Australian Government
Clean Energy Regulator

RENEWABLE ENERGY TARGET

Progress in 2017

Delivering Australia's 2020 Renewable Energy Target

Encouraging renewable energy in Australia

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 Alex Cowley, graphic designer, Clean Energy Regulator
- 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 2018. 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:

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:

Unless otherwise specified, all photos by Chris Oaten and the Clean Energy Regulator.

Cover photo: Kidston Solar Project, Genex Power, Queensland

Progress in 2017

Delivering Australia's 2020 Renewable Energy Target

Encouraging renewable energy in Australia

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 *Progress in 2017: Delivering Australia's 2020 Renewable Energy Target*, the 2017 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 2017 calendar year and includes the annual statement and supporting information about progress towards meeting the 2020 Large-scale Renewable Energy Target.

Yours sincerely

David Parker AM
Clean Energy Regulator Chair
31 May 2018

Contents

Photo: Capital Wind Farm, Infigen Energy, New South Wales

Chair's foreword

The Renewable Energy Target administrative report for 2017 documents a big year for renewable energy in Australia.

Key deliverables are outlined in the graphic on pages 4 and 5.

More than 2000 megawatts of additional renewable energy capacity was installed in 2017, across both the Small-scale Renewable Energy Scheme (1052 megawatts) and Large-scale Renewable Energy Target (1088 megawatts). This is more new capacity than any prior year.

We expect 2018 to be twice as big and that new capacity will provide extra supply of electricity, which should put downward pressure on electricity prices. Investment in large-scale solar has grown significantly and trends, like single-axis tracking and pairing with energy storage, are enabling power to be delivered when demand for electricity is high.

The transformation of energy systems that we are seeing in Australia is part of a global phenomenon of increased penetration of renewable generation into the electricity system.

Investment trends

In 2017, there was more than $AUD10 billion[1] invested in large-scale renewable energy in Australia.

1 Source: Clean Energy Council http://www.cleanenergycouncil.org.au/policy-advocacy/renewable-energy-target/jobs-and-investment.html

The surge in investment in 2017 that has continued in early 2018 means there will be enough new capacity to meet, and likely exceed, the 2020 Large-scale Renewable Energy Target of 33,000 gigawatt hours.

By the end of March 2018, more than 7500 megawatts of projects were operating or firmly announced. This pipeline of projects is 1100 megawatts more than required to meet the target. As of the publication of this report there is sufficient capacity built or being built to meet the target by 2020.

The recent expansion of utility scale solar has driven a remarkable shift in the make-up of the large-scale renewable energy market. In the first 15 years of the Renewable Energy Target, solar accounted for only four per cent of accredited capacity under the Large-scale Renewable Energy Target. Solar now makes up 46 per cent of the new large-scale build capacity announced since 1 January 2016. This is good news for the stability of the electricity grid as large-scale solar usually generates at its highest capacity during hot, sunny days when electricity demand can be high.

Businesses are also responding to rising energy costs and declining technology costs by investing in commercial and industrial sized solar systems in the Large-scale Renewable Energy Target. Systems in the 100 kilowatts to one megawatt range increased by 29 per cent from 2016.

The capacity of these systems increased by 66 per cent. Large-scale energy users are also starting to supply their own energy through renewables. One example is the construction of the 126.5 megawatt solar farm at Sun Metals Zinc Refinery in North Queensland.

This past year has seen the large-scale renewables industry respond to the need for greater system reliability. The roll out of large-scale batteries, integrating wind and solar on the same site, single-axis tracking solar technology and innovations in frequency control by wind farms means generation from the current renewables build will be less variable than previously observed. It is also increasingly able to provide frequency control and other system support services.

This year also saw a big increase in investment in the Small-scale Renewable Energy Scheme, with 41 per cent more capacity installed by households and businesses compared with previous year. The growth resulted from both more systems installed and the size of systems increasing. In 2012, the last time there was comparable installed capacity, the average system size was three kilowatts. This year, the average system size has increased to more than six kilowatts.

We do expect the growth in small-scale investment to continue in 2018, however, small-scale solar is a consumer-driven market so such predictions are inherently uncertain.

While not incentivised under the Renewable Energy Target, there has also been an increase in the number of batteries reported to have been installed with solar systems by households and businesses.

Innovation in regulation

Working with an evolving sector, it is important for us to ensure our regulatory practices and systems continue to adapt and keep pace with industry. In 2017, we focused on innovation and collaboration, and improved our compliance monitoring and regulatory approaches.

To support our agency's small-scale technology certificate processing, we partnered with the Australian Energy Market Operator to run algorithms over their data to verify whether a system has been installed (see page 38). A major innovation has been to work with industry to solve the shared problem of some substandard solar panels in the Australian market without needing more intensive regulation (see page 40). In collaboration with registered agents, we co-designed a competency and capability framework to be rolled out in 2018.

As we expect a significant increase in the volume of power station accreditations and large-scale generation certificate creations, we have begun a project to streamline application and validation processes. This will make it easier for our clients to apply for and receive their certificates in a more timely manner.

In line with advances in technology, we have reviewed our regulatory posture in applying legislation relating to Renewable Energy Target liability for grid-scale storage devices, including pumped hydro and chemical storage. This has improved the economics of investing in this technology and better aligns with the technical characteristics of storage.

This will be important for reliability as we see higher penetration of renewable electricity. We published updated guidance for participants on our website.

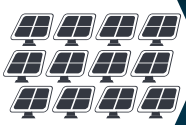
Looking forward

The 2020 Large-scale Renewable Energy Target is in sight. We congratulate the industry and participants for their tenacity to get to this position. Recently, we have seen some softening in the large-scale generation certificate spot prices and this trend is likely to continue as more capacity comes online. We will be keeping the market informed as key build milestones are passed. We will also continue to focus on innovative ways to ensure compliance in line with our legislation.

2017 SIGNIFICANT OUTCOMES

3870 megawatts
of committed projects announced

124
large-scale renewable energy power stations accredited, including **112** new solar power stations



1088 megawatts
of new accredited capacity for large-scale renewable energy power stations

19 million
large-scale generation certificates validated

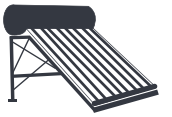
23.2 million
large-scale generation certificates surrendered to meet obligations

95.5%
on time certificate surrender

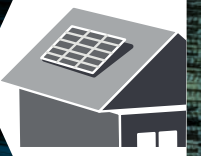
225,991
small-scale systems installed, with **2.9 million** small-scale systems now in Australia

12,446
new commercial-sized small-scale systems installed (10 to 100 kilowatts)

1052 megawatts
of installed capacity for small generation units



41%
increase in capacity of small-scale solar panel systems



11.4 million
megawatt hours of electricity generated or displaced from small systems

21.7 million
small-scale technology certificates validated

12.2 million
small-scale technology certificates surrendered to meet obligations

Photo: Solar installation, Adelaide Showground, South Australia

Annual statement

Progress in 2017 means Australia will meet the 2020 Large-scale Renewable Energy Target.

Owing to the significant progress made during 2017, the 2020 Large-scale Renewable Energy Target is on track to be achieved.

Overall findings

The momentum in new project announcements observed in late 2016 continued throughout 2017 with enough capacity now firmly announced to meet the Large-scale Renewable Energy Target of 33,000 gigawatt hours by 2020.

The portion of household electricity bills attributable to the Large-scale Renewable Energy Target was $8.13 per quarter for the average household electricity bill in 2017. Australian Energy Market Commission modelling also showed additional renewable energy in the market will reduce electricity costs over the next three years.

We expect the large-scale generation certificate spot price to moderate as new capacity comes on line.

Capacity

In the 2016 annual statement, we said 6000 megawatts was needed for the target to be met.[2] Our estimate of the required capacity has increased to 6400 megawatts[3] due to the surge in solar, which has a lower capacity factor[4] than wind. Hence, more capacity is required to achieve the same amount of electricity generation.

Nevertheless, by the end of 2017, 6535 megawatts of projects had been firmly announced which is sufficient to meet the target.

New capacity of 4927 megawatts had either been accredited or was under construction, and a further 1608 megawatts had a power purchase agreement and was expected to reach financial close and begin construction in 2018.

As the strong momentum has continued into early 2018, we believe more than the required build to meet the target will be under construction well before the end of 2018. This is ahead of schedule to the timing we initially said was needed to meet the target. A record 1088 megawatts of constructed projects were accredited and generating in 2017, more than double the capacity in 2016. Our expectation is that accredited capacity will more than double again in 2018. We continuously update the pipeline of project announcements on our website and provide regular updates to the market.[5]

As project commitments largely started in late 2016, certificate liquidity may remain relatively tight in 2018 and 2019. However, in our view, about five million certificates will still remain after the annual surrender date in each year. Hence, exceeding the capacity required to meet the target will improve certificate liquidity and provide the best prospects for redeeming shortfall charges within the allowable three-year period.

2 At this time, we estimated wind would make up 75 per cent of the pipeline and solar 25 per cent.

3 The current pipeline of projects is 54 per cent wind and 46 per cent solar.

4 See Glossary for further detail.

5 For more details, see http://www.cleanenergyregulator.gov.au

Photo: Tarraleah, Hydro Tasmania, Tasmania

Certificate prices

Large-scale generation certificate spot prices moved within the $76 to $89 range in 2017 and experienced some periods of volatility. The price was $85.25 at the end of 2017.

In 2017, 19.1 million large-scale generation certificates were validated and we expect this will increase to about 24 million in 2018 and likely around 32 to 34 million in 2019.

Following the annual surrender of certificates in February 2018, 9.4 million large-scale generation certificates remained available in the market, down from 13.4 million the previous year.

Demand in the Large-scale Renewable Energy Target remains the same from 2020 to 2030, so supply is expected to materially exceed demand at some stage, leading to lower large-scale generation certificate spot prices. The expectation of price declines over time are reinforced by the forward contract price curve and published power purchase agreement prices that remain far lower than the current spot price.

Liability

On time surrender of large-scale generation certificates improved to 93 per cent, up from 89 per cent the previous year. For the first time we saw some liable entities use the legislative allowance to carry forward less than 10 per cent of liability to the following year without paying the shortfall charge. Most entities have this option available to them and this will assist certificate liquidity over the next two years.

Household electricity prices

According to the Australian Energy Market Commission, the Large-scale Renewable Energy Target accounted for an estimated 2.4 per cent (or an average $8.13 per quarter) of the average household electricity bill in 2017. We estimate that there has been approximately a 12 per cent increase on previous years.

This is a result of large-scale generation certificate spot prices largely staying the same but the numbers of certificates required to meet the target increasing. However, it should be noted the additional renewable energy entering the market under the Renewable Energy Target is likely to reduce wholesale electricity costs in the National Energy Market in 2018–19 and 2019–20.[6]

Looking forward

A key feature of 2017 was that enough large-scale build was firmly announced to reach the Large-scale Renewable Energy Target. We expect 2018 and 2019 will see significant construction and the first generation from large-scale capacity.

Our expectation is about 2600 megawatts of large-scale capacity will be accredited in 2018 and at least another 2700 megawatts in 2019.[7]

We will continue to monitor and publish project announcements including those expected as a result of state processes that leverage the Large-scale Renewable Energy Target.[8]

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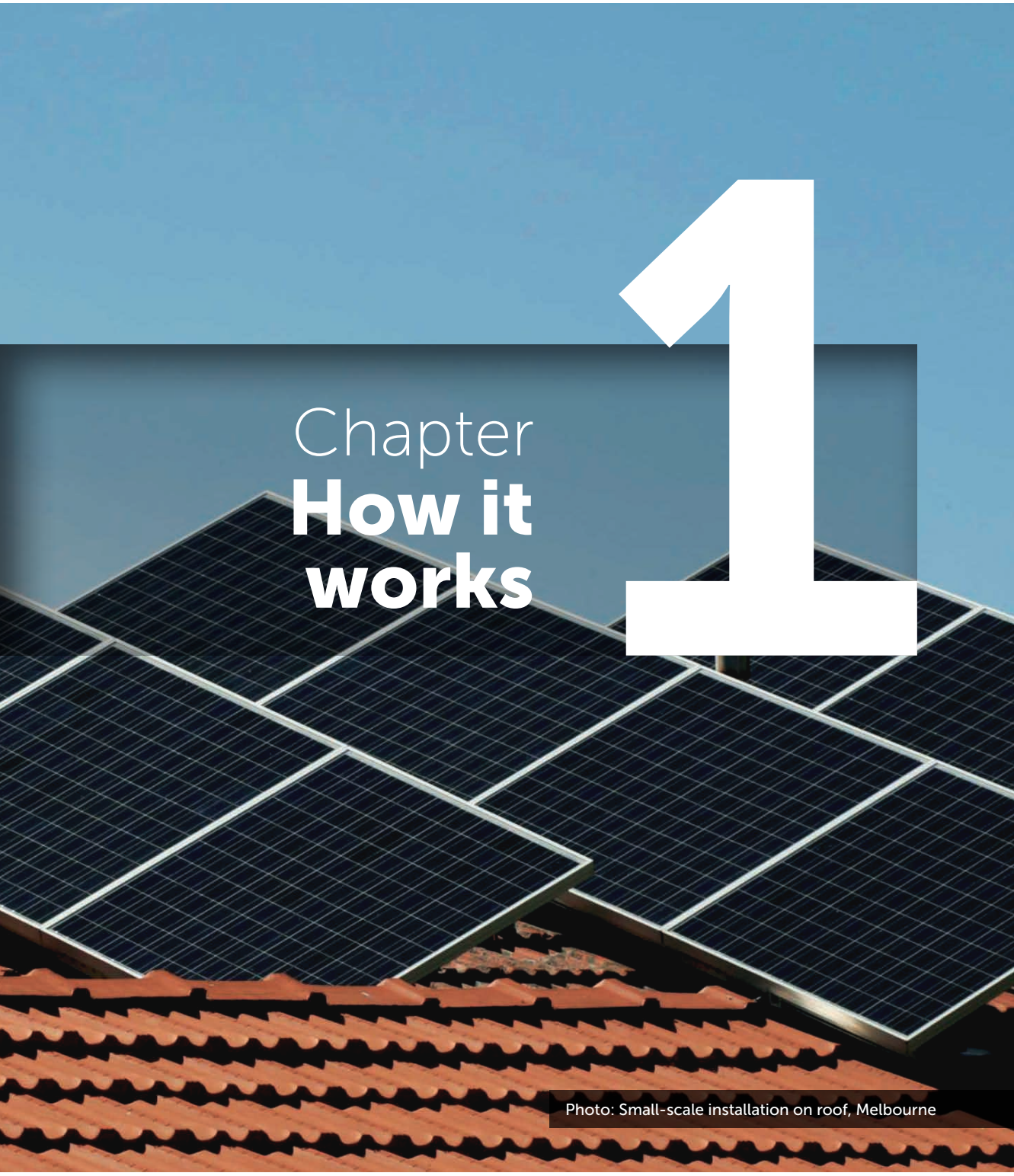
6 Source: Australian Energy Market Commission 2017 Residential Electricity Price Trends https://www.aemc.gov.au/markets-reviews-advice/2017-residential-electricity-price-trends

7 Projects announced in first quarter of 2018 will be accredited in 2019, so this number will increase based on future announcements.

