moree and Clare solar farms feature tracking technology, with panels that follow the sun throughout the day to maximise output.

The community increasingly expects renewables to replace traditional fossil fuels in the energy mix, and the industry is working on solutions to improve the reliability of renewables.

Origin Energy also recently signed a power purchase agreement for the 10.8 megawatt Lakeland Solar Project in far north Queensland, one of Australia's first 'edge-of-grid projects'. Lakeland will feature 5.3 megawatt hours of battery storage that will allow a network of 3000 local homes to be 'islanded' from the main electricity grid and powered entirely by solar and batteries for several hours during the evening peak. It is hoped the pioneering project will make a significant contribution to a broader rollout of solar and battery power.

In 2017, Origin Energy will continue to focus on renewables, including progressing the 110 megawatt Darling Downs Solar Farm, which will be Australia's largest solar power farm with the capacity to power up to 32 000 homes in south-east Queensland.

Origin Energy provided this content.

Photo: The 10.8 megawatt Lakeland project in far north Queensland, one of Australia's first "edge-of-grid" projects, provided by Origin Energy.

Increase in large-scale renewable energy power station capacity and generation

The total additional capacity of new large-scale renewable energy power stations accredited in 2016 was 494 megawatts.

This is an increase on the 300 megawatt capacity of large-scale renewable energy power stations accredited in 2015.

The combined capacity of all large-scale renewable energy power stations under the Renewable Energy Target is now 14 157[27] megawatts.

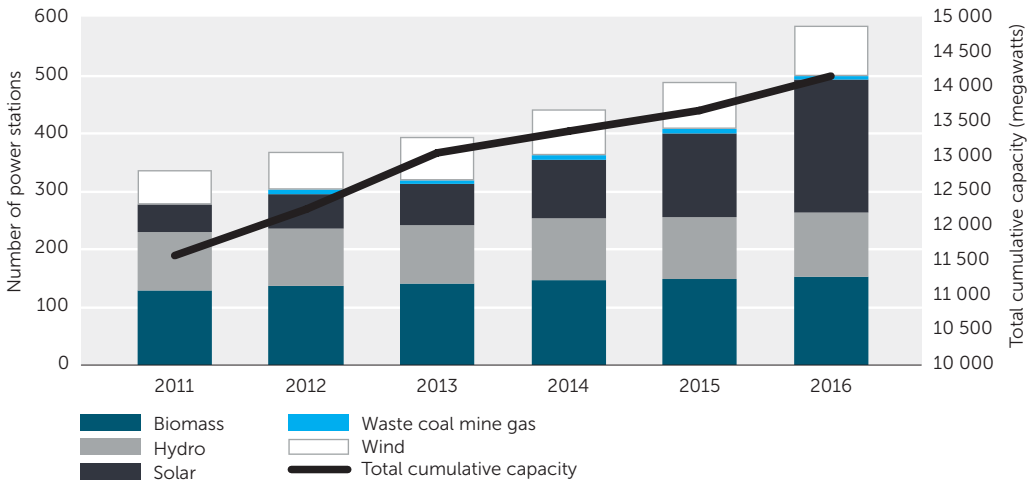
Capacity increased year-on-year for wind. The smaller number of wind farms continues to contribute a greater proportion of the overall capacity.

Solar has a lower capacity factor[28] than wind, meaning more needs to be built to generate an equivalent amount of renewable source electricity.

2016 FAST FACT

There was a **64 per cent** increase in accredited capacity in 2016 compared to 2015.

Graph 1: Growth in the number of accredited large-scale renewable energy power stations and their cumulative capacity since 2011



Accredited large-scale renewable energy power stations have reported generation of about 18.3 million megawatt hours of renewable energy above their baselines for the 2016 year. This is an increase on the 16 million megawatt hours reported as generated above baseline in 2015. However, this number is expected to increase progressively as they have up to 12 months to report the generation and create the certificates.

27 This figure does not include capacity for eight co-fired power stations but does include capacity that does not contribute additional generation (eg power stations that have a baseline).

28 See glossary for definition.

A word from the industry

AGL ENERGY'S NEW RENEWABLES INVESTMENT APPROACH

In early 2016 AGL Energy (AGL) announced an innovative approach to renewable energy investment. The Powering Australian Renewables Fund is an investment vehicle for institutional capital to invest directly in renewable energy assets. It is structured to provide the necessary scale, diversification (by asset and location) and balance of risk to attract experienced infrastructure investors, while also meeting AGL's needs. QIC Global Infrastructure (QIC) is the preferred equity partner in the Powering Australian Renewables Fund.

Designed to support investment in approximately 1000 megawatts of renewable energy, the fund enables QIC and its clients to invest in a portfolio of greenfield and brownfield assets.

This represents approximately 20 per cent of the estimated additional capacity required to meet the 2020 target.

AGL and QIC have made equity commitments of $200 million and $800 million respectively, with the remaining capital to come from debt sourced on a project-by-project basis. Once fully invested, the total capital deployed is expected to be between $2–3 billion.

AGL will provide offtake agreements covering both energy and large-scale generation certificates for fund assets. These agreements will be for terms of either 5+5 years or 7+5 years—shorter than traditional offtake agreements.

In November 2016 the Powering Australian Renewables Fund made its first investment, acquiring two operational assets—the newly constructed 102 megawatt Nyngan solar plant and the 53 megawatt Broken Hill solar plant, both in western New South Wales.

In January 2017 the fund announced the acquisition and financial close of the 200 megawatt Silverton wind farm project in western New South Wales—the first greenfield project that AGL will develop and manage on behalf of the fund.

AGL has indicated the next likely development is the Coopers Gap wind farm project. At up to 460 megawatts, successful acquisition of Coopers Gap would see the Powering Australian Renewables Fund achieved financial close on 80 per cent of the planned 1000 megawatts in just over 12 months of operation.

AGL Energy provided this content.

Photo: Nyngan Solar Farm, supplied by AGL Energy.

Increase in large-scale generation certificates and spot prices in 2016

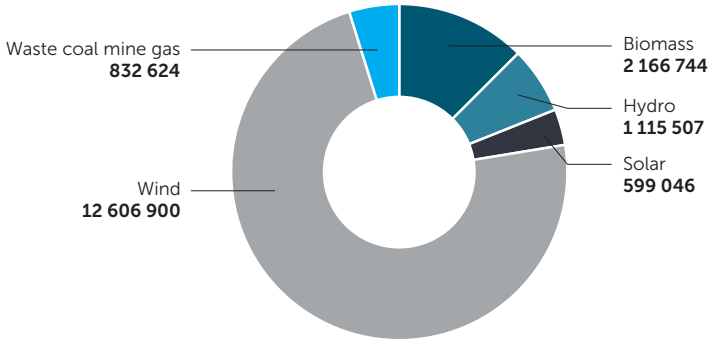
We validated 17 320 821 large-scale generation certificates in 2016.

This is an increase on the 16 463 436 certificates validated in 2015.

Thorough documentation is required from scheme participants, with validated certificates audited before being deemed eligible.

Graph 2 shows that most validated certificates were for wind generation, followed by biomass[29].

Graph 2: Validated large-scale generation certificates by source in 2016



The large-scale generation certificate price continued to rise during 2016. The 12 week average spot price to the end of 2016 was $87.80 compared with $71.73 in 2015.

This increase is due to factors such as the tightening of supply and demand dynamics (see page 47).

2016 FAST FACTS

Certificates validated in 2016 increased by **five per cent** over 2015.

29 See glossary for definition.

A word from the industry

GOLDWIND AND CECWPC JOINT WIND FARM INVESTMENT

The joint Goldwind and CECEP Wind Power Corporation (CECWPC) White Rock Wind Farm in northern New South Wales is being built on a merchant basis. This 175 megawatt capacity project reached financial close in early 2016, the first for the year, and construction started in May 2016.

John Titchen, Managing Director of Goldwind Australia, said the project had been well received by the local community.

'We are committed to local sourcing and engagement of local contractors and suppliers where feasible, and have been from day one.' said Mr Titchen.

In October 2016 a community event in Glen Innes marked the delivery of the largest wind turbine blade in Australia, at 59.5 metres long, as a significant project milestone.

When Stage 1 of White Rock Wind Farm is fully commissioned at the end of 2017, Goldwind will have installed an overall total of 340 megawatts of wind power in New South Wales.

Mr Titchen said Goldwind will continue to lead the market as momentum builds towards meeting the 2020 Renewable Energy Target.

'We are preparing several projects for construction across Australia including Moorabool Wind Farm in Victoria (approved for the construction and operation of 107 turbines) and Coppabella Wind Farm in NSW (approved for the construction and operation of 79 turbines). Market conditions have developed as expected and we continue to see an increased interest from customers for Goldwind turbines and Engineering Procurement and Construction contracts. There is real momentum underway across the sector and we are focused on delivering projects to meet the Renewable Energy Target.' said Mr Titchen.

Goldwind's innovative wind-solar hybrid projects are also progressing well—Gullen Solar Farm (jointly owned by Beijing Jingneng Clean Energy) and White Rock Solar Farm—will commence construction in 2017. These projects will represent 10 megawatts and 20 megawatts respectively of solar generation, located at wind farm sites and sharing the existing wind farm infrastructure. Co-location of wind and solar provides numerous benefits such as complementary energy generation patterns, and reduced environmental impacts and project costs. These co-location projects are the first of their kind in Australia and will provide a blueprint for similar projects to follow.

Goldwind provided this content.

Photo: Glen Innes community event, supplied by Goldwind.

Record number of announcements of new large-scale renewable energy power stations

Monitoring committed and probable new projects provides a lead indicator of momentum towards the 2020 target.

A total of 2069 megawatts of new build was committed or probable during 2016.

This compares with 409 megawatts of new build committed or probable in 2015.

Committed projects refers to large-scale renewable energy projects that have received all development approvals and reached final investment decision according to the commercial understanding of the term.

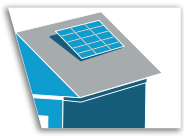
Probable projects have a high degree of confidence that they will proceed following a public announcement of a power purchase agreement with a strong counter party or other evidence of funding.

2016 FAST FACT

The Ararat Wind Farm was the largest power station accredited, with **242 megawatt** capacity.

The largest solar power station accredited was the **56 megawatt** Moree Solar Farm.

Steady year in the small-scale market



While 2016 began with the traditionally slow period in January, there were steady installations of small-scale systems each month for the rest of the year, and a number of key milestones were reached.

Three small-scale system milestones passed

Households and businesses continued to embrace renewables in 2016, installing another 182 173 small-scale systems.

As a result, the Small-scale Renewable Energy Scheme passed the following significant milestones in 2016:

- 2.5 million small-scale systems in total
- one million solar water heaters and air source heat pumps, and
- combined ability to generate or displace 10 million megawatt hours of electricity.

Small-scale system installations and trends

In 2016 a further 182 173 new small-scale systems were installed, bringing the total to 2 661 839.

2016 FAST FACTS

A total of **182 173** small-scale systems were installed:

127 333 solar panel systems

39 806 solar water heaters

15 025 air source heat pumps, and

9 small-scale wind installations.

Together these small-scale systems can generate or displace 10 million megawatt hours of electricity—enough to power 1.6 million average Australian households.

The capacity of small generation units installed in 2016 was 707 megawatts. The combined capacity of all small generation units under the Renewable Energy Target is now 5426 megawatts.

Overall, the number of small-scale systems installed in 2016 was less than in 2015. This continues the gradual downward trend in the number of new installations each year since 2013 as shown in graph 3 on page 39. However, as discussed below, the average capacity has increased.

SPOTLIGHT...
One million milestone for solar water heaters and air source heat pumps

In October 2016, the routine installation of a household solar water heater in the New South Wales town of Weston signalled a major milestone: one million solar water heaters and air source heat pumps installed in Australia.

This demonstrates continuing strong interest from households in participating in the Small-scale Renewable Energy Scheme, and enjoying the associated financial and environmental benefits.

The scheme creates a financial incentive to install small-scale systems such as solar water heaters and air source heat pumps.

An average household can use around a quarter of its total energy on heating water, so solar water heaters reduce energy bills while avoiding greenhouse gas emissions.

While solar panel systems account for most of the small-scale systems installed under the scheme, solar water heater technology is also proving popular with households and businesses. With prices for these systems reducing, these systems are expected to continue to be popular with consumers.

TOWARDS AN AFFORDABLE AND RELIABLE RENEWABLE ENERGY FUTURE

The Australian Renewable Energy Agency (ARENA) is helping the most promising renewable energy technologies advance more quickly to the commercial market.

