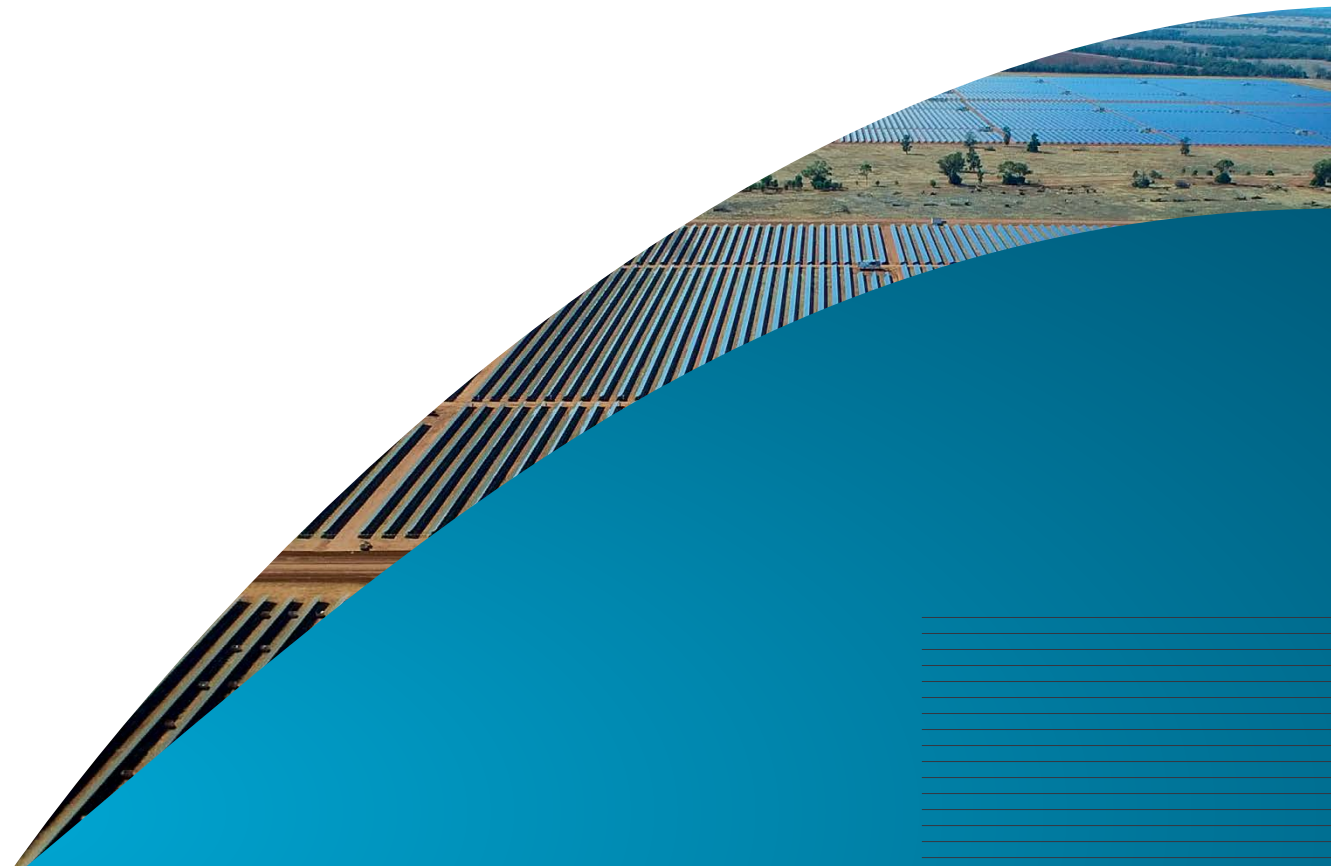
Australian Government

Clean Energy Regulator

RENEWABLE ENERGY TARGET



THE ACCELERATION OF RENEWABLES DELIVERED IN 2019

Encouraging renewable energy in Australia

Contact details:

Published by the Clean Energy Regulator

ISSN 2202–0047

Acknowledgements

This report reflects the efforts of many people. Special thanks to the staff of the Clean Energy Regulator and the external contributors.