8 Source: Victorian Renewable Energy Auction Scheme https://www.energy.vic.gov.au/renewable-energy/victorian-renewable-energy-auction-scheme and Queensland Renewables 400 https://www.business.qld.gov.au/industries/mining-energy-water/energy/renewable/renewables-400.

1052 megawatts

of installed capacity for small generation units



Chapter 1
How it works

Photo: Small-scale installation on roof, Melbourne

How it works

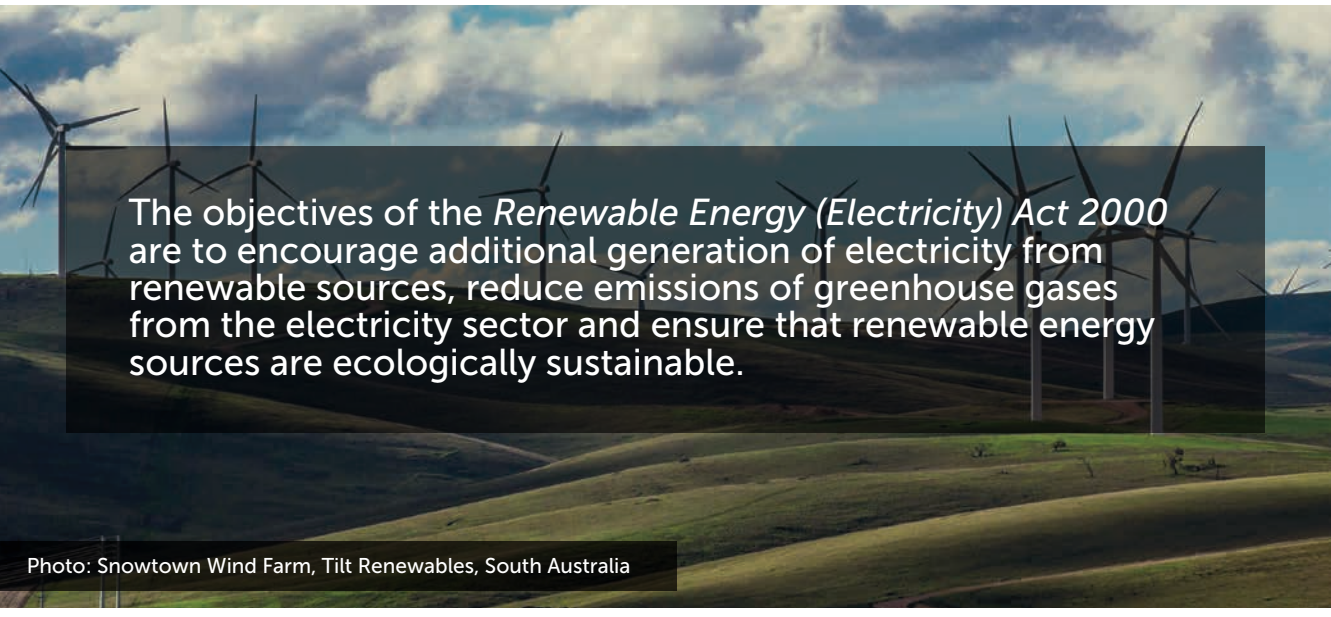
Encouraging renewable energy

The purpose of the Renewable Energy Target is to encourage investment in renewable energy and reduce greenhouse gas emissions. It does this 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 energy generated or displaced (no longer required from the grid). On the demand side, electricity retailers source these certificates to meet their renewable energy obligations in proportion to the total electricity sold to their customers.

The 2020 Renewable Energy Target is one of the Government's policies that contributes to reducing Australia's emissions to meet Australia's international climate change commitments. The Department of the Environment and Energy said in its 2017 Emissions Projections[9] update that Australia will overachieve on its 2020 emissions reduction target.

The Government is currently working on the design of the National Energy Guarantee, which proposes to integrate energy and emissions policy in a way that will encourage new investment in clean and low emissions technologies while allowing the electricity system to continue to operate reliably.

9 Source: http://www.environment.gov.au/climate-change/publications/emissions-projections-2017



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.

Photo: Snowtown Wind Farm, Tilt Renewables, South Australia

Why it is important

Renewable energy has an important role to play in reducing Australia's greenhouse gas emissions.

Since its beginning in 2001, the Renewable Energy Target has significantly increased the number of installations of small-scale renewable energy systems, and successfully stimulated material investment in renewable energy power stations.

The Renewable Energy Target has two parts:

- 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. This scheme encourages companies to invest in new large-scale renewable energy power stations, including solar and wind farms, and hydro and biomass power stations.
- The Small-scale Renewable Energy Scheme provides incentives for households and small businesses to install small-scale systems. This includes solar panels, solar water heaters, small scale wind or hydro systems and air source heat pumps.

Our role

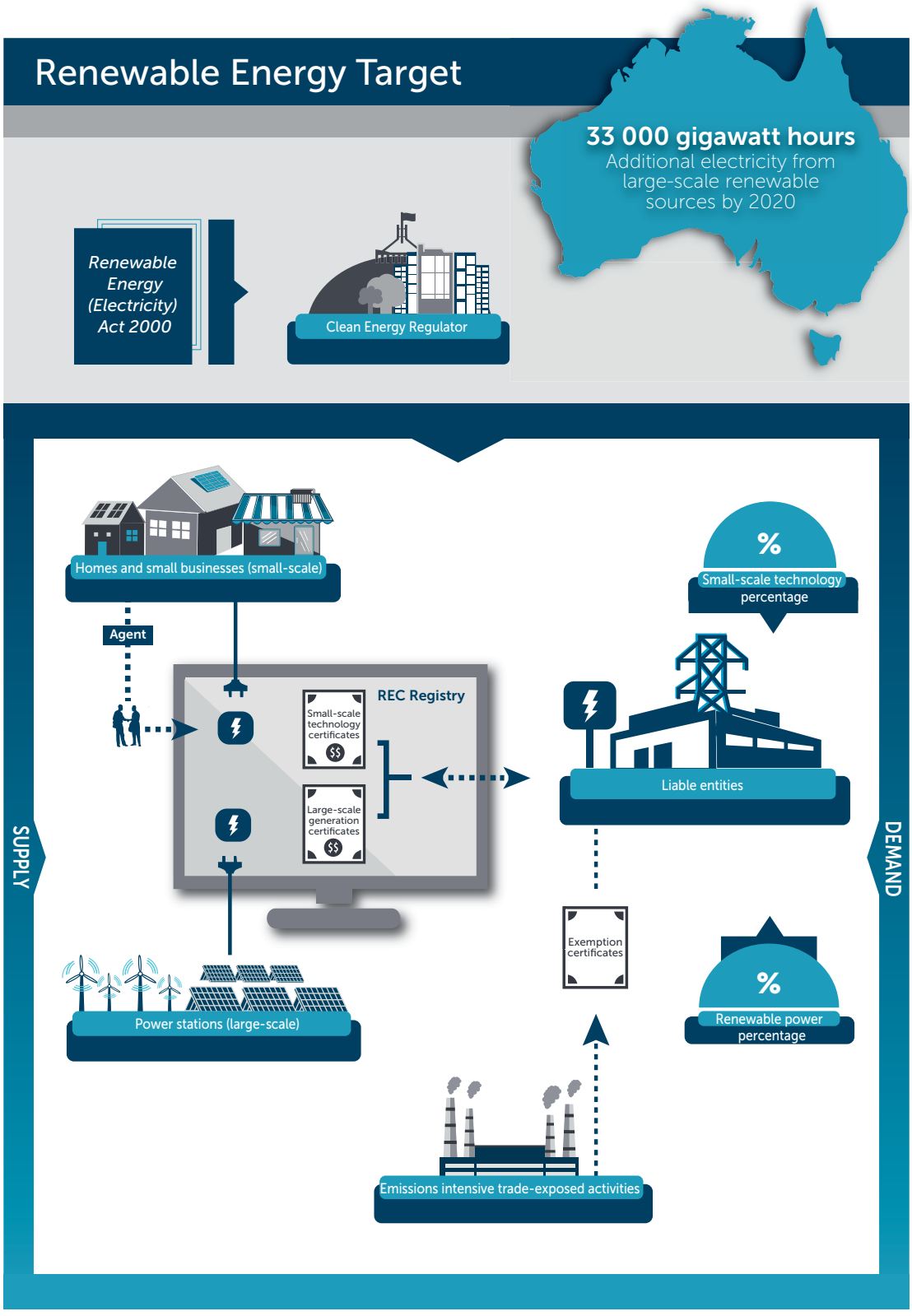
Our role as the Clean Energy Regulator is to administer the Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme. This includes:

- accrediting large-scale renewable energy power stations
- setting eligibility criteria in the Small-scale Renewable Energy Scheme
- validating renewable energy certificates
- providing the secure system for creating, surrendering and trading certificates via the REC Registry
- advising the Minister on setting the statutory demand for certificates by determining the amount of certificates electricity retailers must surrender each year
- working with liable entities (electricity retailers) to encourage compliance, and
- providing market data to help inform investment decisions.

Legislation

The Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme are set in law through the *Renewable Energy (Electricity) Act 2000*. The objectives of the Act 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.

The Renewable Energy Target operates on a calendar year, so key data and analysis in this report reflects the operations of the Act from 1 January to 31 December 2017, as required by legislation.


Renewable Energy Target
33 000 gigawatt hours
Additional electricity from large-scale renewable sources by 2020
Renewable Energy (Electricity) Act 2000
Clean Energy Regulator
SUPPLY
DEMAND
Homes and small businesses (small-scale)
Agent
REC Registry
Small-scale technology certificates
Large-scale generation certificates
Power stations (large-scale)
%
Small-scale technology percentage
Liable entities
Exemption certificates
%
Renewable power percentage
Emissions intensive trade-exposed activities

Spotlight...Top three solar towns

Over the last 10 years, 23 per cent more Australians have embraced rooftop solar. One in five homes and businesses now generate their own renewable energy and reduce carbon emissions through rooftop solar.

Our data reflects a geographically diverse spread of small-scale system installations, with particular emphasis on suburban, regional and rural areas of Queensland, Victoria and Western Australia. Werribee (Victoria), Hoppers Crossing (Victoria) and Bundaberg (Queensland) have accumulated the highest number of small-scale renewable energy installations since the Renewable Energy Target began in 2001, with more than 17,500 installations each.

The average size of installations nationally in 2017 was six kilowatts. The Small-scale Renewable Energy Scheme incentivises systems up to 100 kilowatts in size.

Photo: Rooftop solar, Clean Energy Council


AUD$10 billion
invested in large-scale renewable power stations

Chapter

2 Year in review

Photo: Kidston Solar Project, Genex Power, Queensland

A WORD FROM THE INDUSTRY

Accelerating the next phase of Australia's clean energy transition

Since its inception, the Clean Energy Finance Corporation's (CEFC) direct investment commitments in new large-scale solar and wind projects have exceeded $1 billion and catalysed the development of almost two gigawatts of additional renewable generation capacity Australia-wide.

As the single largest debt financier in large-scale solar, with $440 million committed to 10 new projects in 2016–17, the CEFC saw rapid improvements in the cost competitiveness of solar, so that it is now possible to develop a commercially viable large-scale solar project without grant funding. Such projects are attracting new domestic and international financiers alongside the CEFC's debt finance.

As the wind sector has matured, the CEFC has also seen growing investor interest in projects that may have either partial offtake arrangements or full merchant price exposure. CEFC commitments to large-scale wind projects in 2016–17 were notable for both the size of the CEFC investments, at $200 million, and the scale of the projects, to accelerate 383 megawatts of new clean energy.