By taking a strategic and commercial approach to selecting projects, ARENA supports organisations that identify and address barriers to energy system transformation, minimise investment risk and overcome the higher costs of doing business faced by early adopters.

Since it was established in 2012, ARENA has been a driving force in bringing down the cost and accelerating the commercial viability of large-scale solar in Australia. It has delivered a multi-year plan to build capacity in Australian supply chains and expertise over successive large-scale solar projects.

In 2016 ARENA held a $100 million competitive funding round to develop an additional 200 megawatts of large-scale solar capacity in Australia and achieve cost-parity between solar and wind energy projects by 2020.

The competitive round exceeded expectations, with the 12 selected projects slated to produce 480 megawatts of capacity once operational. The funding ask dropped from half of total project costs to just 10 per cent on average. With this support, the cost of large-scale solar is rapidly falling, which increases investor confidence, lowers finance costs and creates a more supportive market for power purchase agreements.

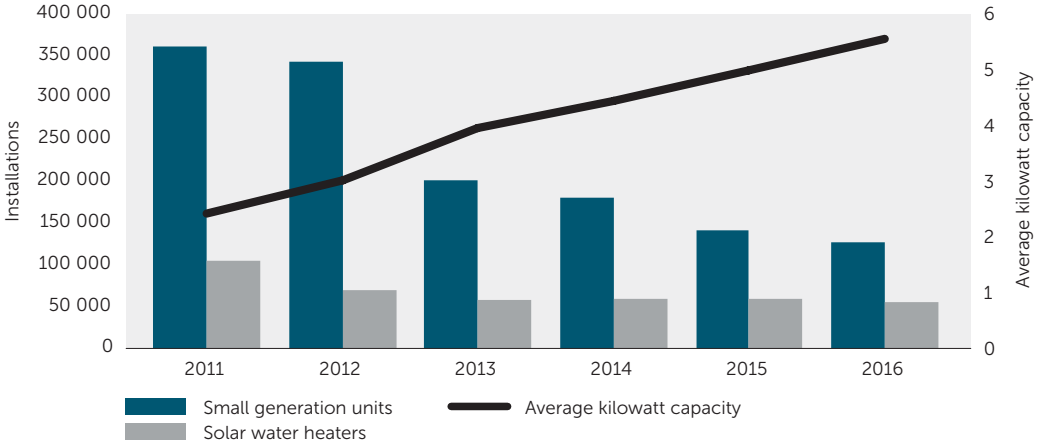
ARENA is also supporting a number of projects to co-locate large-scale solar installations with wind farms. An ARENA-supported study found an estimated 100 megawatts of potential opportunities to add solar alongside existing wind farms. Placing the two technologies together saves money on grid connection, approvals and site development, allowing solar plants to roll out more quickly and cheaply across the country.

The co-location of solar and wind also provides a pathway to continuous supply from renewables, with solar energy being generated during the day and wind energy generally at night.

The Australian Renewable Energy Agency provided this content.

Photo: Supplied by the Australian Renewable Energy Agency.

Graph 3: Number of small-scale system installations since 2011



Increase in capacity of small-scale systems

Around 70 per cent of the small-scale installations in 2016 were small-scale solar panel systems. Most of the remaining 30 per cent were solar water heaters and air source heat pumps.

The average capacity of small-scale solar panel systems continued to increase in 2016 from 5.0 kilowatts in 2015 to 5.6 kilowatts in 2016.

The increase in average capacity reflects more investment in commercial-sized solar panel systems of between 10 and 100 kilowatt capacity. Examples include systems installed in industrial estates, schools, retirement villages and hospitals. There is also a gradual increase in the size of standard household systems. The continued reduction in the cost of solar panel systems is likely to be contributing to this increase in capacity. Also of note was an increase in the number of air source heat pumps installed in 2016 compared with 2015, rising from 9922 to 15 025.

The Small-scale Renewable Energy Scheme does not include incentives for battery storage[30], however, this is an emerging area attracting significant interest from the market.

The Battery Market Report from SunWiz[31] released in February 2017 states that 6750 battery systems were installed in 2016, able to store a total of 52 megawatt hours. Further, the report outlines that the industry expects the market to triple in the coming years, with at least 20 000 installations storing more than 170 megawatt hours.

30 Participants in the Small-scale Renewable Energy Scheme are encouraged to voluntarily disclose when a system has been installed with battery storage as part of their application for small-scale technology certificates. The Clean Energy Regulator collect data for installations of small-scale solar panel systems including those with concurrent battery storage but do not collect data on existing solar panel systems that have batteries installed at a later date.

31 For details, see 2017 Battery Market Report, www.sunwiz.com.au/index.php/battery-market-report-2017.html.

A word from the industry

NEWCASTLE CITY COUNCIL EMBRACING SOLAR

Installing a photovoltaic system on the Newcastle Museum was by no means straightforward for the forward-thinking Newcastle City Council (NCC), which had already embraced renewable energy through solar arrays.

As a heritage-listed site, the former railway workshop housing the museum posed unique challenges, including mandatory heritage assessments and the need to minimise the visual impact on the popular Honeysuckle precinct next to the harbour.

When it was switched on in May 2016, the discreet rooftop installation added a further 100 kilowatt of capacity to a growing number of eight solar set ups.

Together these now account for more than 440 kilowatt of renewable energy generation.

Installed by Hunter Valley-based company HCB Solar, the museum installation generates around 146 000 kilowatt hours, reducing the facility's grid consumption by 27 per cent.

'Through our Newcastle 2020 Carbon and Water Management Action Plan, Council has established a series of goals to progress financial and environmental sustainability,' said Newcastle Lord Mayor Nuatali Nelmes.

'One of these targets is for 30 per cent renewable energy generation for Council by 2020, and we continue to look at opportunities to achieve this goal.'

Solar PV, together with other projects, such as energy-efficient retrofits at popular cultural and recreational centres, has helped reduce Council's electricity consumption by around 1.45 million kilowatt hours a year.

Since 2012, rooftop solar systems have been installed at the Council's Works Depot at Waratah (91.26 kilowatts), Newcastle Art Gallery (86.25 kilowatts), Newcastle City Library (44.28 kilowatts), Wallsend Library (80.08 kilowatts), New Lambton Library (9.9 kilowatts), No.1 Sportsground (10.2 kilowatts), No.2 Sportsground (20.16 kilowatts) and the Newcastle Museum (99.75 kilowatts).

A small-scale wind turbine (2.5 kilowatts) is operating at Council's waste management centre and a 22 kilowatt hour battery storage system was installed at the city's No.2 Sportsground last year.

The **Newcastle City Council** provided this content.

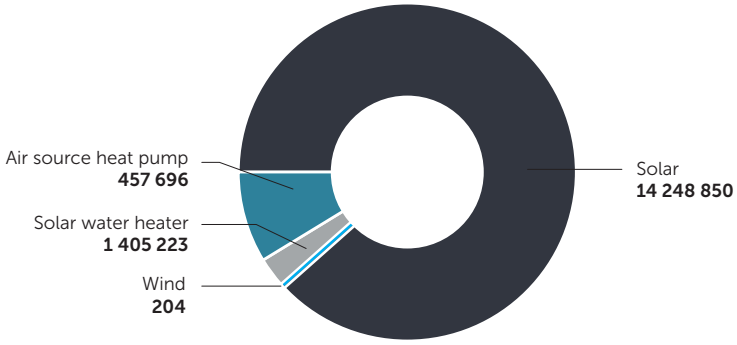
Photo: supplied by Newcastle City Council.

Increase in number of small-scale technology certificates

We validated 16 111 973 small-scale technology certificates during 2016[32].

This is an increase from 15 928 663 small-scale technology certificates validated last year[33]. The increase may be influenced by the reduction in the deeming period that begins in 2017 (see page 42), along with the increase in commercial-sized systems. Graph 4 shows that most certificates validated were for solar panel systems.

Graph 4: Validated small-scale technology certificates by renewable energy source



Trends in the small-scale market

Australia has the highest small-scale solar panel rooftop penetration per capita in the world[34].

A number of factors are driving this, including Australia's high levels of solar energy, national wealth, a well-developed solar industry and government incentives.

A range of commercial factors have also influenced the uptake of small-scale installations and will continue to over the forward years, including:

- increasing electricity prices—electricity prices are generally forecast to rise in the future[35]
- decreasing costs for small-scale solar—the CSIRO has projected the cost of small-scale solar panel systems will continue to decline until 2035[36]

32 Small-scale technology certificates can be created up to 12 months after a system is installed. This means final figures for installations in 2016 will be slightly higher once all relevant data is available. For up-to-date information, see www.cleanenergyregulator.gov.au.

33 There was an error in the *2015 Renewable Energy Target Administration Report and Annual Statement*, which has been resolved in this report.

34 International Energy Agency, Renewable Energy Medium-Term Market Report 2016.

35 Figure 10, National Electricity Forecasting Report, Australian Energy Market Operator, June 2016 http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/2016-National-Electricity-Forecasting-Report-NEFR.pdf.

36 Future energy storage trends, CSIRO, September 2015, www.aemc.gov.au/Major-Pages/...of.../CSIRIO-Future-Trends-Report-2015.aspx.

- energy storage—the availability of storage technology at a declining cost may drive new demand for systems and upgrading (sizing) of existing systems
- technological and regulatory changes—such as smart apps and embedding solar cells in common building products, and
- regulatory changes—planning requirements for suitable buildings.

This suggests that the small-scale solar market will continue to be strong for many years. The Australian Energy Market Operator recently conducted a detailed review of the National Electricity Market and forecasted that small-scale solar panel systems will continue to grow strongly, increasing 350 per cent from 2016 levels by 2035–36[37].

Change in deeming period for small-scale solar panel systems

This was the last calendar year that the 15-year deeming period was available for solar panel system installations. From 2017, the deeming period will reduce by one year, every year. This will reduce the number of small-scale technology certificates that may be created each year until the scheme ends. This provides a predictable path and certainty for industry.

As system costs continue to fall year-on-year, purchasers are unlikely to see any price impact from the gradual change in deeming, as system prices are also expected to continue to fall year-on-year.

In effect, the same reducing incentive applies to the Large-scale Renewable Energy Target, with renewable energy power stations accredited in early 2017 only able to create certificates for 14 years.

37 Figure 10, National Electricity Forecasting Report, Australian Energy Market Operator, June 2016 www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/2016-National-Electricity-Forecasting-Report-NEFR.pdf.

A word from the industry

REDUCTION IN TECHNOLOGY COSTS DRIVES INVESTMENT IN SOLAR

Australian rooftop solar photovoltaic technology used in solar panel systems is among the cheapest in the world thanks to global manufacturing economies of scale, a competitive and experienced installation workforce, and Australia's high solar penetration (the highest per square metre of any continent).

At current price levels, electricity produced via solar panel systems at or near the point where it is used significantly out-competes retail grid electricity.

John Grimes, Chief Executive Officer of the Australian Solar Council said, 'Solar is proving a rational economic choice for consumers and, as an economic investment, outperforms prevailing bank interest rates several fold'.

In addition, emerging battery storage technology is enabling consumers to capture and store solar energy generated during the day for use later, such as at night or in peak times, rather than feeding the excess back to the grid.

The first wave of energy storage is also beginning—including feeding excess solar energy into a resistive element hot water tank to use at a later date—and it is inexpensive, at less than $72 per kilowatt hour to set up.