This report has been prepared in accordance with the requirements of section 105 of the *Renewable Energy (Electricity) Act 200*0. The data is accurate as at 31 March 2020. 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 and Contract Centre
Clean Energy Regulator
02 6159 3100

Photo acknowledgements:

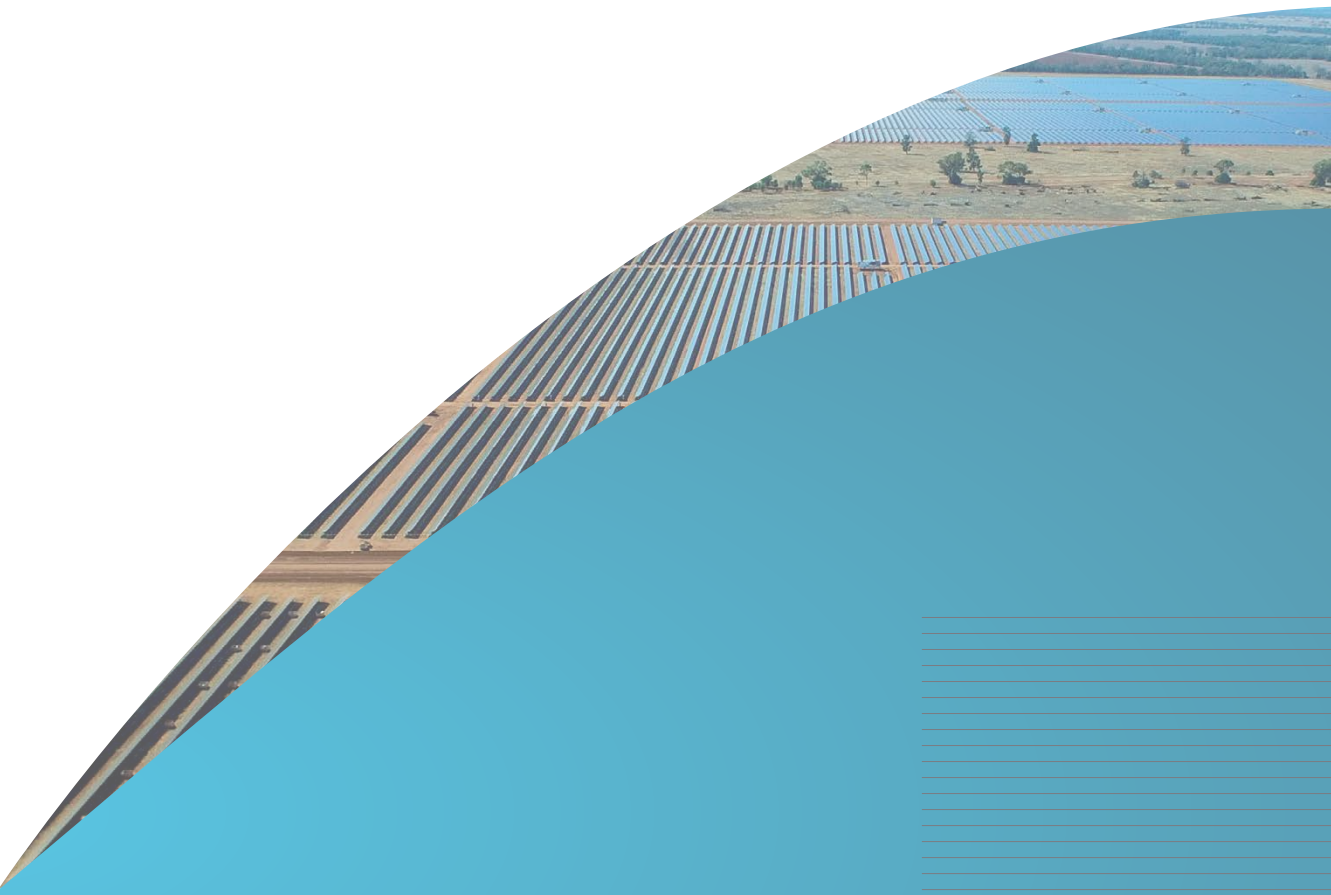
Front cover: Solar Farm, Nyngan, NSW. Photo: Clean Energy Regulator.

Back cover: Wind turbines at Macarthur Wind Farm Victoria. Photo: Powering Australian Renewables Fund.