Recent CEFC investment commitments underscore its innovative approach to financing renewable energy generation.

The CEFC is investing $94 million in Australia's first fully integrated wind, solar and battery project, at the central north Queensland Kennedy Energy Park. The 60 megawatt hybrid project will connect to the local grid, providing electricity to communities from Julia Creek to Charters Towers, more than 500 kilometres away.

The landmark project creates a new model for renewable energy that brings together the benefits of wind, solar and battery storage to overcome intermittency and improve reliability. Financing three separate technologies on one site was a complex undertaking that had not previously been achieved in Australia. As the sole debt financier for the project, the CEFC demonstrated the bankability of large-scale, integrated hybrid renewable energy projects for the future. The CEFC expects such projects to become an increasingly important part of Australia's electricity system, with complementary battery storage addressing the intermittency of wind and solar generation to support grid stability.

The CEFC committed a further $150 million in debt finance to the Lincoln Gap wind farm in South Australia. The project includes Australia's first unsubsidised large-scale grid-connected battery alongside a greenfield wind development, signalling an important new milestone in the evolution of the energy storage sector.

With large-scale battery technology developing rapidly, costs are expected to fall significantly, reflecting the pathway of wind and solar. As the first development project in Australia that has been able to secure debt finance for a grid-connected large-scale battery component on a non-subsidised basis, Lincoln Gap provides an important financing model for other developers and investors wanting to be at the forefront of closer integration of renewables into the grid.

These commitments confirm the CEFC's view that, through a planned and coordinated approach, Australia's energy mix can incorporate higher levels of clean energy alongside strengthened transmission, better demand management systems and increased storage capacity, contributing to improved system reliability, energy affordability and environmental sustainability.

CEFC provided this content.

Year in review

This year has seen a record level of investment in renewable energy in Australia. As renewables costs reduce and electricity costs increase, there has been a surge in investment in and delivery of renewables, particularly under the Renewable Energy Target. The momentum in the market has meant enough new capacity required to meet Australia's Renewable Energy Target has been announced.

Biggest year ever for renewables

This past year was the biggest ever for renewables with the most small-scale system installation capacity and the highest amount of large-scale capacity both firmly announced and accredited in a single year.

Photo: Kennedy Energy Park, CEFC, Queensland

A WORD FROM THE INDUSTRY

Origin's investment in renewables rapidly accelerating

Origin is accelerating its commitment to clean energy with plans to nearly triple capacity from solar and wind in coming years.

With an aim for renewable energy to comprise up to 25 per cent of its generation mix by 2020, Origin is targeting 1500 megawatts of new large-scale solar and wind coming online by the end of the decade.

Four major solar farms in Queensland—Clare, Lakeland, Darling Downs and Daydream—are expected to come online in 2018 with a combined capacity of more than 470 megawatts.

The biggest of the Queensland solar farms is the 150 megawatt Daydream project near Collinsville in northern Queensland, which features a single-axis tracking system with panels that track the sun during the day to maximise output. It will generate approximately 380,000 megawatt hours of electricity a year—enough to power more than 53,000 homes with clean energy.

Despite the Lakeland solar farm being the smallest of the four projects at just 10.8 megawatts, it punches above its weight. Its location at the edge of the grid in Far North Queensland and an integrated 5.3 megawatt hour battery will provide valuable insight into how to achieve a consistent supply from solar during periods of cloud cover and how to stretch a renewable resource into periods when it is not generating. Insights like these will enable battery storage to improve in effectiveness and cost, and in the future help batteries to play a stronger role in maintaining energy security.

In Victoria, work is expected to start early in 2018 on the huge 530 megawatt Stockyard Hill wind farm. Slated to be Australia's largest wind farm, Origin's agreement to purchase energy from Stockyard Hill set a new benchmark for renewable power purchase agreement pricing in the market and demonstrated how rapidly renewable energy costs have come down.

Origin is also involved in one of the largest solar farms in Australia, the 220 megawatt solar farm at Bungala near Port Augusta, which will have nearly 1.2 million solar photovoltaic panels. Also due to come online in 2018, Bungala will further add to Origin's ability to deliver clean energy to Australians, and importantly will boost jobs in South Australia, with more than 350 local jobs created during construction.

As Origin rapidly grows the share of clean energy in our portfolio, it is also mindful of the need to maintain downward pressure on energy prices and maintain reliable supply. With Australia's largest fleet of peaking gas-fired power stations, Origin is already able to support its growing renewables portfolio with firm, dispatchable power to maintain a reliable energy supply that homes and businesses rely on.

All of this demonstrates Origin's commitment to lead the transition to a cleaner and smarter energy future for Australia.

Origin provided this content.

Photo: Moree Solar Farm, Origin Energy, Queensland

Investment surge in small-scale

This year saw an unprecedented level of investment by Australian households and businesses in small-scale renewable energy systems.

There was an upturn in small-scale system installations in 2017, characterised by the following achievements:

- more than 6500 megawatts of installed capacity reached overall
- more than 1050 megawatts installed
- a nine per cent increase in air source heat pump installations nationally, continuing the steady increase since 2015, and
- 21.7 million small-scale certificates were validated.

This brings the total to 2.9 million small-scale systems now installed in Australian homes and businesses.

There were 225,991 installations in 2017, up from 194,695 in 2016. The majority of these were solar. There was also a notable increase in 10 to 50 kilowatt size systems, with 11,353 systems installed in 2017, a 51 per cent increase over 2016 installations. As costs fall, the average size of systems continues to increase, by 11 per cent from 5.6 kilowatts in 2016 to 6.3 kilowatts in 2017.

Momentum continues in large-scale

There were record levels of investment in large-scale renewable energy projects in 2017, building on the momentum observed towards the end of 2016.

An unprecedented 6535 megawatts of capacity has been firmly announced since 1 January 2016, with more than 4900 megawatts already operating or under construction. The remaining projects are underwritten by power purchase agreements and we expect they will begin construction in 2018. The generation capacity of these projects will create enough large-scale generation certificates to meet the 2020 Large-scale Renewable Energy Target.

The project announcements were accompanied by a record-breaking year in 2017 for large-scale accreditation in the scheme, with:

- 124 renewable energy power stations accredited, up from 98 in 2016
- 120 per cent increase in accredited capacity, from 494 megawatts in 2016 to 1088 megawatts in 2017, and
- 19 million large-scale generation certificates created.

In total, there are 711 accredited power stations with combined capacity of 15,286 megawatts. In 2017, accredited power stations generated 16.9 million megawatt hours of renewable energy above baseline.[10]

It should be noted that generation in 2017 reduced compared to 2016, however validated certificates went up. 2016 was an exceptionally good year for hydro powered generation, and while generation was included in 2016 numbers, the certificates were validated in 2017 and are included in 2017 numbers.

10 The existing generation of renewable source electricity in 1997 is referred to as 'baseline'. See Glossary for more information.

A WORD FROM THE INDUSTRY

The Kidston renewable energy hub

The small, rural town of Kidston in Far North Queensland was once a prosperous, bustling mining centre, home to the largest open-cut gold mine in the country. In 2001, the mining operations ceased, and the town was left desolated.

Turning to 2018, Genex Power is in the process of transforming this abandoned mine into a renewable energy hub. Genex has completed the first of two stages of the hub, with the 50 megawatt solar project ('K1') finalised and connected to the grid.

K1 comprises 540,000 solar panels, capable of producing 145,000 megawatt hours of renewable energy each year. This is the equivalent of powering 26,500 homes entirely with renewable energy and offsetting 120,000 tonnes of CO_2 per year.

Significantly, this renewable energy hub is unlike any other in the world, as it utilises the existing infrastructure left behind from the mining operations in order to significantly reduce construction time and cost.

Genex has used the tailings storage facility of the abandoned mine for the K1 Project, as the consistent, flat topography creates an ideal surface for a large-scale solar project. Genex has also capitalised on a number of other infrastructure pieces left from the mining operations, including an existing substation, transmission line connected to the grid, solid road access, accommodation camp and airstrip.

However, of most significance for Genex are the two mining voids that were left behind. As a result of previous rehabilitation processes, these voids are now filled with large volumes of water, providing the perfect framework for the company's 250 megawatts Pumped Storage Hydro Project ('K2H').

K2H will use the mining voids as the upper and lower reservoirs for the Project, releasing the water from the upper to the lower reservoir via a turbine-generator system to generate electricity during peak demand, and pumping water back into the upper reservoir during off-peak periods. The scheme is essentially a 'giant water battery', as water held at height is potential energy stored, with the ability to release the water/produce electricity instantaneously on demand.

K2H is capable of storing and producing 250 megawatts for eight hours. Furthermore, the scheme will be paired with an additional 270 megawatts of solar panels, which will be used to pump the water back into the upper reservoir during the day. This will be the first integrated solar-pumped hydro project in the world, creating dispatchable, reliable and affordable renewable energy, or in other words, 'renewable energy on tap'.

Genex Power provided this content.

Photo: Kidston Renewable Energy Hub, Genex Power, Queensland

States on the move

During 2017, utility scale investment was highest in Queensland, Victoria and New South Wales. Projects in Queensland amounted to 1478 megawatts in new capacity financed and 141 megawatts of power stations accredited. There was also a lot of activity in Victoria, with 1025 megawatts in new capacity financed and 67 megawatts of power stations accredited.

Investment in New South Wales was more subdued during 2017, with 519 megawatts in new capacity financed. It was, however, a strong year for accredited capacity, with 525 megawatts of capacity accredited.

The highest existing capacity of utility scale renewables is in South Australia, but activity in that state was lower than in Queensland, New South Wales and Victoria, with 578 megawatts in new capacity financed and 232 megawatts accredited.

In 2017, new investment and accredited capacity in Western Australia, Tasmania and the Northern Territory was relatively low at 123 megawatts in total. However, power purchase agreements were signed for more than 300 megawatts in new capacity based in Western Australia and Tasmania during the year. These agreements indicate an emerging interest in new utility scale generation infrastructure among electricity retailers in these states.

In the Small-scale Renewable Energy Scheme, Queensland continues to lead the nation with more than 45,000 solar panel system installations and 294 megawatts in additional capacity. The Australian Capital Territory had the highest level of growth with a 44 per cent increase in total installations.

Changing profile of renewables

This year saw a major proportional shift between wind to solar in the large-scale renewables industry—more significant than we had predicted—with the most solar capacity accredited since the scheme began. The accredited capacity of utility solar (projects of more than one megawatt) doubled from 2016 to 2017. For the first 15 years of the Renewable Energy Target, solar's share of the above baseline accredited capacity was four per cent. In 2017, solar accounted for 22 per cent of accredited capacity. The bulk of the increase in solar occurred in the past two years.

Businesses turn to solar

Much of the investment was in commercial and industrial as businesses turn to solar to address their energy challenges. The number of commercial and industrial installations and power stations increased from 2016 to 2017. More significantly, there was a 29 per cent increase in the average capacity of accredited commercial and industrial solar power stations, and an 11 per cent increase in the average capacity of solar installations installed in the Small-scale Renewable Energy Scheme.

Collectively, commercial and industrial solar installations in the Small-scale Renewable Energy Scheme and Large-Scale Renewable Energy Target added 319 megawatts to Australia's energy market, up from 223 megawatts in 2016. The biggest increase in accredited capacity was in large-scale, with a 66 per cent increase from 2016.

Table 1: Commercial and industrial solar installations

Year	Power station quantity	Power station capacity (megawatts)	Installation quantity	Installation capacity (megawatts)
	Large-scale Renewable Energy Target		Small-scale Renewable Energy Scheme	
2016	76	16.22	8388	206.52
2017	98	26.92	12,446	292.27

Year	Quantity	Capacity (megawatts)
	Total for both schemes	
2016	8464	222.74
2017	12,544	319.19

A WORD FROM THE INDUSTRY

Sun Metals Solar Farm

Sun Metals Zinc Refinery is located 15 kilometres south of the city of Townsville in North Queensland. The refinery was built in 1996 by Sun Metals Corporation Pty Ltd, the Australian subsidiary of the Korea Zinc Company Limited. Korea Zinc produces 10 per cent of the world's zinc from plants in Korea and Australia.

Sun Metals is the largest electricity user in the region and the second largest industrial consumer in Queensland. Its state of the art facility consumed just less than one million megawatt hours of electricity in 2017 to produce more than 220,000 tonnes of special high grade zinc products.

Zinc metal production is highly energy intensive, even with the very latest technology and management practices. Sun Metals is at the forefront of energy efficiency in zinc production because of its drive to reduce electricity costs, with electricity charges currently representing more than 50 per cent of its operating costs.

Sun Metals has actively sought to find the most cost effective way to meet current and future power requirements. This included a detailed review of solar power in 2016, which culminated in the company's decision to invest $200 million of capital to construct a 124 megawatt (AC) solar farm on approximately 130 hectares of suitable land surrounding the Sun Metals Zinc Refinery.

Detailed design was conducted in early 2017, and construction commenced in April 2017. Half of the solar farm will be energised in March 2018 and full generation will occur in April 2018, with project completion in May 2018. Benefits to the region include around 300 local construction jobs and the injection of millions of dollars into labour, housing, materials and increased general economic activity.