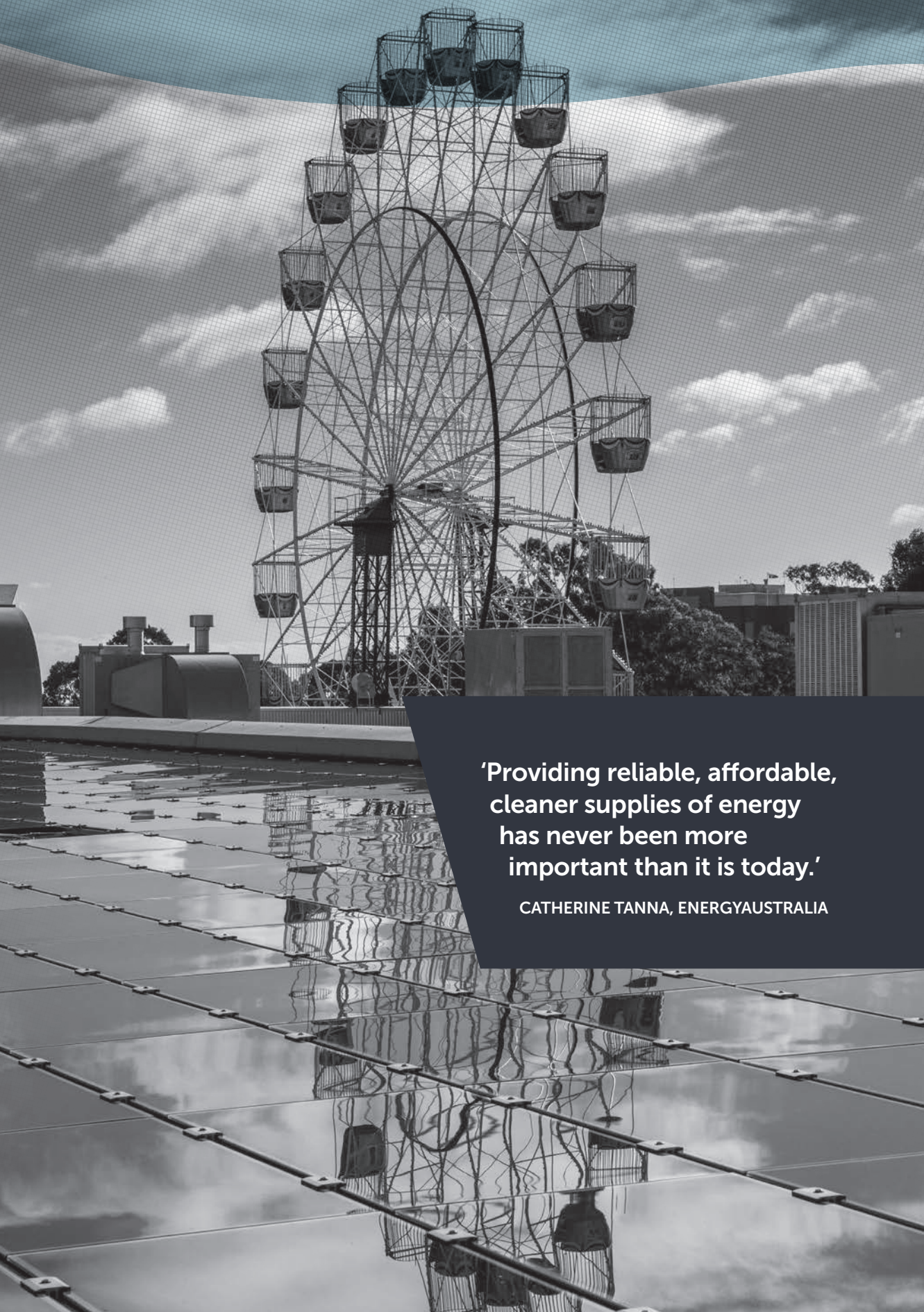
Large-scale solar is starting to compete with other electricity sources. It is becoming cost competitive with large-scale wind and is cheaper to build than new coal or gas generation power stations.

The enabling tools of energy storage systems and energy management software are quickly maturing and becoming cheaper, offering the availability and robustness of supply consumers are entitled to expect.

These economic fundamentals will drive solar, increasing the adoption of solar panel systems into, and well past, 2020.

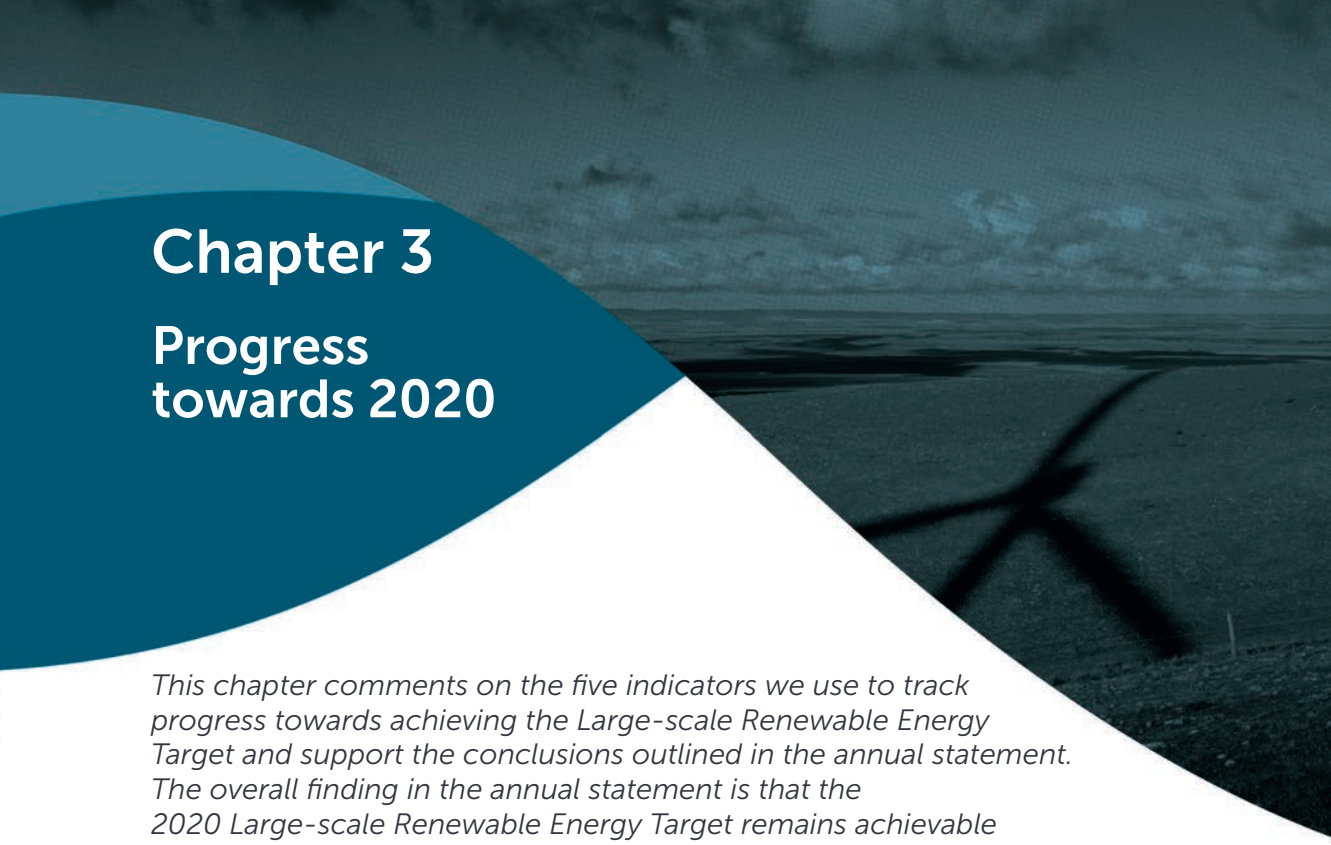
The **Australian Solar Council** provided this content.

Photo: Broken Hill Solar Plant, supplied by the Clean Energy Regulator.



‘Providing reliable, affordable, cleaner supplies of energy has never been more important than it is today.’

CATHERINE TANNA, ENERGYAUSTRALIA



Chapter 3

Progress towards 2020

This chapter comments on the five indicators we use to track progress towards achieving the Large-scale Renewable Energy Target and support the conclusions outlined in the annual statement. The overall finding in the annual statement is that the 2020 Large-scale Renewable Energy Target remains achievable provided the current pace of investment continues in 2017.

Progress indicators

The progress indicators are designed to guide and support the conclusions reached in the annual statement (see page 9). Progress towards meeting the target in 2020 is tracked against five indicators.

The indicators draw on data from the 2016 calendar year. While the indicators are presented separately, each can influence or be influenced by one or more of the other indicators. Combined, the indicators provide an insight into the performance of the market in 2016 and progress towards meeting the 2020 target.

Build required to meet the 2020 target

The status of committed projects and accredited large-scale renewable energy power stations is assessed as 'on track', 'within reach' or 'off track'.

On track	Within reach	Off track
Indicator is within modelled and acceptable parameters	Indicator is outside modelled parameters but acceptable at this time	Indicator is outside of modelled and acceptable parameters

These are the lead indicators for progress towards the 2020 target as they demonstrate the pipeline of construction of new renewable energy power stations and final accreditation of projects that can begin to supply certificates.

Table 2: Lead indicators

Indicator	Description	2016 progress	Assessment
1. Committed projects 	Capacity (megawatts) and estimated generation output in a full year (megawatt hours) of large-scale renewable energy projects that have received all development approvals and secured financial investment according to the commercial understanding of the term.	1350 megawatt capacity was committed in 2016. At the end of 2016 an additional 719 megawatts was assessed as probable. We expect this will become committed in early 2017. Together, this new build will be capable of generating an estimated 3 946 000 megawatt hours over a full calendar year.	**Within reach** One-third of capacity required to meet the target was committed or probable in 2016. This is below our target of 3000 megawatts. It can be recovered in 2017. Early evidence suggests that the momentum from the later part of 2016 is continuing in early 2017.
2. Accredited large-scale renewable energy power stations[38] 	Capacity (megawatts) and estimated generation in a full year (megawatt hours) of large-scale renewable energy power stations we have accredited.	494 megawatt capacity accredited in 2016. Capable of generating an estimated 1 530 000 megawatt hours over a full calendar year.	**On track** More than double the expected capacity was accredited in 2016.

38 Capacity accredited relates to total capacity of a large-scale renewable energy power station, not the capacity commissioned in the year of accreditation. For example, wind farms can take up to two years to become fully commissioned.

Market health

Large-scale generation certificate spot prices, supply and demand dynamics as well as liability shortfall are discussed in relation to the outlook from now to 2020. The availability of certificates and the price paid reflects the efficient functioning of the market.

On balance the indicators highlight that the appropriate signals have been provided to the market and these are eliciting the required response. The slow start to new project announcements means that certificate supply will be tighter. This is reflected in the high spot price, which then incentivises more project commitments. This in turn should improve the outlook for supply and help moderate certificate prices in time. The 2020 Renewable Energy Target can still be met even if certificate spot prices remain high along the way.

Table 3: Market indicators in 2016

Indicator	Description	2016 progress	Assessment
3. Large-scale generation certificate spot price 	The 12-week average of large-scale generation certificate spot price as at the end of the 2016 calendar year.	$87.80[39] (12-week average price)	The positive price signal to the market is in excess of the price required to finance new build. The spot price remains well below the post-tax shortfall charge of $93.
4. Supply and demand dynamics 	Registered large-scale generation certificates available after the surrender date of 14 February 2017 and concentration of holdings.	A total of 13.4 million large-scale generation certificates available after 2016 surrender.	Sufficient large-scale generation certificates are available for the 2017 compliance year. Supply and demand will be tightly balanced in 2018.

39 Large-scale generation certificate closing rates, http://lgc.mercari.com.au/.

Indicator	Description	2016 progress	Assessment
5. Shortfall 	Proportion of Large-scale Renewable Energy Target liability for which the shortfall charge has been incurred.	A total of 10.4 per cent of the Large-scale Renewable Energy Target liability incurred a shortfall charge.	The majority of electricity retailers fully surrendered large-scale generation certificates. Two large retailers chose to pay the shortfall charge for a material amount citing the high spot price. Those that planned ahead and have contracts to obtain the required certificates are unlikely to have been affected by the high spot price.

Detailed commentary on progress indicators

Indicator 1: Committed projects—within reach

Capacity

The capacity of committed projects in 2016 is 1350 megawatts, estimated to generate a little over 3.9 million megawatt hours in a full year.

Table 4 also shows that at the end of 2016, an additional 719 megawatts was probable to be committed, estimated to generate a little over 1.8 million megawatt hours over a full year.