Australian Government

Clean Energy Regulator

RENEWABLE ENERGY TARGET



THE ACCELERATION OF RENEWABLES DELIVERED IN 2019

Encouraging renewable energy in Australia

Letter of transmittal

The Hon Angus Taylor MP
Minister for Energy and Emissions Reduction
Parliament House
Canberra ACT 2600

Dear Minister

I am pleased to submit the 2019 *Renewable Energy Administrative Report – The acceleration of renewables delivered in 2019*.

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

The report covers the operations of the *Renewable Energy (Electricity) Act 2000* for the 2019 calendar year and the annual statement and supporting information about progress towards meeting the 2020 Large-scale Renewable Energy Target.

Yours sincerely

David Parker AM
Chair, Clean Energy Regulator
12 August 2020

Contents

Chair's foreword

In 2019, a major milestone was achieved for renewable energy in Australia. There was enough capacity delivered to guarantee that the Large-scale Renewable Target of 33,000 gigawatt hours of additional renewable energy will be met.

This milestone was met ahead of schedule and represents the hard work of a growing and dynamic renewables industry.

Across Australia a total of 6.3 gigawatts of additional renewable energy capacity was delivered in 2019, up 24 per cent from 2018. Large-scale capacity[1] grew by 4.1 gigawatts and small-scale solar Photovoltaics (PV) by 2.2 gigawatts. By the end of 2019, over 33 gigawatts of renewable energy capacity[1] had been delivered. This additional capacity took the total share of renewables in the National Electricity Market to 25 per cent by the end of 2019.

Australians continue to invest in rooftop solar PV to reduce their electricity bills and gain the environmental benefits. Even with reducing Commonwealth incentives, rooftop solar PV remains an attractive option for consumers with short payback periods and declining costs.

A strong compliance focus is important to protect the integrity of the Renewable Energy Target, particularly during times of strong growth. As market participation has increased and diversified, the Clean Energy Regulator has continued to make a range of system and process enhancements to provide greater efficiency for both large and small-scale scheme participants. These enhancements include the introduction of a fast-track processing pathway for small-scale technology certificate claims supported by solar panel validation, and changes to the online power station accreditation and the large-scale generation certificate claim processes making it easier and faster for new participants to participate in the scheme.

Australia is on track to increase total renewable generation to 30 per cent by the end of 2020. New renewables investment is now driven primarily by commercial factors and increasingly by corporations entering into power purchase agreements to both hedge electricity prices and meet their own emissions reduction goals.

Although the statutory large-scale target will be met in 2020, the Renewable Energy Target framework will continue to provide a transparent mechanism to demonstrate use of renewable energy and achievement of emission abatement goals to their consumers and supply chain.

The market keeps surprising on the upside, innovating with technology and business models, however current transmission constraints in Australia's electricity grid need to be addressed with a coordinated response. The Australian Energy Market Operator's Integrated System Plan, the Renewables Integration Study and government investment in transmission upgrades will enable Australia's transition to a low emission electricity grid. The expedited progression of key transmission projects will be essential in unlocking the next wave of renewable energy investment in Australia.

The small and large-scale renewable energy schemes were not heavily impacted by the economic slowdown arising from the COVID-19 pandemic at the time of writing this report. The market will continue to be closely monitored and regular updates will be provided through the Quarterly Carbon Market Reports and through the Clean Energy Regulator website.

David Parker AM
Chair, Clean Energy Regulator

1 This includes eight gigawatts of renewable capacity operating prior to the commencement of the Renewable Energy Target.

2019 Annual Statement – Large-scale renewables investment continues beyond the 2020 target

In 2019 sufficient capacity was delivered to exceed the Large-scale Renewable Energy Target of 33,000 gigawatt hours in 2020.

Overall findings

Across Australia a record 4.1 gigawatts of new renewable energy capacity was delivered under the Large-scale Renewable Energy Target in 2019, up 17 per cent from the previous record of 3.5 gigawatts set in 2018.

28,300 gigawatt hours of eligible renewable electricity was generated in 2019 compared to 23,400 gigawatt hours in 2018[2].