The Sun Metals Solar Farm will consist of approximately 1,260,000 solar photovoltaic modules installed on frames that are supported by around 135,000 steel posts. The modules will be installed at a fixed (non-tracking) tilt, at a 14 degree angle, and will face north. The modules will be wired together in arrays connected to inverters to transform the DC current produced by the modules into AC current that can be fed into the grid network. Sun Metals has an existing 132 kilovolt substation allowing for efficient connection into the electrical grid.

The power generated by the solar farm will supply the zinc refinery's own industrial load and/or be sold into the National Electricity Market (NEM) depending on a dynamic consideration of the NEM price and production requirements. The Sun Metals Solar Farm is expected to generate 294,000 megawatt hours of clean, renewable electricity in the first year of operation, supplying about 30 per cent of Sun Metals' total electricity need. The solar farm will reduce greenhouse gas emissions by 229,320 tonnes of CO_2 equivalent per annum.

Sun Metals Corporation provided this content.

Photo: Sun Metals Solar Farm, Sun Metals Corporation, Queensland

Emerging technology

The renewables industry continues to adapt to Australia's energy needs. Single-axis tracking has improved the productivity of solar farms and concurrent battery storage at solar and wind farms has reduced the variability of electricity they produce.

Single-axis tracking

Single-axis tracking technology involves mechanisms that pivot solar panels during the day to face the sun, tracking east to west. Single-axis tracking increases the capacity factor of solar renewable energy power stations by around 18 per cent[11], and is able to generate more energy throughout the day than fixed panels, particularly early in the morning and late in the afternoon. Single-axis tracking installations use slightly more land area, and costs more, for the same number of panels. However, the market believes the value proposition is better given the additional electricity generation from single-axis tracking projects and the extra electricity generated early and late in the day.

This technology dominated the solar industry in 2017, with five accredited projects using the technology and another 19 announced.

Battery storage on the rise

Battery storage is attracting significant interest from the market. It is not incentivised under the Renewable Energy Target, but it helps reduce the variability of electricity generation from renewable energy technology.

There were two large-scale projects with concurrent battery storage accredited in 2017—Lakeland Solar and Storage in Queensland and Hornsdale Power Reserve in South Australia. There are five similar projects in the pipeline.

On a smaller scale, household batteries are being installed in a greater proportion of homes and businesses. Participants in the Small-scale Renewable Energy Scheme can voluntarily provide information about the installation of batteries. The data we collected showed a more than doubling of grid-connected solar panels with battery storage, from 1568 in 2016 to 4356 in 2017.[12]

11 Source: http://gci.uq.edu.au/filething/get/11828/PVSyst%20Assessment%20of%20economics%20of%20array%20types%20at%20gatton%20-%20version%203-edit-final.pdf

12 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. We 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.

A WORD FROM THE INDUSTRY

AGL large-scale investment

The Powering Australian Renewables Fund (PARF) is a landmark partnership to develop, own, and manage approximately 1000 megawatts of large-scale renewable energy infrastructure assets and projects.

PARF is a partnership between AGL (20 per cent) and QIC (80 per cent, on behalf of clients the Future Fund and the QIC Global Infrastructure Fund). PARF's scope represents 20 per cent of the estimated 5000 megawatts of new renewable generation capacity required by 2020 to meet the Renewable Energy Target.

Since its inception in July 2016, PARF now consists of more than 800 megawatts of renewable generation, both operational and under construction.

In November 2016, AGL announced it had reached financial close selling its 102 megawatt Nyngan and 53 megawatt Broken Hill solar plants to PARF. Following this, in January 2017, AGL announced it had reached financial close on the sale to PARF of the greenfield 200 megawatt Silverton Wind Farm construction project in western New South Wales.

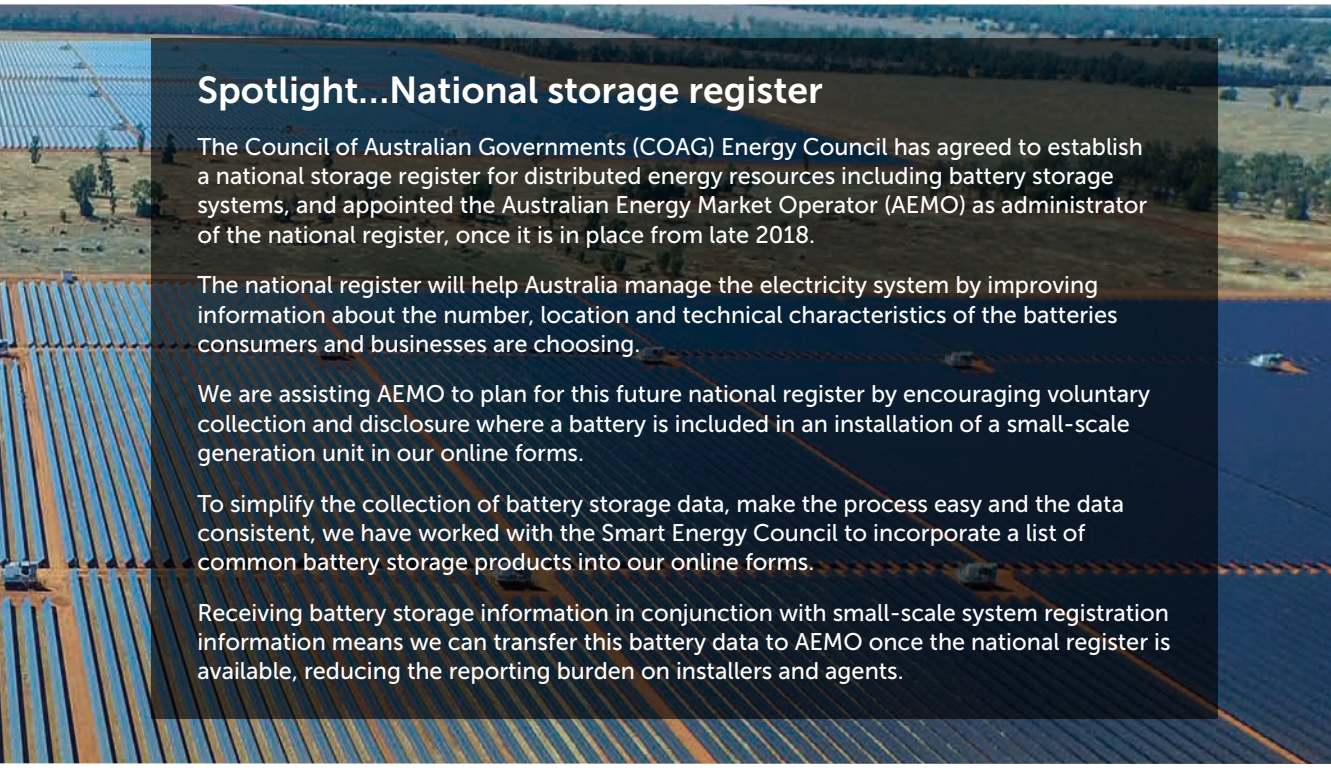
Once constructed (expected 2018) the Silverton Wind Farm will produce approximately 780,000 megawatt hours of renewable energy annually, which can power more than 137,000 average Australian homes. The renewable energy produced from the wind farm's 58 turbines will reduce CO_2 emissions by 655,000 tonnes annually, which is the equivalent of taking 192,000 cars off the road each year.

In August 2017, AGL announced it had reached financial close on the sale to PARF of the greenfield 453 megawatts Coopers Gap Wind Farm construction project at Cooranga North, approximately 250 kilometres north west of Brisbane. On completion in 2019 the project will be the largest wind farm in Australia.

Once constructed (expected 2019), the Coopers Gap Wind Farm will consist of up to 123 wind turbines and produce around 1,510,000 megawatt hours of renewable energy, powering more than 260,000 average Australian homes.
The renewable energy produced would reduce CO_2 emissions by approximately 1,180,000 tonnes annually, which is the equivalent of taking 340,000 cars off the road each year.

AGL provided this content.

Photo: Nyngan Solar Plant, AGL, New South Wales



Spotlight...National storage register

The Council of Australian Governments (COAG) Energy Council has agreed to establish a national storage register for distributed energy resources including battery storage systems, and appointed the Australian Energy Market Operator (AEMO) as administrator of the national register, once it is in place from late 2018.

The national register will help Australia manage the electricity system by improving information about the number, location and technical characteristics of the batteries consumers and businesses are choosing.

We are assisting AEMO to plan for this future national register by encouraging voluntary collection and disclosure where a battery is included in an installation of a small-scale generation unit in our online forms.

To simplify the collection of battery storage data, make the process easy and the data consistent, we have worked with the Smart Energy Council to incorporate a list of common battery storage products into our online forms.

Receiving battery storage information in conjunction with small-scale system registration information means we can transfer this battery data to AEMO once the national register is available, reducing the reporting burden on installers and agents.

Wind farms provide frequency control ancillary services

In 2017, Hornsdale Wind Farm successfully piloted a project providing frequency control ancillary services, with support from the Australian Renewable Energy Agency and Australian Energy Market Operator.

The Hornsdale Wind Farm pilot project provided frequency control ancillary services through pre-curtailment of output. The wind farm can reduce output below the technical limit set by the generator capacity and prevailing wind resource. This provides headroom to increase output by an agreed amount in response to the need for frequency control ancillary services.

Looking forward

This has been a noteworthy year for renewables in Australia, and we are confident the next two years will see even more significant activity.

Across both schemes, more than 2000 megawatts of capacity was added in 2017. Our expectation is this will double in 2018. Based on early data in 2018 in the small-scale scheme, installations and capacity will be higher in 2018 than it was in 2017. In the large-scale scheme, our projections indicate another 2600 megawatts of capacity will be accredited in 2018.

Our projections suggest a similar story for 2019, however we note the significant uncertainty in making projections in the consumer demand-driven Small-scale Renewable Energy Scheme. We expect more than 2700 megawatts of accredited large-scale capacity, and the Bloomberg New Energy Finance forecast indicates significant uptake of commercial and industrial solar, which will mean 2019 will exceed 2018.[13]

13 Source: Bloomberg New Energy Finance New Energy Outlook 2017 http://about.bnef.com/new-energy-outlook

A WORD FROM THE INDUSTRY

EnergyAustralia's demand response trial

Right now, Australia's energy system is underpinned by coal but as those big, centralised plants retire fresh approaches and technologies are emerging, giving shape to a new, modern energy system.

In 2017, EnergyAustralia was announced as the largest single contributor to a three-year joint program by the Australian Renewable Energy Agency and Australian Energy Market Operator to explore how demand response can support delivery of affordable, reliable and cleaner supplies of energy.

Under the program, EnergyAustralia was awarded $9.8 million to secure 38 megawatts of demand response—or reserve capacity—from this summer across New South Wales, Victoria and South Australia, increasing to 50 megawatts by December 2018.

"Demand response is really exciting for its potential to reduce the peak draw on energy, avoiding or minimising the need for investment to 'gold plate' the system," said EnergyAustralia Managing Director Catherine Tanna.

"We think demand response has a critical role to play maintaining system reliability and security while supporting the integration of new supplies of renewable energy. It's an approach that puts customers in control and keeps costs down," she said.

Ms Tanna said customers participating in demand response initiatives agree to provide reserve capacity the market operator can call upon at short notice to stabilise the energy system.

The technique has already been used to offset extreme demand or emergencies, easing the strain on the electricity system and avoiding involuntary load shedding.

For example, a particularly high-demand summer day might trigger an agreement for a business to reduce its load by running its equipment less. Or it might mean tapping into the solar energy stored—but not being used—on a customer's rooftop.

Customers typically receive a financial incentive in exchange for reducing their demand or making excess energy available.

Under the trial, EnergyAustralia will work with a range of customers from residential households to large industrial users, and through a mix of technologies and approaches such as:

- Implementing mass market SMS alert campaigns, in which residential and business customers would agree to reduce or moderate their energy demand in response to a real-time notification that system capacity is tight.
- Installing Wattwatchers monitoring and remote-control capability in residences and small businesses, allowing appliances (such as air-conditioners, pool pumps, machinery or other loads) to be curtailed.
- Aggregating "smart" Redback solar battery storage systems across multiple sites to secure a reliable source of reserve for use during extreme peak periods or emergencies.
- Working with large customers and energy exchange technology company Greensync on load shifting, for example, so businesses can schedule pre-cooling/heating activities to times of the day that minimise consumption.
- Converting diesel generators at large customer sites to run on Australian made biofuel, which is derived from ethically sourced feedstock such as recycled cooking oils.

EnergyAustralia provided this content.

Photo: Redback battery storage system, EnergyAustralia, Australia


6535 megawatts
of projects firmly announced–
enough to meet the
Renewable Energy Target

Chapter

Progress towards 2020

3

Photo: Boco Rock Wind Farm, Springfield, New South Wales

Progress towards 2020

We assess the progress towards the 2020 Large-scale Renewable Energy Target of 33,000 gigawatt hours using five indicators related to project build (construction and capacity of new power stations) and market health (supply and demand for large-scale generation certificates).[14]

These indicators guide and support the findings in the annual statement (see pages 6 and 7). While each indicator is presented separately using data from 2017, cumulative findings influence our overall findings in the annual statement.

Build indicators

These are the lead indicators in progress towards the 2020 target because they demonstrate the number of new accredited power stations that can start creating large-scale generation certificates, as well as power stations in the pipeline of construction.

We assess the status of committed and accredited large-scale renewable energy power stations as on track—the indicators are within modelled and acceptable parameters.