Table 4: Committed and probable projects in 2016

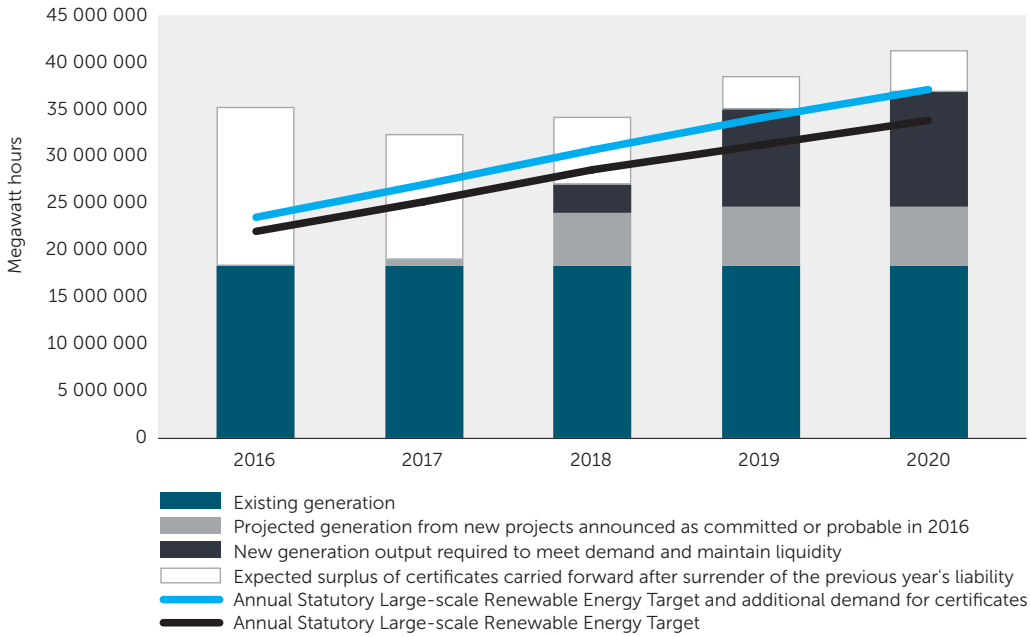
	Capacity committed (megawatts)	Estimated future full year generation from committed projects (megawatt hours)	Capacity probable to be committed (megawatts)	Estimated future full year probable generation from probable projects (megawatt hours)
Wind	869	2 893 000	263	875 000
Solar	481	1 053 000	456	999 000
Total	**1350**	**3 946 000**	**719**	**1 874 000**

In the 2015 annual statement, we estimated 3000 megawatts of capacity was needed to be committed in 2016. While this was not achieved, there was 2069 megawatts of committed or probable projects. We assess this indicator as 'within reach' because of the following factors:

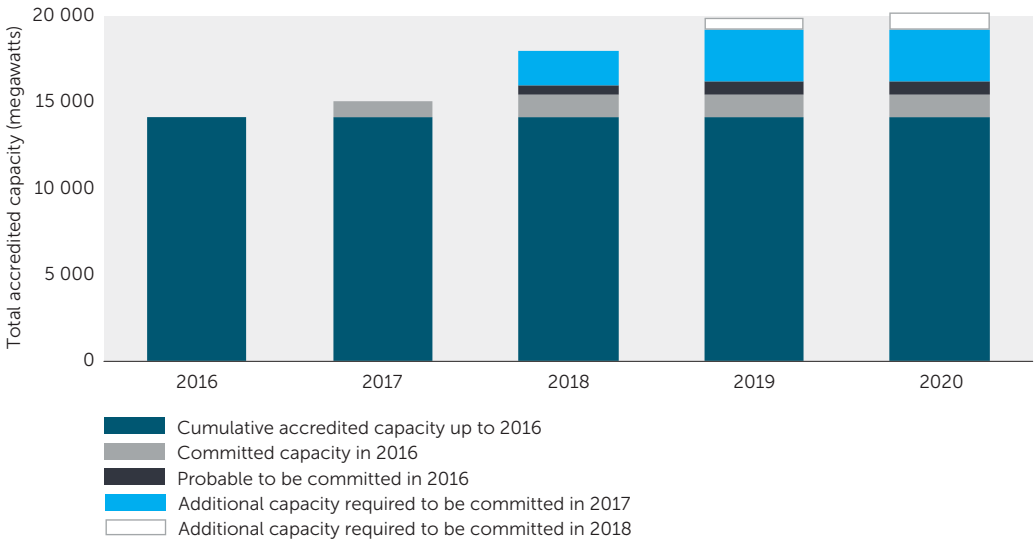
- There are plenty of projects in the pipeline and all indications are that bridging that gap will be possible in 2017.
- There is significant momentum in the market. The momentum observed towards the end of 2016 appears to have carried forward into 2017.
- There was also a notable shift towards solar projects, which have a shorter construction time and can deliver generation more quickly.
- The committed and probable capacity in 2016 was five times more than the previous year.

In the 2015 annual statement we estimated an additional 6000 megawatts of installed capacity was needed from 2016 through to 2020 to meet the total cumulative demand for large-scale generation certificates. Graphs 5 and 6 show the current required capacity and generation to reach the target.

Graph 5: Current and required generation to meet expected demand in 2020

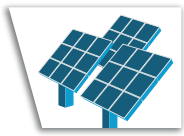


Graph 6: Current accredited and modelled capacity required to meet expected demand in 2020



A number of projects that were identified as probable in 2016 have been committed in the first few months of 2017, in addition to further significant public announcements about new projects in 2017.

Continuing shift towards solar



The shift towards large-scale solar power stations continued in 2016, with an increase in solar projects among committed and probable projects.

As discussed on page 30, the cost of solar is falling and therefore building large-scale solar projects is becoming increasingly more commercially attractive.

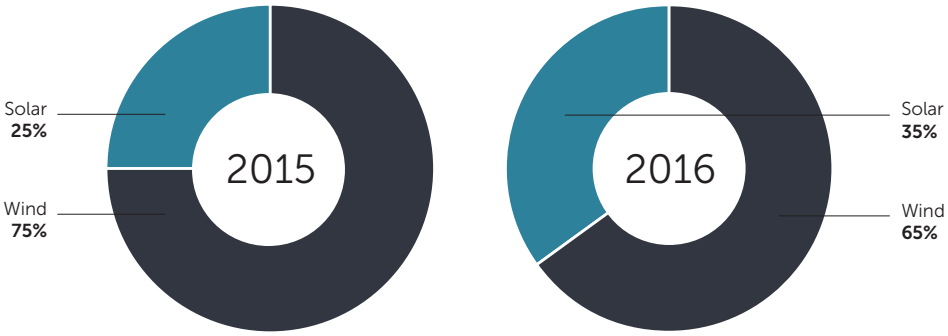
While solar projects generally have a lower capacity compared with wind, large-scale solar power stations require a shorter build time. The shift to solar during 2016 was more rapid than assumed in the 2015 modelling that underpinned the 3000 megawatt requirement. If this trend continues, it may help partially offset the reduction in certificate liquidity owing to the slower than required commitments for new build in 2016.

Graph 7 on page 52 shows the mix of technology types in the market. Around 35 per cent of new capacity financed during 2016 was solar.

‘The rising costs of grid-supplied electricity, coupled with the falling costs of renewable energy production have resulted in a narrowing of the price difference between renewable and traditional energy sources. For large energy users contracting with a renewable energy generator and / or retailer to meet all or part of your energy supply needs is now a commercially viable proposition.’

ANITA STADLER, ENERGETICS PRINCIPAL CONSULTANT

Graph 7: Change in percentage of technology mix for estimated megawatt capacity



Indicator 2: Accredited large-scale renewable energy power stations—on track

Large-scale renewable energy power stations accredited[40] in 2016 added 494 megawatts capacity and, as shown below in table 5, an estimated generation output of more than 1.5 million megawatt hours over a full year. This is above the 230 megawatts capacity that we expected to be accredited in 2016.

This is the main reason this indicator is assessed as 'on track'. Other factors that influenced our assessment include:

- more than doubling of the accreditation of commercial and industrial solar projects from 2015 to 2016. 76 projects were accredited in 2016 compared with 35 in 2015. If this trend continues, commercial and industrial solar projects will make an increasing contribution towards the target. The combined accredited capacity of commercial and industrial solar projects is 16.11 megawatts, comparable with the Royalla Solar Farm (20 megawatts).

Table 5: Accredited large-scale renewable energy power stations in 2016

Capacity accredited	494 megawatts
Estimated future annual generation from accredited large-scale renewable energy power stations	1 530 000 megawatt hours

40 A list of accredited large-scale renewable energy power stations is available on our website at www.cleanenergyregulator.gov.au.

Indicator 3: Large-scale generation certificates spot prices

The large-scale generation certificate price trended upward during 2016.

The spot price is working as it should by sending a signal to the market that new build is required to come on quickly. As shown in table 6, the price was $86.75 at the end of 2016, which is below the post-tax equivalent of the shortfall charge of $93 per certificate. This is higher than the price at the end of 2015.

Table 6: Large-scale generation certificate spot price in 2016

Large-scale generation certificate spot price comparison	Price
Average spot price for the last 12 weeks of 2016	$87.80
At the start of 2016	$74.00
At the end of 2016	$86.75
Average for 2016	$83.51

The spot price is higher than the cost price needed to finance new projects. It is well-above the prices being announced as part of power purchase agreements, which often include both the large-scale generation certificate price and wholesale electricity costs.

Once the market has formed a view that the necessary build to meet the target is likely to be committed, and that adequate supply will return, the spot price should start to moderate.

Indicator 4: Supply and demand dynamics

A total of 17 320 821 large-scale generation certificates were validated in 2016 compared with 16 463 436 in 2015.

After final surrender of certificates for 2016, a surplus of more than 13 million large-scale generation certificates remains. This is a reduction from the 18 million large-scale generation certificates that remained available after final surrender of certificates for 2015.

Nevertheless, it appears there will be sufficient surplus of certificates for the market to operate in the 2017 compliance year, and there will be enough certificates to meet demand for 2018.

There is time for sufficient build to come on for the operating surplus to return to adequate levels for the 2019 and 2020 compliance years.

Indicator 5: Shortfall

Electricity retailers met 93.8 per cent of their certificate obligations under both the Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme through a combination of surrendering certificates and utilising carried-forward surplus created through over-surrender of certificates in previous years. Once again, the vast majority have complied with the objectives of the *Renewable Energy (Electricity) Act 2000*.

A total of 19 676 342 large-scale generation certificates were surrendered. The certificates surrendered combined with certificate surplus from the previous year reflects a compliance rate of 89.3 per cent in the Large-scale Renewable Energy Target, as shown in table 7. A list of electricity retailers that did not meet their certificate surrender obligations is at Appendix C and is published on our website.

Table 7: Shortfall in 2016

2016 shortfall	Percentage
Percentage of large-scale generation certificate liability acquitted on time	89.3 per cent
Percentage of large-scale generation certificate liability with an associated shortfall charge	10.4 per cent
Percentage of large-scale generation certificate liability with less than 10 per cent carried shortfall (shortfall charges do not apply)	0.3 per cent

The Renewable Energy Target allows some flexibility for electricity retailers to manage their obligations across years, and shortfalls within 10 per cent of their large-scale certificate liability for a year may be carried forward to the next year without incurring a shortfall charge. Of the 22 electricity retailers who reported a shortfall in 2016, a total of 15 had shortfall of greater than 10 per cent and were required to pay shortfall charges.

Sufficient large-scale generation certificates were available in the market for all electricity retailers to meet their surrender obligations. Our position remains that payment of the charge does not fulfil the purpose of the legislation.

The drop in the compliance rate is primarily attributable to just two retailers. The large majority of electricity retailers have met their obligations to surrender certificates.

See *Ensuring the integrity of demand* on page 63 for more information.

Impact on electricity prices

In addition to assessing progress towards the target, we are required to report on the impact of the Large-scale Renewable Energy Target on electricity prices in our 2016 annual statement (see page 9).

Three key factors influence electricity prices:

- wholesale and retail electricity costs
- network charges, and
- environmental policies (Large-scale Renewable Energy Target, Small-scale Renewable Energy Scheme, feed-in tariffs and state-based schemes).

As shown in table 8, the Large-scale Renewable Energy Target accounted for an estimated 2.8 per cent (or an average $9.38 per quarter) of the average household electricity bill in 2016. This is an increase of $2.25 per quarter from 2015. This increase is consistent with the trajectory towards the 2020 target.

Table 8: Impact on electricity prices in 2015 and 2016

Year	Percentage of electricity prices accounted for by the Large-scale Renewable Energy Target	Average cost per quarter in average household electricity bill
2015	1.9 per cent	$7.13
2016	2.8 per cent	$9.38

Source: Australian Energy Market Commission 2016 Residential Electricity Price Trends

Modelled trajectory to 2020

The build trajectory in our model is one possible pathway to meet the target with adequate market health on the journey. A number of other potential trajectories can result in the 2020 target being met. The combination of technologies, investors, project proponents and electricity retailers will determine how the target is delivered.

Each year the model used to assess this trajectory is recalibrated, updated with the most recent data and analysis available relating to supply and demand, including the forecasts we commission for the renewable power percentage.