Generation from large-scale renewables incentivised by the Large-scale Renewable Energy Target is estimated to have delivered 22 million tonnes of carbon dioxide equivalent abatement in 2019, an increase from 18 million tonnes in 2018[3]. The carbon abatement calculation is a conservative estimate based on the emissions intensity of the National Electricity Market in 2019 which has decreased by eight per cent compared to 2018. The emissions intensity of the grid will continue to reduce as the penetration of renewables increases.

In addition to decarbonising the grid, investment in large-scale renewables helped deliver lower electricity prices for consumers in 2019. The Australian Energy Market Commission found the renewable capacity delivered across the year contributed to decreasing wholesale electricity prices; and residential bills started to decline in part due to declining total costs of the Large-scale Renewable Energy Target[4].

The Clean Energy Regulator expects approximately 3.4 gigawatts of new utility-scale renewable capacity to be delivered in 2020[5]. A minimum 34,000 gigawatt hours of eligible renewable energy generation is expected in 2020, exceeding the 33,000 gigawatt hours Large-scale Renewable Energy Target. The estimated generation could increase substantially if there is an above average hydro generation year.

Capacity

Since January 2016, a total of 12.5 gigawatts has been built or is under construction. This is 6.1 gigawatts more capacity than the 6.4 gigawatts required to meet the 2020 target.

This 6.4 gigawatt threshold was passed in September 2019 with the accreditation of Goldwind's Cattle Hill Wind Farm in Tasmania.

Of the 4.1 gigawatts of large-scale projects delivered in 2019, 3.9 gigawatts from utility-scale wind and solar projects and 175 megawatts of mid-scale commercial and industrial sized solar PV systems (100 kilowatts to five megawatts) a strong growth of 51 per cent compared to 2018.

2 Additional to below baseline generation that occurred prior to the Renewable Energy Target. This generation was primarily from hydro and bagasse and is approximately 14,000 gigawatt hours each year.
3 This estimate of carbon abatement does not include below baseline generation.
4 Australian Energy Market Commission, 2019 Residential Electricity Price Trends Report.
5 At the time of writing, there have been no announcements regarding the certain delay of projects expected to complete construction in 2019. As such, our estimate for utility-scale capacity remains at 3.4 gigawatts.

Certificate prices

The increased penetration of renewables in the National Electricity Market has placed downward pressure on both wholesale electricity prices and large-scale generation certificate prices.

Large-scale generation certificate spot prices fell from around $48 in January to $39 at the end of December 2019, with forward spot prices also easing from $39 in calendar 2019 to $15.50 for calendar 2022.

Certificate spot prices are expected to continue to moderate in 2020 and beyond as the supply of large-scale generation certificates increases against the static legislated demand of 33,000 gigawatt hours.

Liability

Annual surrender of large-scale generation certificates reduced to 76.6 per cent of liability set by the renewable power percentage for 2019. This was down from 86.1 per cent for 2018 as a larger amount of large-scale generation certificate liability was taken as shortfall. High differentials between spot and forward certificate prices provides a commercial incentive to utilise shortfall charge mechanisms as entities can pay the shortfall charge and redeem that with lower price certificates in the future.

The announcement by the Government in the 2019–20 Mid-Year Economic and Fiscal Outlook, that it will amend the law retrospectively to clarify that no tax is payable on the refund of large-scale generation certificate shortfall charges, likely encouraged greater use of the shortfall provisions for the 2019 assessment year and into the future.

In the context that the 2020 target will be exceeded, the Clean Energy Regulator views the use of shortfall charge to be reasonable in the expectation that the majority of shortfall charges will be redeemed in the allowed three-year period.

Household electricity prices

According to the Australian Energy Market Commission[6], costs associated with the Large-scale Renewable Energy Target accounted for an estimated average of $8.85 per quarter in 2019 average household electricity bills, a $1 reduction per quarter compared to 2018. This is related to the decline in large-scale generation certificate prices.

Looking forward

In 2019, it became clear that substantial investment in new transmission capacity is required to enable the full delivery of the large pipeline of renewable energy projects while maintaining a secure and stable grid. Grid constraints are leading to curtailment of generation for some operating renewable power stations and delaying connections in some locations. Transmission investment is underway with significant announcements made in 2019 and 2020 for new and upgraded interconnectors[7]; as well as the development of renewable energy zones that will support the connection of new renewables.