Indicator 1: Committed projects—on track

This year has seen an unprecedented level of investment in large-scale renewable energy projects, with more capacity committed in 2017 than in any other year.

In 2016, we said that to meet the 2020 target, 6000 megawatts of new capacity was required. Since then, we have revised the required new capacity to 6400 megawatts following developments in the portfolio where solar—which has a lower capacity factor than wind—increased its market share to about 46 per cent.

Since 2016, 6535 megawatts of new capacity has been firmly announced. Of that, 4927 megawatts is fully financed, under construction or already built. Once all these projects are built, they are expected to generate in excess of 10.8 million megawatt hours per year.

We expect projects that have a power purchase agreement with a strong counterparty, to begin construction on 1608 megawatts of additional capacity in 2018.

Assuming these projects are built and obtain accreditation in 2018 or 2019, the 2020 Renewable Energy Target will be met.

14 The progress indicators refer to megawatts: 1000 megawatts equals one gigawatt.

Indicator 2: Accredited projects—on track

More large-scale renewable energy power stations were accredited in 2017 than in any previous year since 2001, with 124 power stations accredited and a combined capacity of 1088 megawatts.

Estimated future annual generation from accredited large-scale renewable energy power stations was 3,033,000 megawatt hours.

Market health indicators

Market health indicators relate to the supply and demand aspects of the Large-scale Renewable Energy Target market. They provide a basis for us to predict future activity based on large-scale generation certificate prices, availability of certificates in the market and the compliance rates of liable entities (electricity retailers). All these factors point to the state of the market and inform our assessment of progress towards the 2020 target.

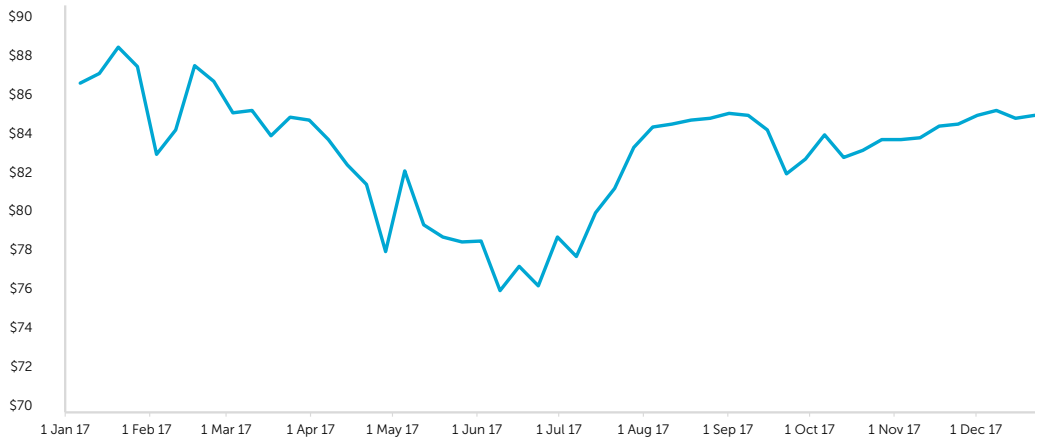
Indicator 3: Large-scale generation certificate spot price

During 2017 the large-scale generation certificate spot price varied between $76 and $89, finishing the year slightly lower ($85.25) than it started ($86.90). The 12-week average spot price at the end of the year was $84.54.[15]

A relatively low proportion of certificates are traded at spot prices through brokers/ intermediaries. Other trades occur either through power purchase agreements or directly between buyers and sellers which could be at prices materially differences to publicly disclosed spot prices.

There continues to be a significant difference between spot large-scale generation certificate market prices and recently reported bundled power purchase agreements. We estimate that the market will continue to operate with a surplus during 2018 and 2019, so we expect any price divergence to narrow as the market gains confidence that the 2020 target will be met and exceeded. We regularly supply information to the market to inform decision making.

Figure 1: Large-scale generation certificate spot price across 2017



15 Data source: TFS Green.

Indicator 4: Supply and demand dynamics

Following final surrender of certificates on 14 February 2018, there was a surplus of about 9.4 million large-scale generation certificates. This year's surplus was partly driven by some liable entities carrying forward less than 10 per cent of their liability to subsequent years. Liable entities have this option available which if fully utilised would represent significant additional supply in 2018 or 2019.

We expect large-scale generation certificate supply to increase to around 24 million certificates in 2018 and then to around 32 million in 2019. This is a significant step up from 16.9 million in 2017.

Given the surge in new project announcements, we estimate the market will continue to operate with a surplus of around five million large-scale generation certificates during 2018 and 2019. The level of that surplus will be influenced by how quickly projects begin generating to create large-scale generation certificates.

Indicator 5: Shortfall

Similar to previous years, the vast majority of liable entities have complied with the objectives of the *Renewable Energy (Electricity) Act 2000*. A total of 23,203,396 large-scale generation certificates were surrendered. The on time certificate surrender rate for the Large-scale Renewable Energy Target for 2017 was 93.3 per cent, up from 89.3 per cent in 2016. This increase is a positive development.

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 27 electricity retailers who reported a large-scale generation certificate shortfall in 2017, a total of 22 had shortfall of greater than 10 per cent and were required to pay shortfall charges. Under the Large-scale Renewable Energy Target, entities who do not surrender at least 90 per cent of their liability are required to pay a $65 shortfall charge for each certificate not surrendered. A list of electricity retailers that did not meet their certificate surrender obligations is at Appendix C and is published on our website. See more about Renewable Energy Target liability in chapter 4, page 47.

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.

The costs of the Renewable Energy Target are imposed on electricity retailers–they are not a levy on electricity bills. The prices at which different retailers can obtain certificates does vary. For example, many large electricity retailers buy large-scale renewable energy certificates over a longer term through power purchase agreements and those are at a much lower price than current certificate spot prices that smaller retailers may purchase at.

Hence, the actual pass through costs to electricity consumers cannot be measured, it has to be modelled. We rely on the modelling undertaken by the Australian Energy Market Commission to provide estimates on the likely impact of the Large-scale Renewable Energy Target on electricity prices.

The target for the number of certificates to be surrendered increases each year until 2020, and then remains the same each year until 2030. Hence, if certificate prices remain constant, the implied cost to electricity prices will increase each year until 2020. At some point in time, spot certificate prices will be much lower than at present and it is reasonable to expect the modelled cost impact will moderate post 2020.

As noted in the annual statement (see page 7), according to the Australian Energy Market Commission, the Large-scale Renewable Energy Target accounted for an estimated 2.4 per cent (or an average $8.13 per quarter) of the average household electricity bill in 2017.

We estimate that this is approximately a 12 per cent increase on the previous year.

The Australian Energy Market Commission's Residential Electricity Price Trends Report showed the additional renewable energy entering the market under the Renewable Energy Target is likely to reduce wholesale electricity costs in the National Energy Market in 2018–19 and 2019–20.

Modelled trajectory to 2020

The model we use to assess the build required to meet the target is updated progressively with the most recent data and analysis. Total supply of certificates is calculated from existing and announced projects. Total demand includes statutory demand under the Large-scale Renewable Energy Target and additional demand related to voluntary surrender of certificates including GreenPower (see page 49).

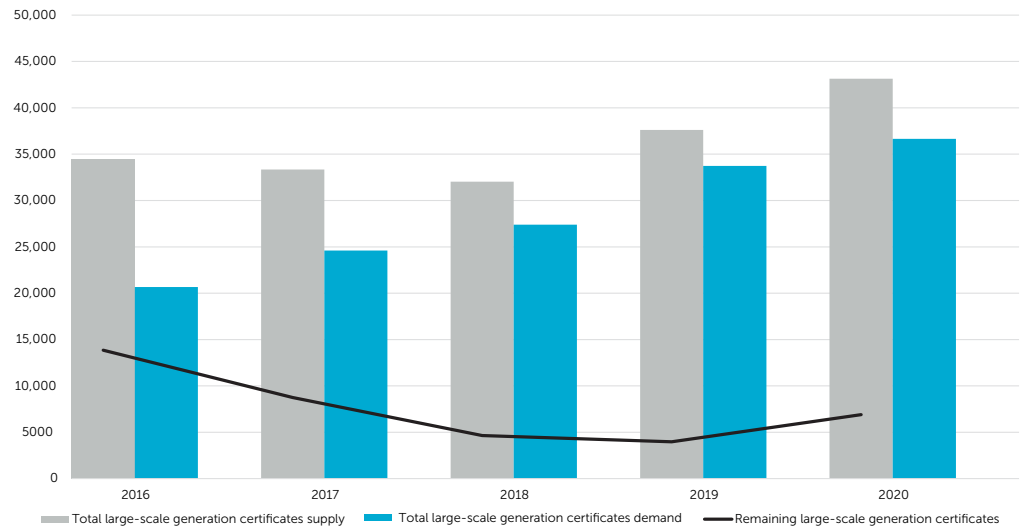
Table 2: Modelling assumptions and inputs

Fuel type	Construction time	Capacity factor[16]	Percentage of future build
Wind	18 months	38 per cent	54 per cent
Solar	12 months	25 per cent	46 per cent

At the end of 2017, sufficient projects had been announced to meet the 2020 target. We projected that at least 1079 megawatts of new capacity was required to be financed in 2018 for the target to be met.

Based on newly updated figures, the continued investment activity we have seen in early 2018 means that generation from existing and announced projects is likely to supply sufficient large-scale generation certificates to maintain a healthy surplus in the market in 2018 and 2019, and to meet the target in 2020.

Figure 2: Current and required generation to meet expected demand in 2020



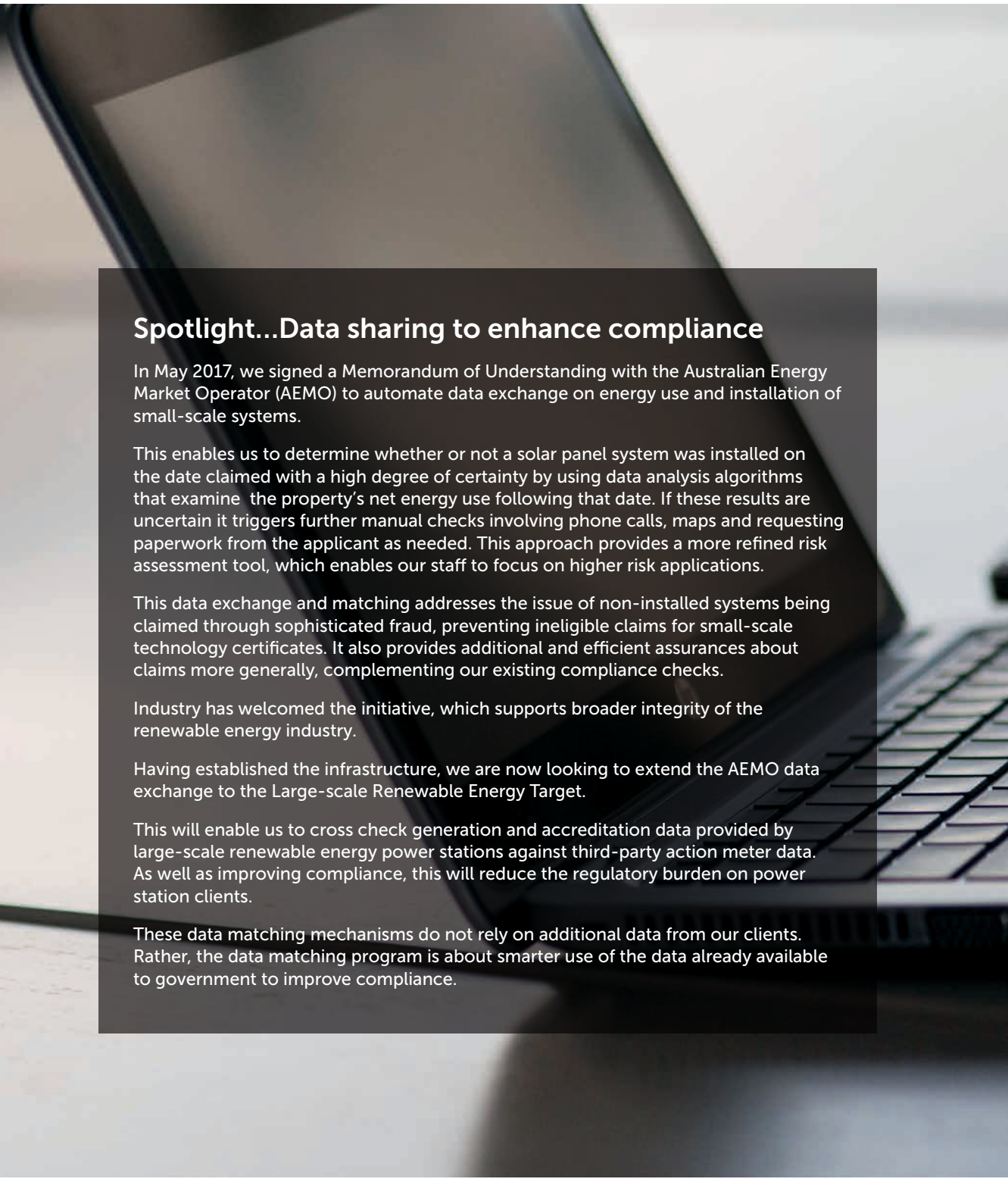
16 Capacity factor assumptions are only used where actual data is not available.