On the supply side, the inputs for our trajectory include the supply of existing large-scale generation certificates held by market participants, the modelled future supply of certificates from existing large-scale renewable energy power stations, and the future supply of certificates from the committed and probable projects we know about.

On the demand side, inputs include the total statutory demand under the Renewable Energy Target and additional demand from a range of contracts for voluntary surrender including Greenpower and desalination plants. See *Spotlight...Extra demand for renewable energy certificates* on page 18 for more information.

Updating elements of supply and demand each year provides a clear indication of progress based on:

Additional generation required—we contrast existing supply against expected total demand to estimate how much additional generation is required each year to meet the annual target. Table 9 shows our assumptions for wind and solar construction as well as capacity factors to determine their contribution to future build.

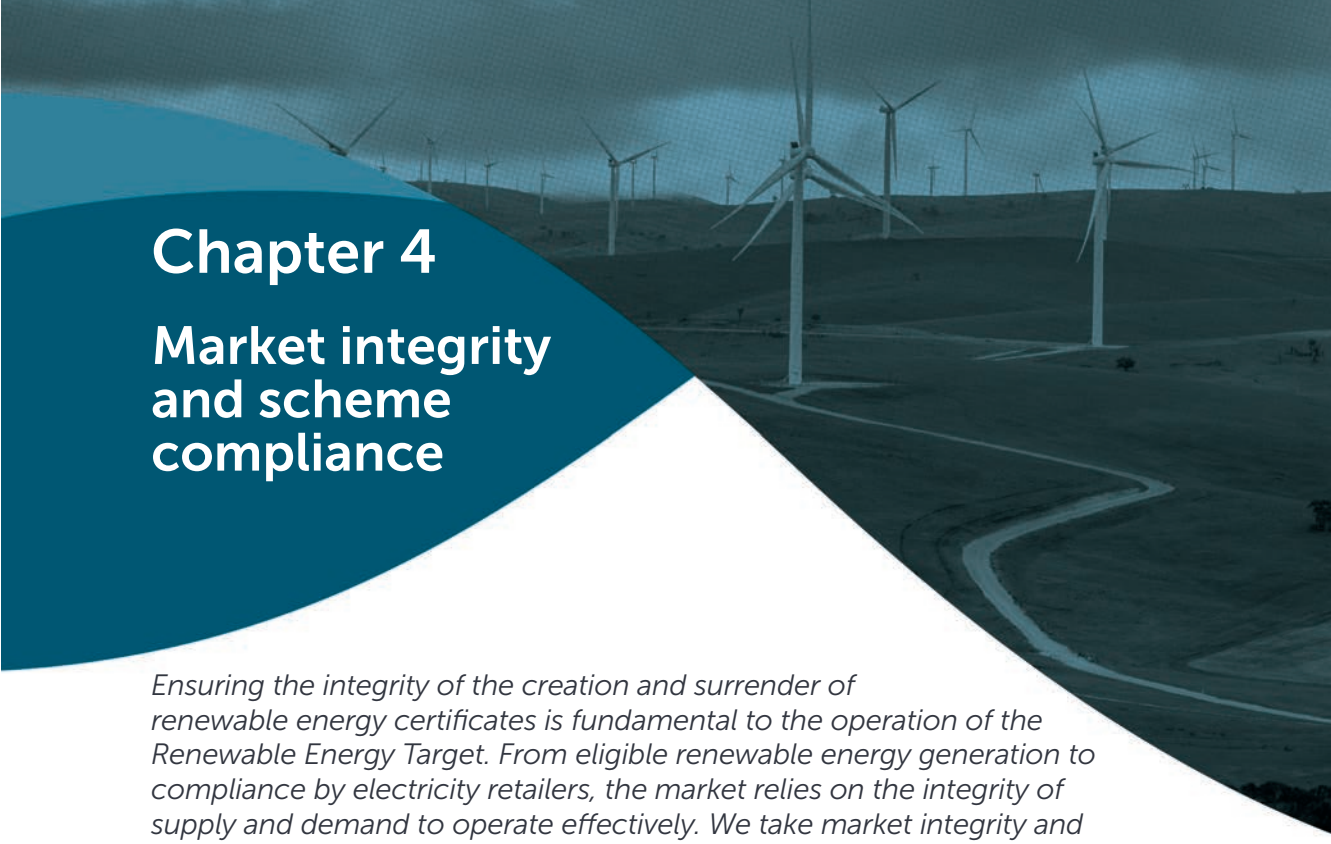
Table 9: Assumptions for additional generation required

Fuel type	Construction time	Capacity factor	Percentage of future build
Wind	18 months	38 per cent	65 per cent
Solar	12 months	25 per cent	35 per cent

Additional demand—demand for certificates from GreenPower and desalination contracts is assumed to remain steady until 2020. Demand associated with various ACT auctions is based on information published by the ACT Government.

Existing supply—existing supply between 2017 and 2020 incorporates actual and expected generation above baseline, and the capacity that has been committed in 2016. This includes assumptions addressing potential variability in generation from hydro and other renewable sources.

Based on these inputs the model generates residual capacity that is required to balance supply and demand and maintain a modest level of liquidity. In round terms a total commitment of 3000 megawatts in 2017 and 1000 megawatts in 2018—in addition to the 2016 committed and probable—would enable the 2020 target to be met.



Chapter 4

Market integrity and scheme compliance

Ensuring the integrity of the creation and surrender of renewable energy certificates is fundamental to the operation of the Renewable Energy Target. From eligible renewable energy generation to compliance by electricity retailers, the market relies on the integrity of supply and demand to operate effectively. We take market integrity and scheme compliance very seriously and have established various monitoring, compliance and enforcement systems.

Ensuring the integrity of supply

As discussed in *Chapter 3 Australia's Renewable Energy Target*, under the Renewable Energy Target, renewable energy must be generated by accredited large-scale renewable energy power stations or eligible small-scale systems.

Only validated renewable energy certificates can be traded in the market. We validate certificates to confirm they represent the correct amount of eligible renewable energy generation.

Creation of large-scale generation certificates

To ensure each large-scale generation certificate reflects one megawatt hour of renewable energy generation, we assess the accreditation of a power station, and creation of certificates. We reconcile this information annually with metered electricity generation data and crosscheck with a range of data sources. We also conduct compliance visits.

To participate in the Large-scale Renewable Energy Target and be eligible for large-scale generation certificates, a large-scale renewable energy power station must be accredited. To receive accreditation, a large-scale renewable energy power station will be assessed against the following requirements:

- the operators meet the 'fit and proper person' criteria
- electricity will be generated from at least one of the eligible renewable sources (such as wind or solar)

- the system is designed to accurately measure the renewable energy generated, and deduct electricity generated using non-renewable sources or used for auxiliary generators
- the generator is large (if so, a marginal loss factor must be defined by the Australian Energy Market Operator or the Independent Market Operator), and
- all relevant Commonwealth, state and local approvals have been obtained.

Once accredited, the large-scale renewable energy power station can create large-scale generation certificates in proportion to the eligible renewable electricity it generates, in accordance with the methodology agreed with the power station.

We validate the certificates based on desktop audits including assessing the metered electricity generation data submitted by the power station.

Each year, the power station must submit an electricity generation return statement, covering the previous year. We assess the statement on:

- the number of large-scale generation certificates created reflects the actual megawatt hours of eligible renewable energy generated
- any non-renewable energy sources or marginal loss factor has been adequately included in calculations, and
- if there has been any contraventions of Commonwealth, state, territory or local government law relating to the operation of the power station during the reporting year.

We are authorised to perform compliance visits[41] to substantiate information provided during the accreditation, large-scale certificate creation or electricity generation return processes. We do this with the consent of the registered person or in accordance with a monitoring warrant issued under the *Renewable Energy (Electricity) Act 2000*.

We also crosscheck electricity generation data with information from the Australian Energy Market Operator and National Greenhouse and Energy Reporting Scheme.

Creation of small-scale technology certificates

Under the Small-scale Renewable Energy Scheme, eligible small-scale renewable energy systems may be entitled to small-scale technology certificates, which can be sold to recover a portion of the cost of purchasing and installing the system.

Small-scale technology certificates are created upfront for small-scale systems based on the deeming period (see page 42).

Individuals and businesses can register to create and trade their own certificates. However, most assign their right to do so to registered agents in return for a discount on the system they are installing.

41 Part 11 of the *Renewable Energy (Electricity) Act 2000*.

Several validation processes occur on certificate creations to ensure that certificates are only validated for eligible small-scale system installations. This includes taking a risk-based approach to auditing certificate creations, using a combination of system and manual checks prior to validating certificates.

In 2016 we introduced automated data exchange with partners including the Australian Energy Market Operator, to further enhance our capability to detect fraud.

The exchange of data with the Australian Energy Market Operator enables us to examine electricity production data to determine whether a small-scale renewable energy system is operating.

SPOTLIGHT...
Serial number validation pilot

The Solar Photovoltaic (Panel) Serial Number Validation Project intends to establish a mechanism that allows businesses in the supply chain to validate the authenticity of solar panels. This aims to protect the integrity of the Small-scale Renewable Energy Scheme and industry by addressing concerns relating to some unapproved panels entering the market.

In 2016, we sought Expressions of Interest for a pilot. Participants in the pilot are investing their own funds to build a new installer application and new validation database. We expect the pilot to begin in mid-2017.

The installer application, for use on mobile devices, will allow installers to collect details of a solar panel system installation while on site and registered agents will submit the details to us. The validation database service will provide confidence to installers that the panels they are using are genuine by verifying solar panel details and providing a digitally signed confirmation of the products. The installer or retailer can then provide proof to their customer.

The project is an excellent example of our agency partnering with industry and service providers to develop a solution to an issue that has the potential to impact consumers and the integrity of the industry.

If the pilot is successful it will provide installers and agents with confidence that they are meeting their obligations under the Small-scale Renewable Energy Scheme, and provide a level of assurance for consumers that they are getting the system they paid for.

Until the pilot is proven and fully implemented, we will increase manual audits of serial numbers with manufacturers.

Our partnership with industry to validate solar panel serial numbers will also further improve our ability to detect and prevent fraud. The validation of solar panel serial numbers by manufacturers provides confidence these solar panels meet scheme eligibility requirements for small-scale technology certificates, as well as providing additional assurances for industry, businesses and homeowners.

Small-scale system compliance

We provide a range of education and support activities to inform participants and broader industry of their obligations under the Small-scale Renewable Energy Scheme.

In 2017, we intend to apply a broader range of tools to monitor and respond to non-compliance. This will include:

- increasing the use of our compliance monitoring powers
- applying administrative sanctions to prevent further non-compliance, and
- pursuing criminal prosecution and civil enforcement penalties for instances of serious non-compliance.

These capabilities will reduce the risk associated with scheme compliance and fraud, and streamline our validation processes.

Small-scale system fraud

We are serious about maintaining integrity in the Small-scale Renewable Energy Scheme. This includes detecting and preventing fraud by claiming certificates for a system that does not meet all eligibility criteria.

We actively investigate allegations of breaches of the *Renewable Energy (Electricity) Act 2000* and collaborate as needed with our regulatory partners.

Most matters investigated related to the improper creation of small-scale technology certificates for solar panel system installations, including providing false details, forging signatures, using unapproved panels and not installing systems as claimed.

Two cases previously referred to the Commonwealth Director of Public Prosecutions remain open.

2016 FAST FACTS

Of the **3441 systems** inspected, less than **2.5 per cent** were found to be unsafe.

A word from the industry

IMPROVING SAFETY AND STANDARDS FOR SOLAR PANELS IN AUSTRALIA

For a small-scale system to be eligible for the Small-scale Renewable Energy Scheme, it must have an accredited designer and installer.

The Clean Energy Council is the peak body for the clean energy industry in Australia. It provides the Solar Accreditation qualifications for individuals to install systems that are eligible under the Renewable Energy Target. System components, including the inverter and solar panels, must also be on the Clean Energy Council's list of approved products.

To ensure the quality of solar panel installations on homes and businesses, the Clean Energy Council runs training and professional development programs for its accredited installers. It also takes action against installers as necessary. For example, in 2016 the Clean Energy Council took action against 66 installers who were required to prove competency, and suspended accreditation of 14 installers as a result.

During 2016, the Clean Energy Council also made changes to the standards for products on its approved products list to improve consumer and safety standards. This led to removing a significant number of outdated product lines from the list.

In addition, a new inverter standard now requires smarter inverters that enable solar and storage systems to provide services that better assist with management of the grid.