Longer term, the Australian Energy Market Operator's Integrated System Plan—expected to be finalised in mid-2020—will provide a roadmap for necessary transmission upgrades to enable the transition of Australia's grid to allow a higher proportion of renewables.

6 Australian Energy Market Commission, 2019 Residential Electricity Price Trends Report.

7 This includes upgrades to the New South Wales – Queensland interconnector. A new interconnector between South Australia – New South Wales has also been listed as a top priority for the Australian Energy Market Operator.

New renewables investment is now driven primarily by commercial factors and increasingly by corporations entering into power purchase agreements to both hedge electricity prices and meet emissions reduction goals. The pipeline of projects tracked by the Clean Energy Regulator at the end of 2019 includes 1.2 gigawatts of projects with a signed power purchase agreement. Beyond this there is 37 gigawatts of projects with development approval[8] across Australia, which provides the potential for solid future investment if the transmission network is upgraded to support this additional capacity.

The economic impacts arising from the COVID-19 pandemic became apparent in mid-March 2020, after the year to which this annual statement relates. However, prior to finalisation of this full report it appeared the large-scale renewables industry was holding up well. No material delays were anticipated with projects under construction. While getting new investments to financial close may be more difficult, the announcements in the first quarter were strong at 837 megawatts and the Clean Energy Regulator believes there are strong prospects of more capacity reaching financial close in 2020 than the two gigawatts in 2019.

Maintenance check on wind turbines at Gullen Range Wind Farm, NSW. Photo: BJCE Australia.

8 Source: Rystad Energy, Renewables Project Analysis

OUTCOMES FOR 2019

Wind turbine at Snowtown Wind Farm, South Australia. Photo: Chris Oaten, Clean Energy Regulator.

34 million tonnes of carbon abatement from generation and displacement

6.3 gigawatts of renewable capacity installed, up 24%

2.2 gigawatts small-scale solar PV capacity installed, up 36%

4.1 gigawatts large-scale renewable capacity accredited, up 17%

35.8 million small-scale technology certificates validated, up 20%

29.6 million large-scale generation certificates validated, up 29%

10.3 gigawatts
of cumulative small-scale solar PV capacity installed, up 27%

22.9 gigawatts
of cumulative large-scale renewable capacity accredited, up 22%

16,100 gigawatt hours
of electricity generated or displaced from small-scale systems, up 20%

28,300 gigawatt hours
generated by large-scale renewable energy power stations, up 21%

38.1 million
small-scale technology certificates acquitted, up 28%

25.6 million
large-scale generation certificates acquitted, up 5%

The Renewable Energy Target

The purpose of the Renewable Energy Target is to encourage new investment in renewable energy and reduce greenhouse gas emissions. It does this by creating a market for renewable energy certificates, which helps drive investment in the sector. On the supply side of the market, participants create certificates for each additional megawatt hour of renewable energy generated or displaced (no longer required from the grid). On the demand side, liable entities (mainly electricity retailers) source certificates in proportion to the total electricity they acquire in an assessment year.

Accredited power stations that operated before 1997 must generate eligible electricity above a set baseline during a year before large-scale generation certificates can be created for that electricity.

The Renewable Energy Target comprises the:

- **Large-scale Renewable Energy Target**, which aims to generate an additional 33,000 gigawatt hours of electricity from renewable sources in 2020, compared with 1997 levels. The scheme encourages companies to invest in new large-scale renewable energy power stations, including solar and wind farms, and hydro and biomass power stations.
- **Small-scale Renewable Energy Scheme**, which provides incentives for households and businesses to install small-scale systems. This includes solar panels, solar water heaters, small-scale wind or hydro systems and air source heat pumps.

The Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme come from the *Renewable Energy (Electricity) Act 2000 (the Act).*

Under the Act, sectors of the economy that are classed as emissions intensive and trade exposed are exempt from obligations on the electricity that they use in their production activities.

For more detail on how the Renewable Energy Target works, see www.cleanenergyregulator.gov.au

Turbines at Boco Rock, Australian Capital Territory. Photo: Chris Oaten, Clean Energy Regulator.