Photo: Capital Wind Farm, Infigen Energy, New South Wales


4140
small-scale systems inspected

Chapter 4
Market integrity

Photo: Small-scale solar installation, Clean Energy Council



Spotlight...Data sharing to enhance compliance

In May 2017, we signed a Memorandum of Understanding with the Australian Energy Market Operator (AEMO) to automate data exchange on energy use and installation of small-scale systems.

This enables us to determine whether or not a solar panel system was installed on the date claimed with a high degree of certainty by using data analysis algorithms that examine the property's net energy use following that date. If these results are uncertain it triggers further manual checks involving phone calls, maps and requesting paperwork from the applicant as needed. This approach provides a more refined risk assessment tool, which enables our staff to focus on higher risk applications.

This data exchange and matching addresses the issue of non-installed systems being claimed through sophisticated fraud, preventing ineligible claims for small-scale technology certificates. It also provides additional and efficient assurances about claims more generally, complementing our existing compliance checks.

Industry has welcomed the initiative, which supports broader integrity of the renewable energy industry.

Having established the infrastructure, we are now looking to extend the AEMO data exchange to the Large-scale Renewable Energy Target.

This will enable us to cross check generation and accreditation data provided by large-scale renewable energy power stations against third-party action meter data. As well as improving compliance, this will reduce the regulatory burden on power station clients.

These data matching mechanisms do not rely on additional data from our clients. Rather, the data matching program is about smarter use of the data already available to government to improve compliance.

Market integrity

Our role administering the Renewable Energy Target includes ensuring the integrity of supply of renewable energy certificates and that obligations are being met to surrender them. More information about our integrity measures is available on our website.

Compliance priorities

We published our compliance priorities for all schemes we administer for the first time in 2017.

For the Renewable Energy Target, we focused on:

- Small-scale Renewable Energy Scheme—enhanced monitoring of integrity of claims for small-scale technology certificates, and
- Large-scale Renewable Energy Target—annual acquittal of large-scale generation certificate liability and increased scrutiny of data provided.

We implemented several new initiatives to meet these priorities, including the examples on pages 38 and 42.

Small-scale Renewable Energy Scheme compliance

In 2017 we further enhanced our monitoring of claims for small-scale technology certificates. We take fraud and non-compliance seriously, and take necessary action to ensure the integrity of the scheme.

Scheme participants who are involved in the improper creation of small-scale technology certificates are subject to enforcement action. We have a broad range of enforcement options that include suspending REC Registry accounts, accepting enforceable undertakings[17], and pursuing civil and criminal penalties.

In 2017 we accepted four enforceable undertakings, executed five warrants, suspended five REC Registry accounts and issued 15 notices to produce information for suspected contraventions of the *Renewable Energy (Electricity) Act 2000*. These matters involve the installation of unapproved solar panels, the misuse of installer details, the provision of false and misleading information, and systems not meeting state and territory electrical safety requirements (in line with the eligibility requirements in the Small-scale Renewable Energy Scheme).

This year we published these actions on our website and in media releases to inform the broader industry about our compliance priorities and action. We also participated in industry events to engage agents, installers, manufacturers and other stakeholders.

Our role relates to the integrity of certificate claims under the scheme. This has collateral benefits for consumers in relation to component quality and installer accreditation, however we do not have explicit consumer protection powers. Where we can, we also work to seek remediation for the customer in dealing with non-compliance in the scheme. For example, the four enforceable undertakings entered into in 2017 required that systems identified in the EU are inspected by an accredited Clean Energy Council (CEC) installer and if required, rectified to required standards. All costs under the enforceable undertakings are met by the undertaking party at no cost to the consumer. In addition to these current undertakings, one enforceable undertaking was completed in 2017 that had similar requirements to inspect and rectify systems. Further information about our enforceable undertakings can be found on our website.

17 See Glossary for definition.

Spotlight...New app checks if solar panels are genuine

A voluntary pilot program involving industry partners is developing tools that will allow participants in the Small-scale Renewable Energy Scheme to quickly and easily check if solar panels are genuine before they are installed.

The Solar Panel Validation project stands to benefit everyone involved, from the manufacturers who will be able to protect their brand, through to the householders who can now be assured their panels are genuine products that meet Australian standards and come with a warranty.

In 2017 we identified three partners through an expression of interest process: FormBay, SolarScope and Bridge Select. They have invested their own funds to develop apps to collect solar panel serial number information and build validation databases synced with the apps.

The pilot is a key element of our 2017 compliance priorities. Use of the validation tools creates a signed data package that contains all of the required information about an installation as well as a validation check on the panels.

These signed data packages can be automatically uploaded to the REC Registry as part of the process of registering the solar panel system.

Certificates created using validated solar panel data will deliver a higher level of confidence to the Small-scale Renewable Energy Scheme. Certificates created without validated data will be examined more closely under our compliance program.

Industry response to the concept has been very positive with major manufacturers including Jinko Solar, Canadian Solar, Yingli Solar, Hanwha Q CELLS, LG Electronics and ReneSola signing agreements to provide serial number data for their panels to be validated.

As the tools are tested and come online, more manufacturers, installers and agents will be invited to participate in the pilot. Following evaluation in 2018, the validation tools will be made available for broader industry participation.

We work in close partnership with state and territory fair trading bodies, and other agencies that have consumer protection regulatory responsibilities. This includes joint operations, sharing of relevant information, intelligence gathering, and referring matters for law enforcement.

We have also increased our monitoring of registered agents' competency and capability to participate in our scheme. We are working with registered agents to co-design an online program of tools and resources that aims to support and improve agent due diligence and compliance practices. This program will be rolled out in 2018.

Inspections program

We inspect a statistically significant sample of solar panel systems to check conformance with the relevant Australian standards, including relevant state and territory electrical safety standards, and requirements under the Small-scale Renewable Energy Scheme.

Of the 4140 inspections conducted in 2017, 79 were found to be unsafe. This is an unsafe rate of 1.9 per cent, down from 2.5 per cent in 2016. Typically the main issues found related to water ingress into electrical components. This is an eight per cent decrease in the number of unsafe systems in 2016, continuing a downward trend in the numbers of unsafe systems found during the annual inspection program.

If an inspector finds an unsafe system, they are required to render it safe for the consumer – typically by turning it off. They then notify all interested parties of the extent and nature of the safety risk, including the relevant state and territory electrical safety regulator. We have no direct powers to deal with electrical safety matters.

Our role is to ensure the integrity of the Small-scale Renewable Energy Scheme by providing the results of inspections to all state and territory electrical safety regulators as well as the Clean Energy Council, which manages accreditation of solar panel installers and approves the key components used. The reduction in unsafe systems in recent years reflects the collaboration of industry, state and territory electrical safety regulators using the trends seen in our inspection program to continuously improve installation quality.

Our data has been used to inform electrical safety regulators and peak industry bodies to update Australian Standards and installation guidelines.

For inspections by state see Appendix D (on page 60).

Photo: Solar panels, Australian Capital Territory

Spotlight...Improving client experience and data quality

We are streamlining the way we capture data for the Large-scale Renewable Energy Target, to improve efficiency and data quality.

We run the REC Registry as the framework for transferring and banking renewable energy certificates.

Our staff also use the REC Registry to enter and process client data for the Large-scale Renewable Energy Target. However, Small-scale Renewable Energy Scheme clients enter their own data, with mainly automated processing and approval of certificates.

In the lead up to meeting the 2020 Renewable Energy Target we anticipate a significant increase in applications for accrediting large-scale renewable energy power stations and creating large-scale generation certificates.

We are leveraging lessons learned through the Small-scale Renewable Energy Scheme to reduce manual data entry and automatically upload and validate independent third-party data that can be used for cross checking (see Data sharing to enhance compliance on page 38).

We are enhancing the REC Registry to include a new self-service capability, enabling Large-scale Renewable Energy Target clients to enter their own electricity generation data to fast track creation of their large-scale generation certificates.

We will consolidate multiple client log-ins and current limited reuse of data to a single entry point so clients can 'tell us once'.

By automating existing manual processes we will also free up resources to handle the larger number of applications in the schemes and to focus compliance activities on higher risk areas.

A risk-based assessment of power stations will help identify high risk applications for accreditation and claims for large-scale generation certificates, to support automated validation of certificates.

As well as improving efficiency and data quality, these enhancements will enable much faster access to data reports.

Photo: Royalla Solar Farm, DIF/FRV, Australian Capital Territory

Renewable Energy Target eligibility

Increase in validated renewable energy certificates

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 baseline (the existing generation of renewable source electricity in 1997).

Individuals and businesses who install eligible small-scale systems can create and trade small-scale technology certificates. In most cases, they assign the right to create their certificates to registered agents in return for a discount on the installation of the system.

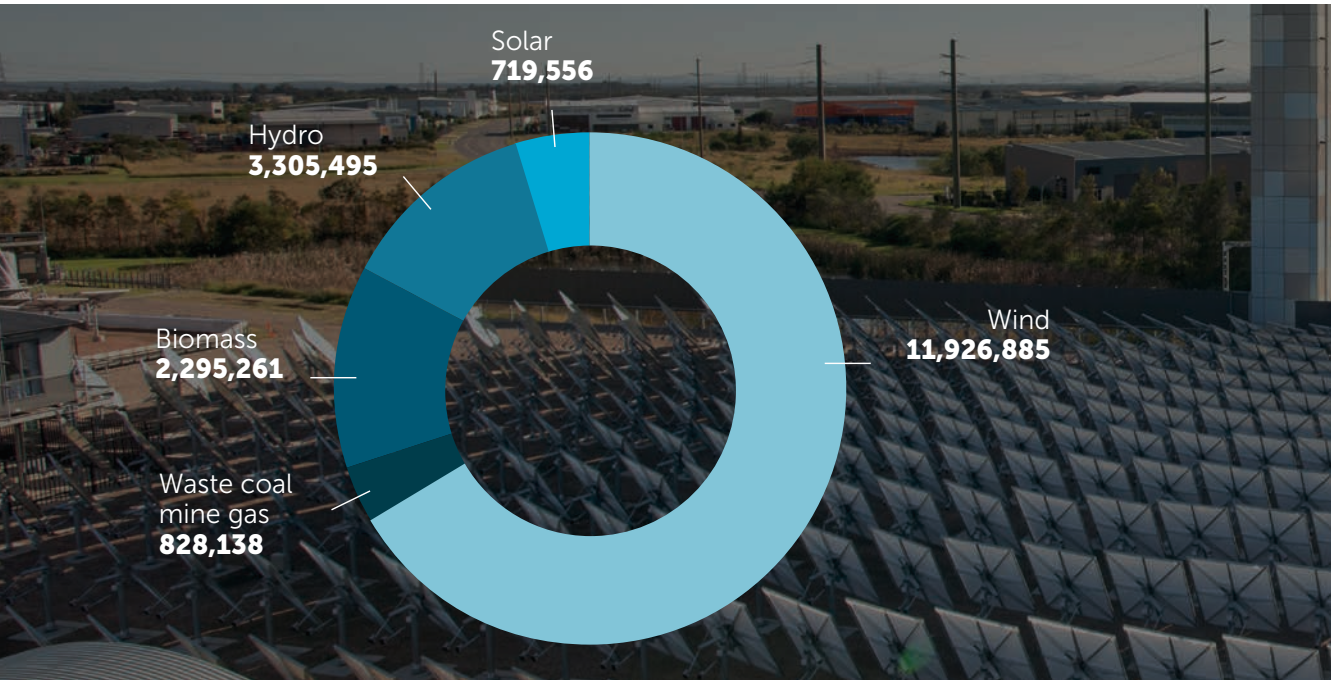
We assess claims for certificates to confirm they represent the correct amount of eligible renewable energy generation. Once validated, certificates can be registered and traded in the market.

This year there was an increase in the number of large-scale generation certificates we validated, from 17,320,821 in 2016 to 19,075,335 in 2017. This reflects the upswing in the number and capacity of power stations accredited in 2016 that went on to create certificates in 2017. It is also partly due to hydro power stations having large numbers of certificates validated.

Wind was again the most dominant fuel source in large-scale generation certificate validations, as shown in Figure 3.

For information on the large-scale generation certificate price, see page 31.

Figure 3: Validated large-scale generation certificates by fuel source in 2017



There was also an increase in the number of small-scale technology certificates validated, up 34 per cent from 16,111,973 in 2016 to 21,662,973 in 2017, with 91 per cent of these for solar panel systems as shown in Figure 4.