With this tightening of safety standards and product quality, the number of inverters on the Clean Energy Council approved product list is now 532 (reduced from 1526) and there are now 37 approved suppliers (reduced from 95).

The Clean Energy Council has also established an independent committee to review any decisions it makes regarding the approved products list. The Product Listing Review Panel will hear any appeals against these decisions. The panel consists of three members, all of whom are independent from suppliers and the Clean Energy Council.

The **Clean Energy Council** provided this content.

Photo: supplied by the Clean Energy Regulator.

Small-scale system inspections

Each year contracted service providers[42] inspect a sample of small-scale generation systems to check they meet the requirements under the scheme, including a focus on relevant standards for electrical safety. We provide inspection results to the relevant state and territory electrical safety regulators, who are responsible for electrical safety. The Clean Energy Council, which manages accreditation of solar panel system installers, can also access the inspection reports. All inspectors hold unrestricted electrical licences in the state or territory where they conduct inspections, as well as Clean Energy Council accreditation.

Most inspections are of solar panel systems on residential rooftops, with a small proportion of commercial sites and schools also inspected. The majority of small-scale systems are randomly selected from all installations within geographical regions. A small number of additional systems in 2016 were selected for inspection due to suspicion of fraud.

If an inspector finds an unsafe system, they are required to render it safe and then notify all interested parties of the extent and nature of the safety risk, including the home or business owner and relevant state and territory electrical safety regulator.

Table 10: Inspections of small generation systems in 2016

State	Number of systems inspected	Systems safe	Systems unsafe	Systems sub-standard
ACT	24	21	0	3
NSW	786	616	28	142
NT	25	19	1	5
QLD	1081	772	31	278
SA	309	246	2	61
TAS	46	37	2	7
VIC	614	481	10	123
WA	556	401	12	143
Total	**3441**	**2593**	**86**	**762**

Note: See the glossary for unsafe and sub-standard definitions.

As shown in table 10, a total of 86 systems were found to be unsafe and 762 were found to be substandard in 2016. This represents a material improvement (2.5 per cent in 2016 compared with 6 per cent in 2015) in the safety of inspected systems and indicates that the requirement since 2015 to install a rooftop shroud to protect the DC isolator from water has been of benefit. More consistent inspections have resulted in a small increase in systems classed as sub-standard.

42 Contracted service providers in 2016 were Global Sustainable Energy Solutions, Master Electricians Australia, the Australian Solar Council, IT Power, Techsafe and SpringCity.

Most unsafe and sub-standard systems are due to water entering direct current isolator switch enclosures, and installers failing to ensure that all direct current wiring in the building is enclosed in heavy duty conduit. We continue to work to address these issues with the Clean Energy Council and state and territory electrical safety regulators who are responsible for installation safety and quality.

Ensuring the integrity of demand

Electricity retailers must meet their liability obligations to surrender certificates under the Renewable Energy Target for the scheme to function effectively.

The intent of the scheme is to increase the additional generation of electricity from renewable sources in Australia.

We view the intentional failure to surrender certificates as a failure to comply with the spirit of the law as it undermines the objectives of the scheme. Payment of the shortfall charge does not incentivise additional renewable source electricity generation, does not support the purpose of the *Renewable Energy (Electricity) Act 2000*, or contribute to the 2020 target.

We use a range of analytics and information to monitor the preparedness of electricity retailers to comply in the lead up to the legislative surrender deadline for large-scale generation certificates. This includes active communication and questioning of electricity retailers, with follow-up engagement where we believe they may intend not to acquit their liability by surrendering certificates.

We also have systems and partnerships in place to review the accuracy of information electricity retailers provide as part of meeting their liability requirements. This includes crosschecking data with the Australian Energy Market Operator and reviewing company disclosures to other regulators.

We impose penalty interest when shortfall charges are not paid on time and, if necessary, proceed with standard debt collection practices to recover unpaid amounts.

Eligibility for exemptions

Companies that carry out specified emissions-intensive trade-exposed activities are eligible for Renewable Energy Target exemption[43].

An exemption is granted for activities that produce products for the global market, to ensure they are not disadvantaged in competition with overseas facilities that may not have the same obligations.

An exemption is determined based on activity production levels (for example, tonnes of metal from a metal production facility) for the two financial years prior to the exemption year. A legislated factor for the activity determines the exemption. From 2010 to 2014 activities received partial exemption. As of 2015, certain activities are fully exempt.

43 Emissions-intensive trade-exposed activities are specified in the Renewable Energy (Electricity) Regulations 2001. A complete list of activities and corresponding exemptions is on our website at www.cleanenergyregulator.gov.au.

Applications are assessed against the requirements of the *Renewable Energy (Electricity) Act 2000*. Applications for exemptions above a certain level must include an audit report. Successful applicants receive exemption certificates for the electricity (megawatt hours) they are exempt.

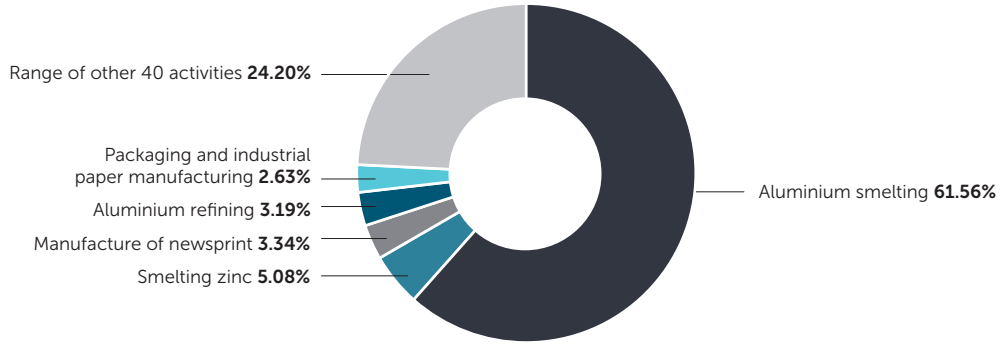
They provide the exemption certificates to the electricity retailer that supplies them with the electricity used for their emissions-intensive trade-exposed activity. The electricity retailer then uses these exemption certificates to reduce their reported electricity acquisitions under the Renewable Energy Target.

2016 FAST FACTS

A total of **188 exemption** certificates were issued, totalling **41 137 443 megawatt hours**.

A total of 45 activities received exemption, as shown in graph 8. Aluminium smelting again accounted for most of the exemption.

Graph 8: Emissions-intensive trade-exposed activities in 2016



Meeting obligations as a liable entity

Obligation to report on electricity acquired

A total of 119 electricity retailers were required to report on the electricity they acquired during 2016. This was one less than the 120 electricity retailers who reported in 2015.

By 14 February 2017—the final surrender date for 2016 liability—97.5 per cent of electricity retailers had submitted their energy acquisition statements.

The total energy acquisition reported in the lodged statements was 172 433 418 megawatt hours, comprising 212 662 962 megawatt hours of relevant electricity minus 41 074 054 megawatt hours of exemptions (see page 63) in 2016.

Surrender of renewable energy certificates

The combined compliance rate for electricity retailers meeting their 2016 obligations by surrendering large-scale generation certificates and small-scale technology certificates was 93.8 per cent. This compares with the 99.7 per cent liability compliance rate in 2015.

The number of certificates that electricity retailers need to surrender each year depends on the renewable power percentage and small-scale technology percentage (see page 20).

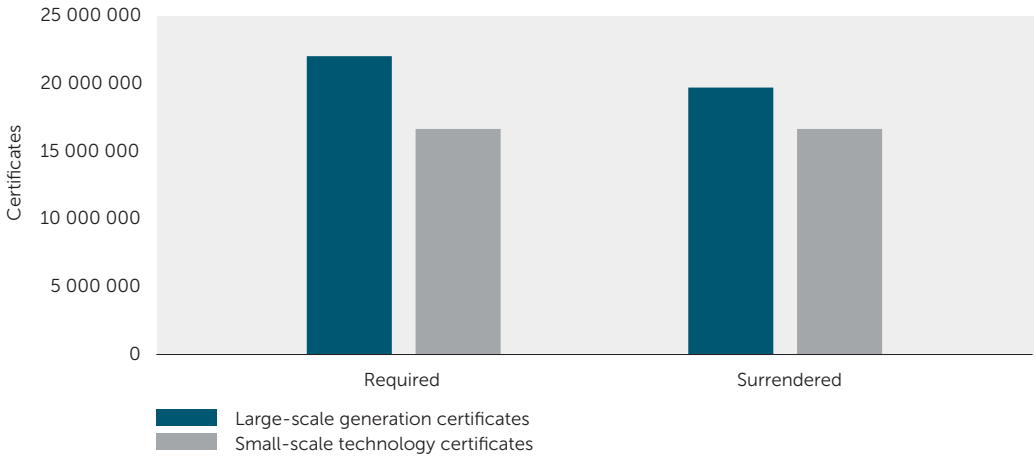
The 2016 renewable power percentage was 12.75 per cent. This means that electricity retailers needed to surrender a total of 21.43 million large-scale generation certificates.

The 2016 small-scale technology percentage was 9.68 per cent. This means that electricity retailers needed to surrender 16.95 million small-scale technology certificates.

By 14 February 2017, electricity retailers had surrendered 19 676 342 million large-scale generation certificates (89.3 per cent compliance) and 16 678 285 million small-scale technology certificates (99.9 per cent compliance).

Electricity retailers who failed to submit their required number of certificates must lodge a shortfall statement and pay a shortfall charge (see page 54).

Graph 9: Certificate surrender in 2016



Certificates surrendered for other reasons

Owners of certificates can choose to surrender certificates for any reason.

For example, they may choose to support the generation of electricity from renewable energy sources over and above the Renewable Energy Target. This is known as voluntary surrender. See *Spotlight... Extra demand for renewable energy certificates* on page 18 for more information.

2016 FAST FACTS

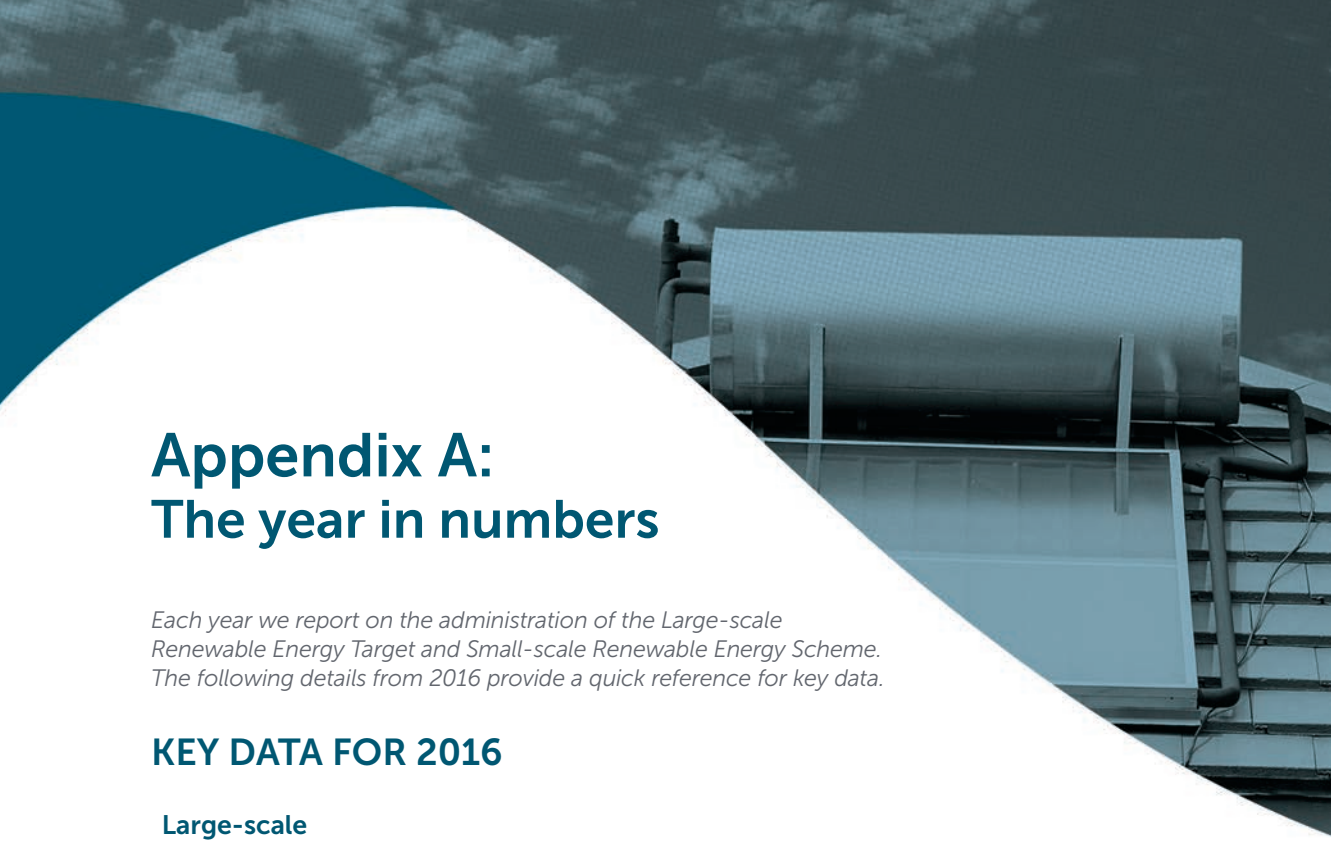
94 per cent compliance with certificate surrender obligations.