YEAR IN REVIEW

Australia's renewable energy acceleration

2019 was another record-breaking year for renewable capacity delivered[9]. The strong performance in 2018 was surpassed in 2019 with total renewable capacity delivered under the Renewable Energy Target (both small-scale and large-scale) increasing by 24 per cent—from 5.1 gigawatts in 2018 to 6.3 gigawatts in 2019.

Investment in solar PV and solar water heater systems under the Small-scale Renewable Energy Scheme increased across all states in 2019. Solar PV continues to be attractive for households and businesses looking to reduce their electricity bills; with net system costs to consumers continuing to fall despite the decreasing subsidy through the Small-scale Renewable Energy Scheme[10].

New South Wales, Queensland and Victoria all saw strong growth in solar PV installations in 2019. By the end of 2019 the cumulative capacity installed under the Small-scale Renewable Energy Scheme exceeded 10 gigawatts.

Table 1: Small-scale Renewable Energy Scheme installations and capacity delivered by state and territory

State/ territory	2019 installations	2019 capacity (megawatts)	Cumulative installations	Cumulative capacity (megawatts)
ACT	4,508	30	38,883	122
NSW	83,145	585	823,462	2,433
NT	4,267	30	35,536	103
QLD	80,418	562	965,525	2,946
SA	28,983	222	335,263	1,230
TAS	4,285	20	52,222	157
VIC	88,653	456	786,081	2,009
WA	44,803	245	507,403	1,312
Total	**339,062**	**2,150[11]**	**3,544,375**	**10,312**

The state and territory profile of new utility-scale power station capacity delivered is more variable due to long construction times and complexity in connecting to the grid. New South Wales dominated utility-scale capacity delivered with the greatest increase from 2018 while growth in Queensland declined following delivery of substantial commitments over the period 2016-2018. Key projects delivered in Tasmania and Western Australia in 2019 also resulted in a significant increase in renewable capacity delivered compared to 2018, albeit from a relatively small baseline. Cumulatively New South Wales has the largest total renewables fleet by capacity, owing to a strong portfolio of hydro power stations operating before the commencement of the Renewable Energy Target combined with new investment in solar and wind projects in recent years.

9 Delivered refers to power stations or installations that are accredited under the Large-scale Renewable Energy Target or installed under the Small-scale Renewable Energy Schemes. Delivered utility-scale projects may still be ramping up to full commissioned capacity.

10 The Small-scale Renewable Energy Scheme ends in 2030 with the subsidy provided through the scheme for solar PV decreasing each year since 2017. The deeming or forward crediting of certificates declines by one year every year until 2030.

11 This number will continue to increase marginally to the end of 2020 as residual claims for 2019 are submitted and processed.

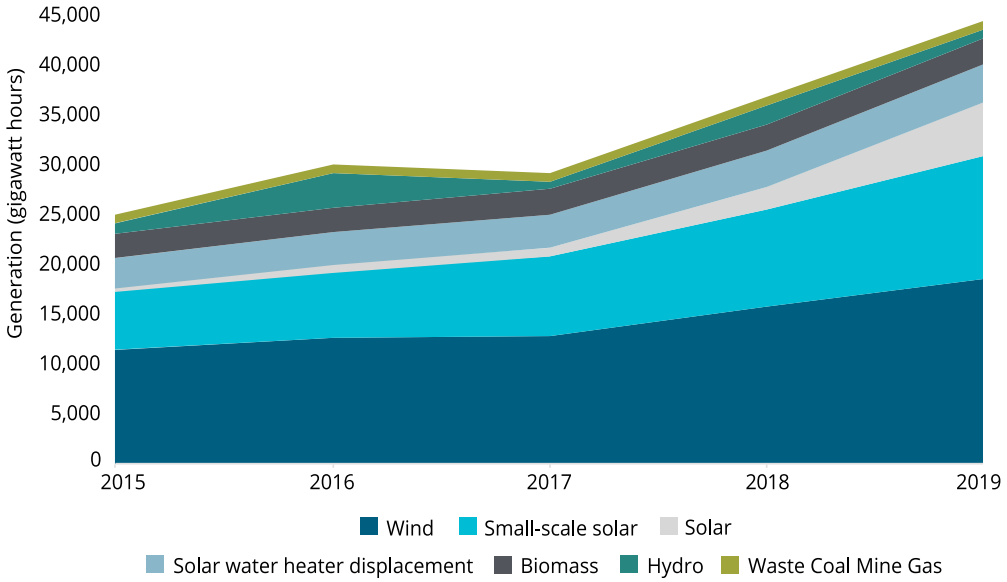
Salt Creek Wind Farm located on a Merino stud farm near Woorndoo, Victoria. Photo: Mondo.