Figure 4: Validated small-scale technology certificates by fuel source in 2017

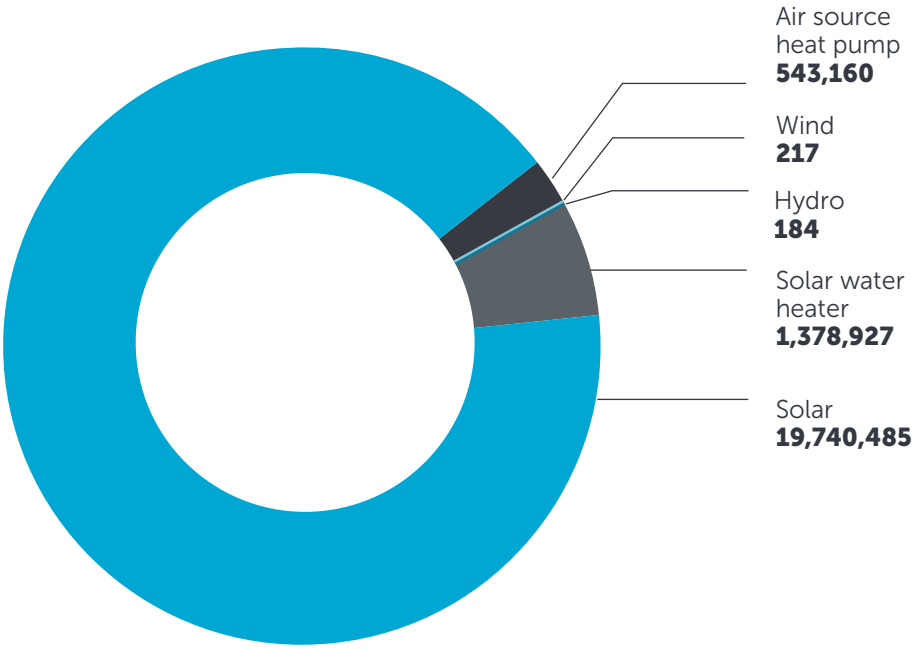


Photo: CSIRO Energy Centre, CSIRO, New South Wales

Renewable Energy Target liability

A healthy surplus of large-scale generation certificates remains in the Large-scale Renewable Energy Target market following final surrender by liable entities for the 2017 assessment year. The surplus should remain healthy and support liquidity in the market as supply from new projects is delivered in 2018.

Across both the Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme, 95.5 per cent of certificates were surrendered on time by liable entities, up from 93.8 per cent for the 2016 assessment year.

Under the Large-scale Renewable Energy Target, entities that do not surrender at least 90 per cent of their liability are required to pay a $65 shortfall charge for each certificate not surrendered.

In 2017, the on time surrender rate for large-scale generation certificates was 93.3 per cent, up from 89.3 per cent last year and the amount of shortfall charges substantially decreased, from $143 million last year to $89.5 million.

A full list of large-scale generation certificate shortfall of more than 10 per cent is at Appendix C (on page 58).

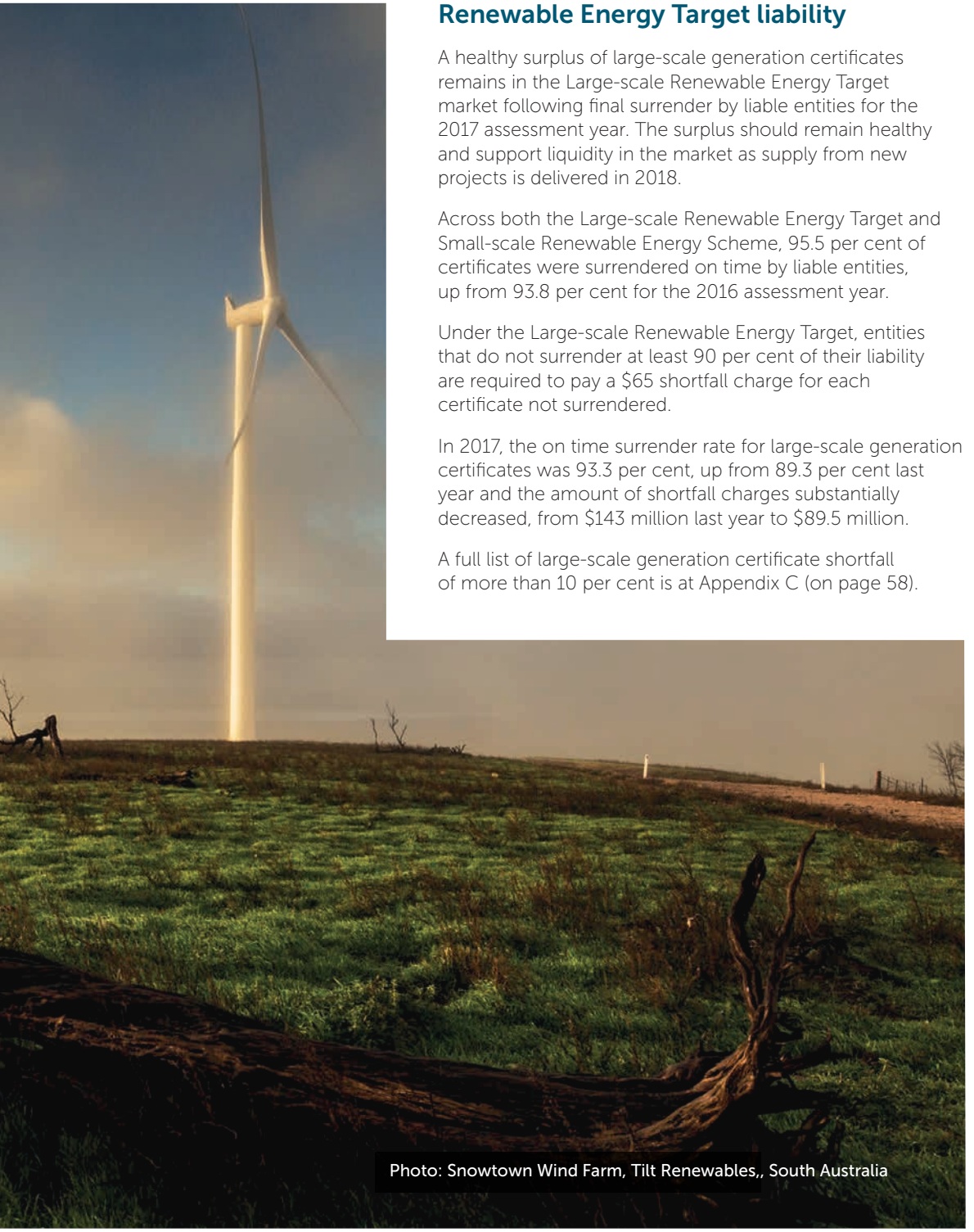


Photo: Snowtown Wind Farm, Tilt Renewables,, South Australia

Spotlight...large-scale generation certificate shortfall carry forward

Under the Large-scale Renewable Energy Target, if liable entities fail to surrender the required number of renewable energy certificates by the due date, they are required to pay a shortfall charge of $65 per certificate, which is not tax deductible.

There is some flexibility, as liable entities that surrender more than 90 per cent of their total large-scale generation certificate liability may carry forward their shortfall to the next assessment year. The carried forward shortfall becomes part of the liable entity's total large-scale generation certificate surrender liability for the following year.

Carried forward shortfalls can accumulate over multiple assessment years. However, once the shortfall is 10 per cent or more of a liable entity's total large-scale generation certificate liability for an assessment year, the shortfall charge becomes payable.

Photo: Boco Rock Wind Farm, CWP Renewables/EGCO, New South Wales

Voluntary surrender

Some organisations surrender renewable energy certificates for reasons not related to liability under the Renewable Energy Target—this is known as voluntary surrender. Most certificates voluntarily surrendered are through the state and territory accredited program, GreenPower. In addition, some desalination plants surrender certificates in accordance with their state-based approvals.

Table 3: Voluntary surrender of renewable energy certificates by type in 2017

Type of certificate	Number of certificates surrendered
Large-scale generation certificates, GreenPower	738,365
Large-scale generation certificates, desalination	169,881
Large-scale generation certificates, altruistic[18]	28,018
Small-scale technology certificates, previous non-compliance	14,303
Small-scale technology certificates, altruistic	2666
Total	**953,233**

Liability exemptions

The *Renewable Energy (Electricity) Act 2000* allows for liability exemptions for emissions-intensive trade-exposed activities. Companies eligible for an exemption are issued with exemption certificates, which are provided to their electricity retailer. The electricity retailer then uses these exemption certificates to reduce their reported electricity acquisitions under the Renewable Energy Target.

In 2017 we finished streamlining the exemption certificate application process, resulting in applications being processed several months earlier than in previous years.

In a significant deregulation outcome for industry, we worked with the Department of the Environment and Energy to streamline the method used to calculate exemptions, based on electricity used by emissions-intensive trade-exposed activities rather than weighted industry average electricity used and the previous financial year's production. The process to amend the regulations was completed in December 2017.

18 Altruistic surrenders are typically offered to offset consumption of a particular business or entity.

Spotlight...Improved transparency for market information

We are committed to data transparency, so making our data accessible to clients and stakeholders is a key area of focus.

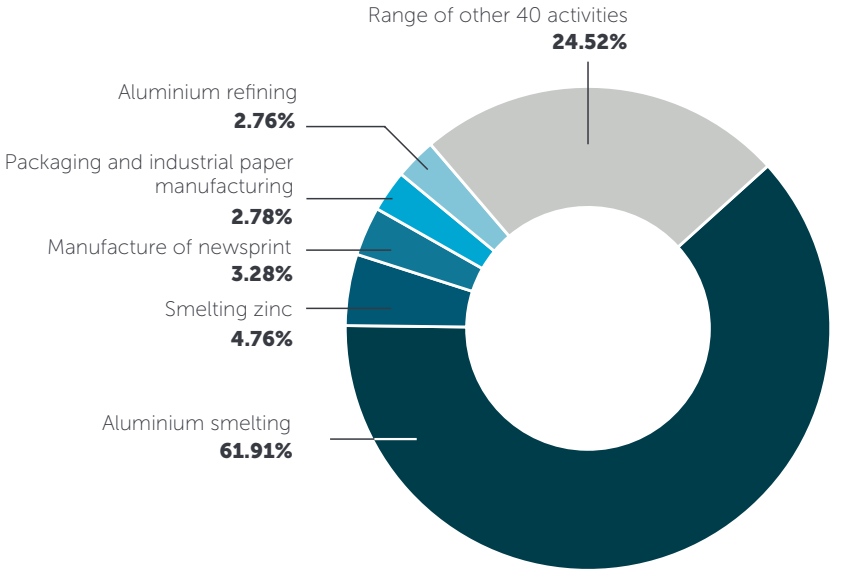
To deliver on this commitment we publish a range of datasets on our website and release regular market updates relating to both the Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme. Some of the additional information about the large-scale market we publish includes updated power station accreditations, collated project announcements and sources of certificate demand.

We have also issued a number of small-scale market updates that include analysis of system installations, certificate creations and the available certificates in the STC Clearing House.

We publish such updates regularly on our website and continually explore new opportunities to publish more data and analysis to address information asymmetry and drive the best investment decisions.

As shown in Figure 5, in 2017 the most exemption certificates were issued to aluminium smelting activities, consistent with previous years.

Figure 5: Emissions-intensive trade-exposed activities in 2017



Setting demand

Under the Renewable Energy Target, liable entities must surrender a number of large-scale generation certificates and small-scale technology certificates each year. The number is determined by applying the renewable power percentage for large-scale generation certificates and the small-scale technology percentage for small-scale technology certificates to an entity's electricity acquisitions, minus exemptions, for that year. Entities acquit their liability by surrendering the required number of certificates to us—quarterly for small-scale technology certificates and annually for large-scale generation certificates.

The renewable power percentage for 2017 was 14.22 per cent.

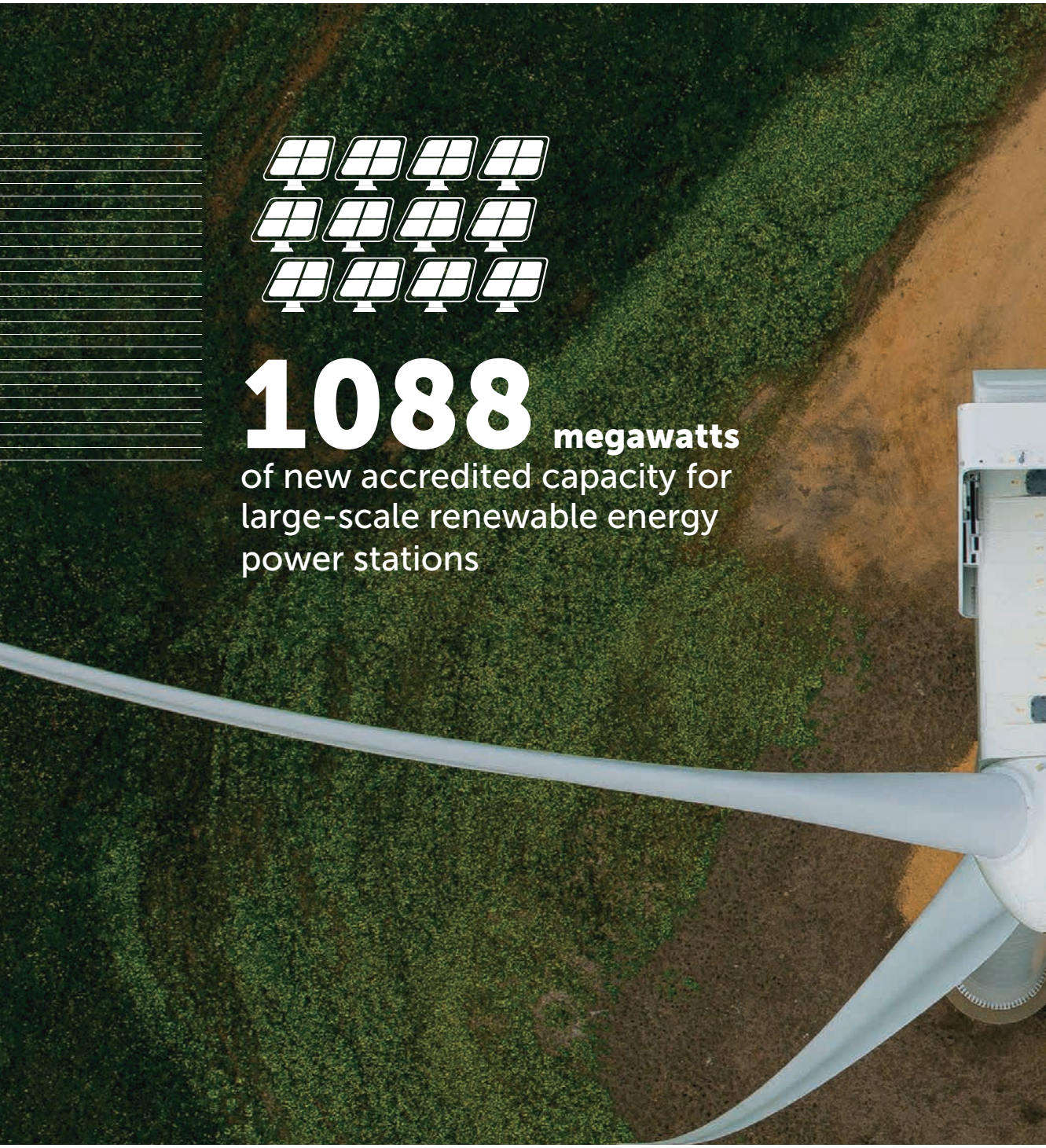
The renewable power percentage takes into account:

- the legislated annual target (renewable electricity required for the year)
- certificates surrendered under or over the previous year's target
- the estimated amount of electricity that liable entities will acquire that year, and
- the estimated exemption in that year for emissions-intensive trade-exposed activities.