As table 11 shows, in 2016 a total of 1 133 669 certificates (representing 70 transactions) were voluntarily surrendered in the REC Registry, the majority (1 092 066) for GreenPower. More than 99 per cent of these were large-scale generation certificates.

This compares with 1 324 434 certificates (representing 114 transactions) in 2015, with 98 per cent being large-scale generation certificates.

Table 11: Voluntary surrender of renewable energy certificates by type in 2016

Type of certificate	Number of certificates surrendered
Large-scale generation certificates, GreenPower	1 092 066
Large-scale generation certificates, desalination	3735
Large-scale generation certificates, altruistic	30 112
Small-scale technology certificates, previous non-compliance	7601
Small-scale technology certificates, altruistic	155
Total	**1 133 669**



Appendix A: The year in numbers

Each year we report on the administration of the Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme. The following details from 2016 provide a quick reference for key data.

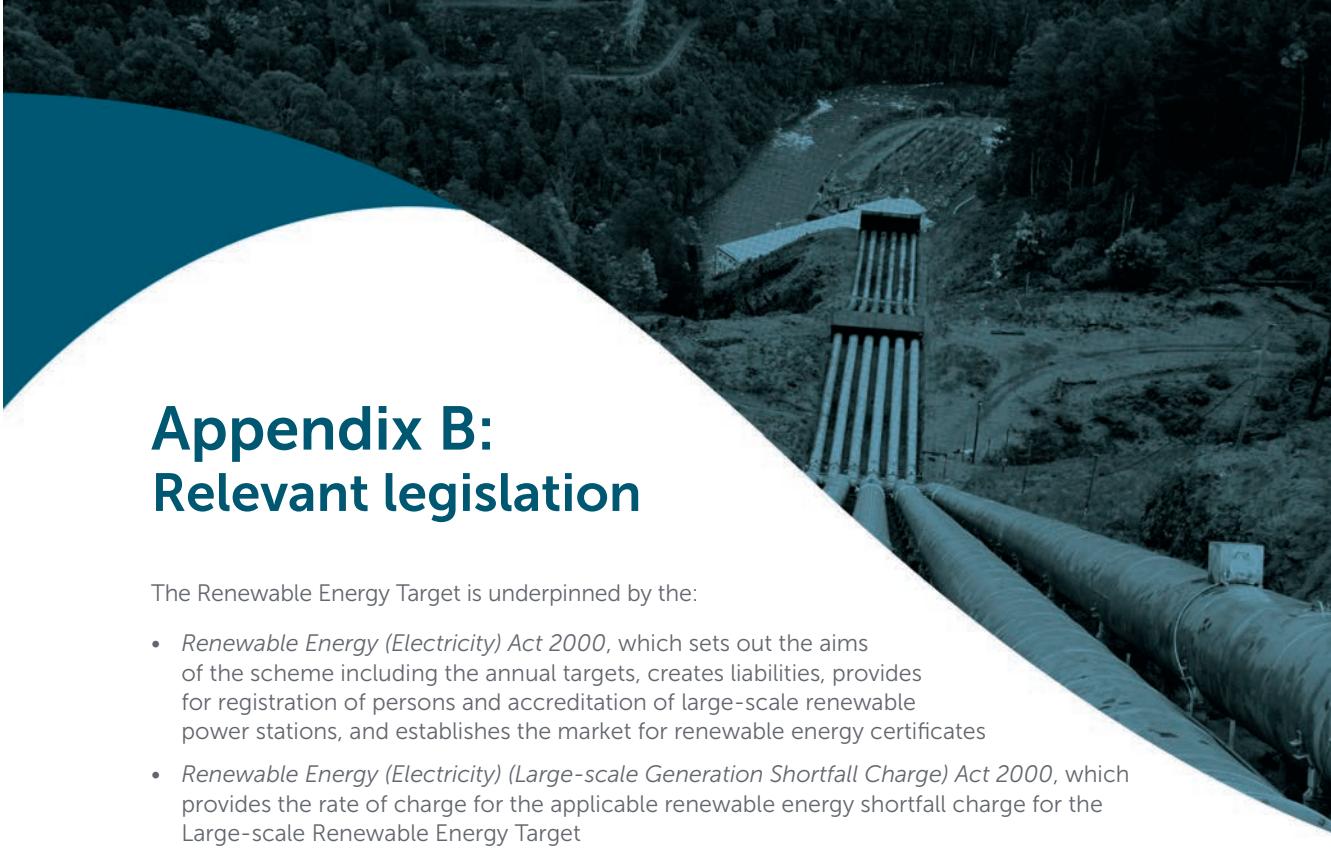
KEY DATA FOR 2016

Large-scale

Supply	Large-scale renewable energy power stations accredited	98
	Large-scale renewable energy power stations by energy source	86 solar 5 wind 3 hydro 4 biomass (1 agricultural waste, 3 landfill gas)
	Large-scale renewable energy power station capacity	494 megawatts
	Total number of large-scale renewable energy power stations	587
	Cumulative capacity of all large-scale renewable energy power stations	14 157 megawatts
	Committed and probable construction of new large-scale renewable energy power station capacity	2069 megawatts
	Large-scale generation certificates validated	17 320 821
Demand	Large-scale generation certificates surrendered	19 676 342
	Number of large-scale generation certificates voluntarily surrendered (mainly for GreenPower)	1 125 913
	Large-scale Renewable Energy Target compliance rate	89.3 per cent

Small-scale

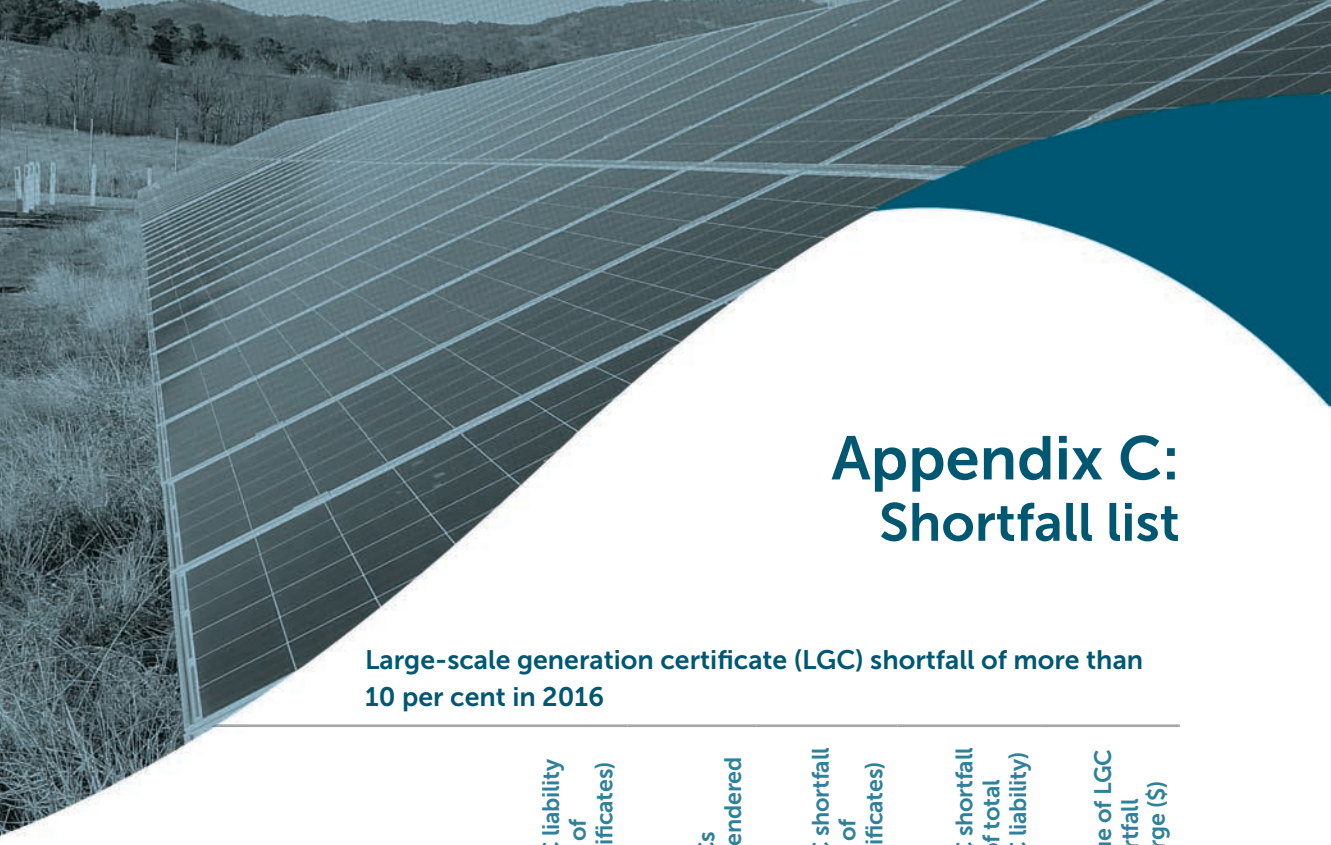
Supply	New small-scale systems installed	182 173
	Total capacity for small generation units installed	707 megawatts
	Cumulative capacity for small generation units	5 426 megawatts
	Small-scale systems by type	127 333 solar panel systems 39 806 solar water heaters 15 025 air source heat pumps 9 wind systems
	Average capacity of solar panel systems	5.6 kilowatts
	Number of residential (0–10 kilowatt) solar panel system installations in 2016	119 541
	Number of commercial (10–100 kilowatt) solar panel system installations	7792
	Total number of small-scale solar panel system installations	127 333
	Number of all small-scale solar panel system installations by state and territory	ACT 927 NSW 28 047 NT 1677 QLD 33 238 SA 12 018 TAS 2414 VIC 25 300 WA 23 712
	Total number of installed small-scale systems	2 661 839
	Small-scale technology certificates validated	16 111 973
Demand	Small-scale technology certificates surrendered	16 678 285
Market integrity	Inspections of small-scale systems	3441 inspection 86 unsafe 762 sub-standard
	Total number of registered agents	1658
	Total number of registered persons	7773



Appendix B:
Relevant legislation

The Renewable Energy Target is underpinned by the:

- *Renewable Energy (Electricity) Act 2000*, which sets out the aims of the scheme including the annual targets, creates liabilities, provides for registration of persons and accreditation of large-scale renewable power stations, and establishes the market for renewable energy certificates
- *Renewable Energy (Electricity) (Large-scale Generation Shortfall Charge) Act 2000*, which provides the rate of charge for the applicable renewable energy shortfall charge for the Large-scale Renewable Energy Target
- *Renewable Energy (Electricity) (Small-scale Technology Shortfall Charge) Act 2010*, which provides the rate of charge for the applicable renewable energy shortfall charge for the Small-scale Renewable Energy Scheme, and
- Renewable Energy (Electricity) Regulations 2001, which provide details on issues including eligibility criteria for renewable energy sources, set the rate of liability and therefore demand for certificates, and provide criteria for accreditation of large-scale renewable energy power stations and eligibility requirements for small-scale systems.