Table 2: Large-scale Renewable Energy Target capacity delivered by state and territory

State	2019 power stations	2019 capacity (megawatts)	Cumulative power station number	Cumulative capacity (megawatts)
ACT	2	1	23	56
NSW	80	1,410	335	8,190
NT	7	3	57	30
QLD	80	1,255	276	4,252
SA	70	403	193	2,696
TAS	4	151	71	2,801
VIC	110	653	359	3,865
WA	38	198	150	997
Total	**391**	**4,074**	**1,464**	**22,887**

The additional capacity delivered in 2019 drove a record amount of renewable energy generation across Australia. Total generation and displacement under the Renewable Energy Target increased by 21 per cent from 36,800 gigawatt hours in 2018 to 44,400 gigawatt hours in 2019. Of this, 28,300 gigawatt hours was renewable energy generation under the Large-scale Renewable Energy Target and 16,100 gigawatt hours was from generation and displacement under the Small-scale Renewable Energy Scheme.

Figure 1: Total Renewable Energy Target generation and displacement by fuel source



By the end of 2019, total generation from renewables accounted for approximately 25 per cent of total electricity generation in the National Electricity Market. This is a significant increase from the end of 2018 when renewables accounted for 20 per cent of generation.

Large-scale capacity increases ahead of the target

In 2019, more than enough capacity was delivered to meet the 2020 target. The strong growth in large-scale renewables continued throughout 2019:

- 4.1 gigawatts delivered, an increase of 17 per cent from the previous record of 3.5 gigawatts in 2018, bringing the total accredited capacity to 22.9[12] gigawatts.
- 391 power stations accredited, up from 362 in 2018, with the majority being (88 per cent) solar power stations between 100 kilowatts to 5 megawatts, and
- 29.6 million large-scale generation certificates validated, a 29 per cent increase on 2018.
- 28,300 gigawatt hours of renewable energy generation, a 21 percent increase on generation in 2018.

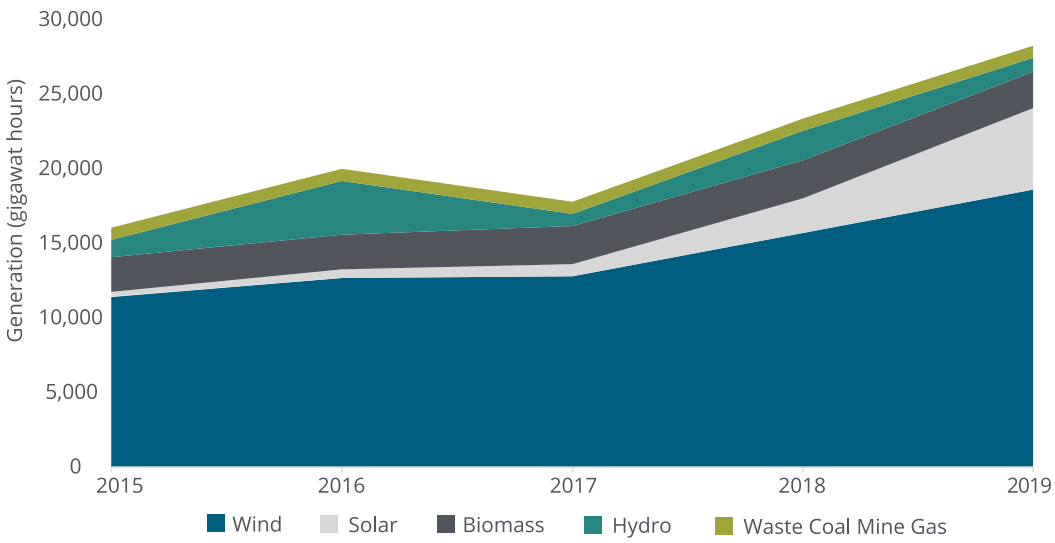
2019 was the hottest and driest year on record[13] and hydro generation decreased due to extended drought throughout Australia. Above baseline hydro generation in 2019 declined by more than 50 per cent compared to 2018. 2019 was the first year there was more wind generation in Australia than total hydro generation. The record delivery of utility-scale solar farms over recent years led to a more than doubling of solar PV generation in 2019 compared with 2018.