The small-scale technology percentage was 7.01 per cent.

The small-scale technology percentage is calculated based on the:

- estimated value (in megawatt hours) of small-scale technology certificates that will be created for the year
- certificates surrendered that were under or over the previous year target
- accumulated excess or shortfall from previous years
- estimated amount of electricity that will be acquired by liable entities for the year, and
- estimated exemption for that year for emissions-intensive trade-exposed activities.


1088 megawatts
of new accredited capacity for large-scale renewable energy power stations

Appendices

Appendix A: The year in numbers
Appendix B: Relevant legislation
Appendix C: Shortfall list
Appendix D: Inspections by state

Photo: Macarthur Wind Farm, AGL, Victoria

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 2017 provide a quick reference for key data.

Key data – Large-scale Renewable Energy Target

Supply

	Description	Metric
2017	Large-scale renewable energy power stations accredited	124
	Large-scale renewable energy power stations by energy source	112 Solar 8 Wind 4 Biomass
	Large-scale renewable energy power station capacity	1088 megawatts
	Large-scale generation certificates validated	19,075,335
Cumulative	Cumulative number of large-scale renewable energy power stations	711
	Cumulative capacity of all large-scale renewable energy power stations	15,286 megawatts
	Committed and probable construction of new large-scale renewable energy power stations capacity since 1 January 2016	6535 megawatts

Demand

2017	Large-scale generation certificates surrendered	23,203,396
	Large-scale generation certificates voluntarily surrendered (mainly for GreenPower)	936,264
	Large-scale Renewable Energy Target on-time surrender	93.3 per cent
	Total large-scale certificate shortfall charge	$89.5 million

Key data – Small-scale Renewable Energy Scheme

Supply

	Description	Metric
2017	New small-scale systems installed	225,991
	Small-scale systems installed by type	167,870 solar panel systems 40,322 solar water heaters 17,791 air source heat pumps 8 wind systems
	Total capacity for small-scale generation units installed	1052 megawatts
	Average capacity of solar panel systems	6.3 kilowatts
	Number of residential (0–10 kilowatt) solar panel system installations and capacity	Installations: 155,424 Capacity: 759 megawatts
	Number of commercial (10–100 kilowatt) solar panel system installations and capacity	Installations: 12,446 Capacity: 292 megawatts
	Number of small-scale solar panel system installations by state and territory	1742 Australian Capital Territory 41,000 New South Wales 1870 Northern Territory 45,113 Queensland 15,275 South Australia 2319 Tasmania 29,753 Victoria 30,798 Western Australia
	Small-scale technology certificates validated	21,662,973
Cumulative	Cumulative number of installed small-scale systems	2,900,361
	Cumulative number of installed small-scale systems by type	1,809,950 solar panel systems 860,357 solar water heaters 229,615 air source heat pumps 421 wind systems 18 hydro systems
	Cumulative capacity for small generation units	6519 megawatts

Demand

2017	Small-scale technology certificates surrendered	12,213,677

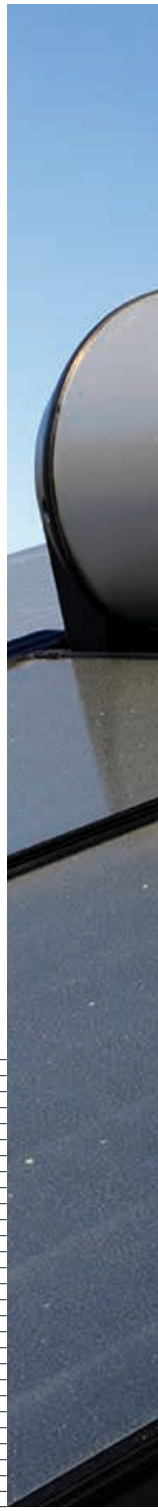
Market integrity

2017	Inspections of small-scale systems	4140 inspections 79 unsafe 822 substandard
	Total number of registered agents	136
	Total number of registered persons	326

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

Liable entity	LGC liability (Number of certificates)	LGCs surrendered	LGC shortfall (Number of certificates)	LGC shortfall per cent of total LGC liability (%)	Value of LGC shortfall charge ($)	STC shortfall (Number of certificates)	Value of STC shortfall charge ($)
1st Energy Pty Ltd	27,299	-	27,299	100	1,774,435	-	-
Alinta DEWAP Pty Ltd	65,884	-	65,883	100	4,282,395	-	-
Alinta Energy Retail Sales Pty. Ltd.	373,552	8590	364,962	98	23,722,530	-	-
Alinta Energy Transmission (Roy Hill) Pty Ltd	30,336	-	30,336	100	1,971,840	-	-
Alinta Sales Pty Ltd	300,099	-	300,099	100	19,506,435	-	-
Amanda Energy Pty Ltd	19,158	17,300	1858	10	-	-	-
Blue NRG Pty. Ltd.	68,471	-	68,471	100	4,450,615	-	-
Braemar Power Project Pty Ltd	318	-	318	100	20,670	-	-
Change Energy Pty LTd	1532	-	1532	100	99,580	-	-
COzero Energy Retail Pty Ltd	-	-	-	-	-	596	38,740
CovaU Pty Limited	30,596	-	30,596	100	1,988,740	-	-
EnergyAustralia Pty Ltd	1,628,380	1,496,655	130,144	8	-	-	-
EnergyAustralia Yallourn Pty Ltd	1,158,893	1,066,182	92,711	8	-	-	-
Enwave Mascot Pty Ltd	3773	3600	173	5	-	-	-

LGC = large-scale generation certificate
STC = small-scale technology certificate

Liable entity	LGC liability (Number of certificates)	LGCs surrendered	LGC shortfall (Number of certificates)	LGC shortfall per cent of total LGC liability (%)	Value of LGC shortfall charge ($)	STC shortfall (Number of certificates)	Value of STC shortfall charge ($)
Globird Energy Pty Ltd	7749	-	7749	100	503,685	2	130
IPOWER 2 PTY LIMITED and IPOWER PTY LIMITED TA Simply Energy	566,821	511,600	55,221	10	-	-	-
Karara Energy Pty Ltd	23,217	20,657	2560	11	166,400	1267	82,355
Mojo Power Pty Ltd	7746	250	7465	96	485,225	3232	210,080
Next Business Energy Pty Ltd	38,907	-	38,907	100	2,528,955	-	-
Online Power & Gas Pty Ltd	10,401	-	10,401	100	676,065	-	-
OzGen Retail Pty Ltd	3616	-	3616	100	235,040	-	-
People Energy Pty Ltd	8704	-	8704	100	565,760	-	-
Perth Energy Pty Ltd	256,977	-	256,977	100	16,703,505	-	-
Progressive Green Pty Ltd	70,615	-	70,615	100	4,589,975	-	-
Qenergy Limited	42,053	5729	36,324	86	2,361,060	-	-
Rimfire Energy Pty Ltd	12,048	-	12,048	100	783,120	-	-
Sanctuary Energy Pty Ltd	4726	-	4726	100	307,190	-	-
Sumo Power Pty Ltd	25,420	-	25,420	100	1,652,300	-	-
TEC Hedland Pty Ltd	-	-	-	-	-	678	44,070

LGC = large-scale generation certificate
STC = small-scale generation certificate

Appendix D:
Inspections by state

State	Number of systems inspected	Systems safe	Systems unsafe	Systems substandard
ACT	24	17	-	7
NSW	930	765	16	149
NT	34	21	1	12
QLD	1142	859	30	253
SA	323	248	1	74
TAS	72	60	1	11
VIC	821	656	18	147
WA	794	613	12	169
Total	**4140**	**3239**	**79**	**822**

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 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.

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.

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 the renewable source that 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 we assess and approve 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.

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.

Photovoltaic system

A photovoltaic 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 construction/projects

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

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 a registered 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 panel

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

STC Clearing House

Market participants can buy and sell small-scale technology certificates through the small-scale technology certficate (STC) Clearing House at a fixed price of $40 (ex GST). We operate the STC Clearing House, which is available through the REC Registry.

Substandard

A substandard 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.

Index

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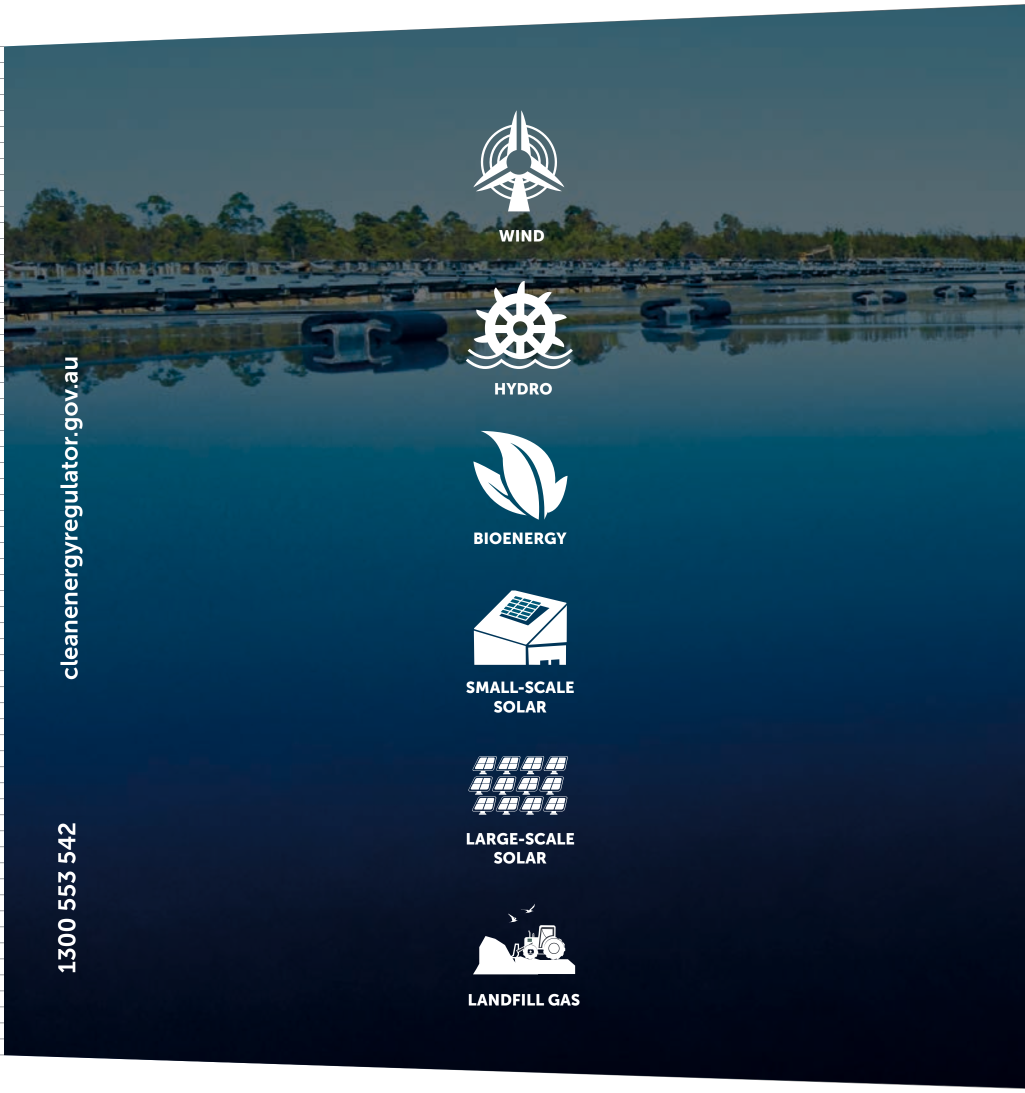
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