Appendix C: Shortfall list

Large-scale generation certificate (LGC) shortfall of more than 10 per cent in 2016

Liable entity	LGC liability (no. of certificates)	LGCs surrendered	LGC shortfall (no. of certificates)	LGC shortfall (% of total LGC liability)	Value of LGC shortfall charge ($)
ERM Power Retail Pty Ltd	2 255 827	354 588	190 000	84.22%	123 500 000
Alinta Energy Retail Sales Pty. Ltd	344 982	221 930	123 052	35.66%	7 998 380
Alinta Sales Pty Ltd	217 871	140 331	77 539	35.58%	5 040 035
Qenergy Limited	62 671	-	62 671	100%	4 073 615
CovaU Pty Limited	26 658	77	26 581	99.71%	1 727 765
Next Business Energy Pty Ltd	17 962	-	17 962	100%	1 167 530
Online Power & Gas Pty Ltd	17 015	241	16 728	98.31%	1 087 320
COzero Energy Retail Pty Ltd	15 887	-	15 887	100%	1 032 655
GoEnergy Pty Ltd	14 485	-	14 485	100%	941 525
SparQ Pty Ltd	7836	-	7836	100%	509 340
People Energy Pty Ltd	6349	-	6129	96.53%	398 385
1st Energy	5483	508	4973	90.69%	323 245
Globird Energy Pty Ltd	3675	-	3675	100%	238 875
Sanctuary Energy Pty Ltd	3328	-	3328	100%	216 320
OzGen Retail Pty Ltd	3181	-	3181	100%	206 765

Large-scale generation certificate (LGC) shortfall of less than 10 per cent in 2016

Liable entity	LGC liability (no. of certificates)	LGCs surrendered	LGC shortfall (no. of certificates)	LGC shortfall (% of total LGC liability)	Value of LGC shortfall charge ($)
Perth Energy Pty Ltd	228 567	200 400	22 852	9.99%	-
Blue NRG Pty. Ltd.	47 307	42 800	4507	9.52%	-
IPOWER 2 PTY LIMITED and IPOWER PTY LIMITED TA Simply Energy	476 431	432 123	44 308	9.29%	-
Amanda Energy Pty Ltd	10 693	10 000	693	6.48%	-
GridX Power Pty Ltd	3103	2951	152	4.89%	-
Progressive Green Pty Ltd	36 658	36 240	394	1.07%	-
Karara Energy Pty Ltd	183	17 123	183	0.45%	-

Glossary

Air source heat pumps

Air source heat pump water heaters transfer heat from air outside the unit to water stored inside the unit. The air heats a special type of refrigerant (not a CFC) and the energy is used to heat the water.

Bagasse

Bagasse is the fibrous waste left from the crushing of sugar cane, which is used as a fuel source to generate renewable energy under the Renewable Energy Target.

Baseline

The baseline is the amount of electricity above which an accredited large-scale renewable energy power station can begin to create large-scale generation certificates. We determine baselines under the Renewable Energy (Electricity) Regulations 2001.

Biomass

Biomass is a consolidation of a number of fuel types including agricultural waste, bagasse, biomass-based components of municipal solid waste, black liquor, energy crops, food processing waste, food waste, landfill gas, sewage gas and biomass-based components of sewage, waste from processing agricultural products and wood waste.

Capacity factor

Capacity factor of a power station is the ratio of actual electricity generated (output) over a given period of time to the maximum possible electricity generation (output) over the same period of time.

Certificate spot price

Certificate spot price refers to the current market price for certificates. Large-scale generation certificates are traded through the wholesale market in parcels, with a minimum parcel size of 5000 certificates.

Committed projects

Committed projects refers to large-scale renewable energy projects that have received all development approvals and reached a final investment decision according to the commercial understanding of the term.

Direct current isolator switch

Direct Current (or DC) isolators are switches used to stop electrical currents from being supplied to or from certain equipment, such as solar panels and inverters, during installation and repairs.

Displaced/displacement

The estimated reduction in demand for electricity from the grid that results from the installation of a solar water heater or air source heat pump.

Electricity retailers

See *liable entity.*

Energy acquisition statement

Entities liable under the Renewable Energy Target are required to report all relevant acquisitions of energy (relevant electricity use) they have made throughout the previous calendar year. These energy acquisition statements are due between 1 January and 14 February each year.

Enforceable undertaking

An enforceable undertaking is a voluntary binding agreement that allows an individual or organisation to mitigate, avoid or compensate for a contravention of the law, without going through litigation.

Generation from accredited renewable energy power stations

Accredited renewable energy power stations can report their renewable energy generation and create large-scale generation certificates no later than 12 months after the calendar year in which the generation occurred. The above baseline generation number published in this report refers to generation for the calendar year that has had large-scale generation certificates validated against it. This number will continue to rise due to the 12-month creation rule.

Greenhouse gas emissions

Greenhouse gas emissions refers to gases produced from human activity, such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). These emissions alter the natural greenhouse effect and encourage atmospheric warming.

The greenhouse effect is created by naturally occurring gases such as water vapour (H_2O) that insulate the Earth, preventing the sun's heat from escaping and keep the Earth at liveable temperatures.

GreenPower

GreenPower is the only voluntary state and territory government accredited program that enables electricity providers to purchase renewable source electricity on behalf of households or businesses. A joint initiative of the governments of the Australian Capital Territory, New South Wales, South Australia, Victoria and Tasmania, GreenPower guarantees that the renewable source electricity consumers buy from energy suppliers meets stringent environmental standards.

Kilowatt

A kilowatt is a measurement of power. Power is the rate at which the energy is generated or used. One kilowatt is equal to 1000 watts

Kilowatt hour

A kilowatt hour is a measure of electrical energy equivalent to a power consumption of 1000 watts for one hour.

Large-scale generation certificates validated

This represents the number of certificates assessed and approved by the Clean Energy Regulator in a relevant period. This does not account for when certificates were created or when the renewable energy generation (above baseline) occurred. This is used to track progress towards the 33 000 gigawatt target, as validated certificates can then be used by electricity retailers to meet their obligations against the target, after the fee is paid for registration.

Liable entity

A person who, during a year, makes a relevant acquisition of electricity is called a liable entity. Liable entities are mainly electricity retailers, so are referred to as such throughout this report.

Megawatt

A megawatt is a measurement of power. Power is the rate at which the energy is generated or used. One megawatt is equal to 1000 kilowatts.

Megawatt hour

A megawatt hour is a measure of electrical energy equivalent to a power consumption of 1000 kilowatts for one hour.

Offtake agreement

See *power purchase agreement*.

Photovoltaic system

A photovoltaic (PV) system, also known as a solar PV power system or PV system, is a power system designed to convert sunlight into usable electrical power by means of photovoltaic cells.

Power purchase agreement

A power purchase agreement is a contract between two parties, one which generates electricity (the seller) and the other looking to purchase electricity (the buyer). Under the Renewable Energy Target the seller is often the operator of a large-scale renewable energy power station, and the buyer is often an electricity retailer (liable entity).

Probable projects

Probable projects have a high degree of confidence that they will proceed following a public announcement of a power purchase agreement with a strong counter party or other evidence of funding.

Reduced acquisitions

Relevant acquisitions of electricity minus exemption certificates. In this report we mainly refer to relevant electricity used.

Registered person

Individuals and companies must apply to us to become a registered person in order to create renewable energy certificates, apply for accreditation of a large-scale renewable energy power station, or apply to be an agent.

Registered agent

Retailers, traders and installers who wish to help individuals and small businesses install a small-scale system at their premises and claim the small-scale technology certificates must apply to us to become a registered agent.

Renewable energy certificate

Renewable energy certificate refers to both large-scale generation certificates and small-scale technology certificates.

Renewable power percentage

The basis, set out in the Renewable Energy (Electricity) Regulations 2001, for calculating the number of large-scale generation certificates that a liable entity must purchase in a given year.

Shortfall charge

Liable entities who fail to meet their compliance obligations under the Renewable Energy Target are required to pay a shortfall charge. This charge is non-tax deductible, and must be paid at the rate of $65 per megawatt hour of the shortfall amount.

Small-scale technology percentage

The basis, set out in the Renewable Energy (Electricity) Regulations 2001, for calculating the number of small-scale technology certificates that a liable entity must purchase in a given year.

Solar panels

A panel designed to absorb the sun's rays as a source of energy for generating electricity or heating.

Sub-standard

A sub-standard small-scale system does not meet key clauses in the Clean Energy Council standards and requirements for installation, or relevant Australian Standards, and may lead to premature equipment failure or other issues. The installation work and or equipment should be improved. The system owner should contact the installation company or a qualified installer to rectify the items listed for improvement.

Unsafe

An unsafe system has a safety hazard which poses an imminent risk to a person or property. The inspector shuts down the system and renders it safe. The inspector also advises the relevant state or territory regulatory authority of the nature and extent of the safety risk. The system owner should contact the installation company or a qualified installer to rectify the items listed for improvement.

Alphabetical index

Published by the Clean Energy Regulator

ISSN 2202–0047

This report reflects the efforts of many people. Special thanks to the staff of the Clean Energy Regulator and the external contributors as well as the following professional service providers:

- Writing and editing support by Cinden Lester Communications
- Indexing by Libraries Alive!
- Design and typesetting by Giraffe Visual Communication Management
- Printed by CanPrint Communications Pty Limited.

This report has been prepared in accordance with the requirements of section 105 of the *Renewable Energy (Electricity) Act 2000*. The data is accurate as at 21 February 2017. For up to date figures, please refer to the Clean Energy Regulator website.

Statements made by third parties in the report do not necessarily reflect the views and opinions of the Clean Energy Regulator.

Contact us

General enquiries:

Mail	GPO Box 621 Canberra ACT 2601
Phone	1300 553 542 if calling within Australia +61 2 6159 3100 if calling from overseas 13 14 50 translating and interpreting service 133 677 TTY service 1300 555 727 speak and listen service
Email	enquiries@cleanenergyregulator.gov.au
Website	www.cleanenergyregulator.gov.au

Enquiries about this report:

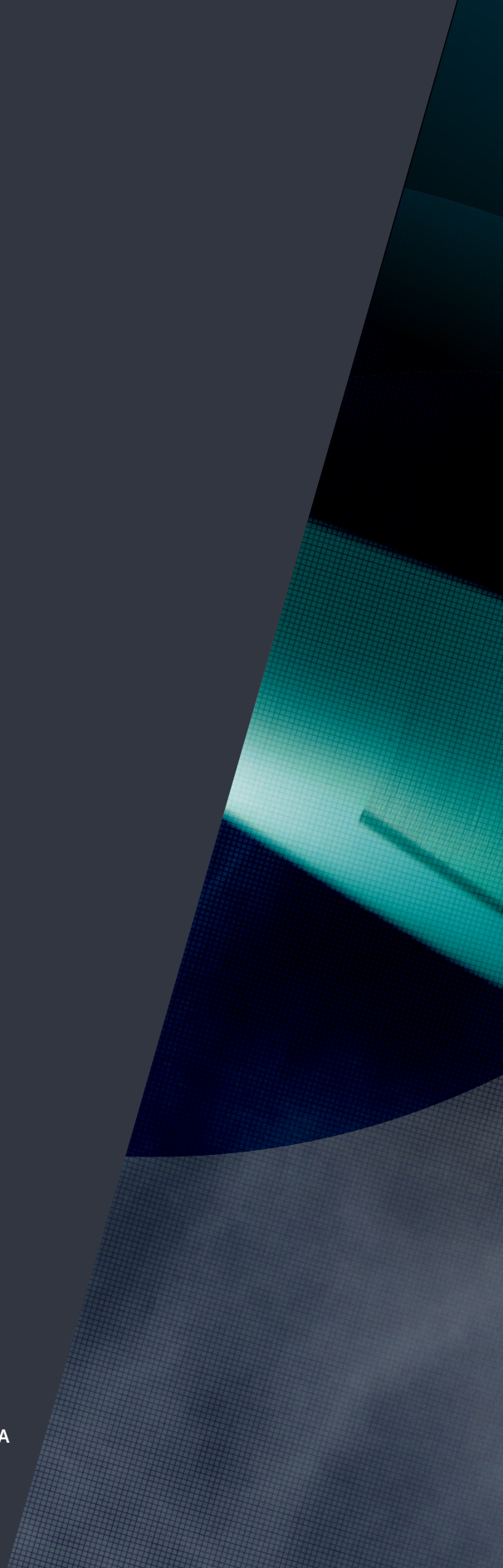
Manager, Communications Section
Business Operations Division
Clean Energy Regulator

02 6159 3100

Photo acknowledgements:

Uncaptioned photos: Supplied by the Clean Energy Regulator.

1300 553 542
CLEANENERGYREGULATOR.GOV.AU



ACCELERATING CARBON ABATEMENT FOR AUSTRALIA