12 This includes approximately eight gigawatts of existing capacity at the start of the Renewable Energy Target in 2001.

13 Australian Energy Market Operator, Quarterly Energy Dynamics Q4 2019, January 2020. Available at: https://aemo.com.au/-/media/files/major-publications/qed/2019/qed-q4-2019.pdf?la=en

Solar panels on Ayers Rock Airport. Photo: Voyages.

Figure 2: Above baseline generation by fuel source, 201–2019.



Small-scale investment continues to grow

Investment by Australian households and businesses in small-scale renewable energy systems grew strongly in 2019:

- 24 per cent increase in the number of small-scale solar PV installed compared with 2018; almost one in four households now has a small-scale solar PV installation.
- 2.2 gigawatts of small-scale solar PV capacity installed (a 36 per cent increase on 2018), bringing the cumulative national total to 10.3 gigawatts.
- 16,100 gigawatt hours of electricity generated or displaced by small-scale renewable energy systems.
- 35.8 million small-scale technology certificates validated.

Residential rooftop solar panels. Photo: Jonathan Mandl, Clean Energy Regulator.

The average size of small-scale solar PV systems increased in 2019, up by six per cent from 7.2 kilowatts in 2018 to 7.6 kilowatts in 2019. Installations of mid-scale solar PV systems (15 to 100 kilowatts) on businesses, schools and commercial buildings and households choosing larger sizes of solar PV installations are factors driving this increase.

Carbon abatement accelerates

The Renewable Energy Target reduces Australia's emissions by displacing coal and gas used for electricity generation and water heating with renewable sources such as solar, wind and hydro.

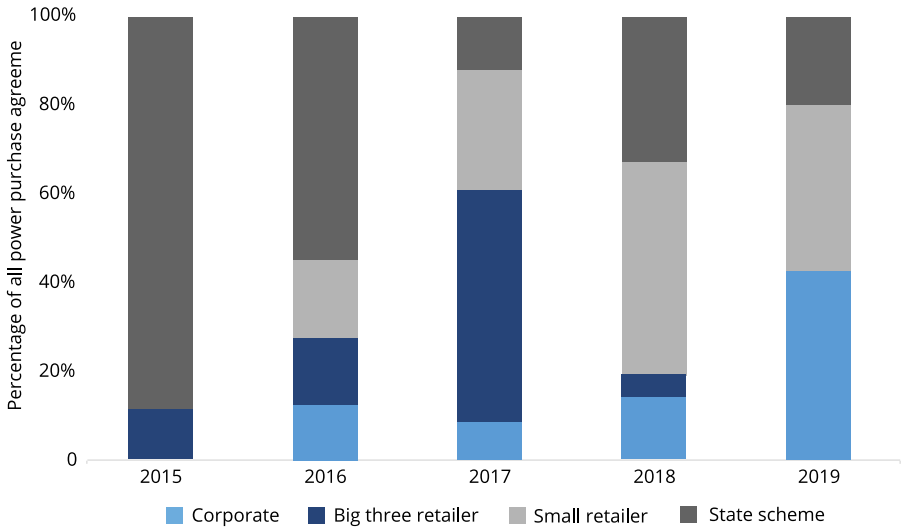
Renewable energy generation increased by 21 per cent in 2019, reducing the emissions intensity of the National Energy Market to 0.74 tCO^2-e/MWh in 2019 down from to 0.77[14] in 2018. Total emissions reductions from the Renewable Energy Target in 2019 reached an estimated 34 million tonnes of CO2-e with 21 million tonnes from the Large-scale Renewable Energy Target and 13 million tonnes from the Small-scale Renewable Energy Scheme.

Power purchase agreements drive investment in new renewables

Reported[15] power purchase agreements underpin over 77 per cent of the total large-scale renewable project pipeline. Prior to 2017, these agreements were mostly between generators and large retailers or states and territories with their own renewable energy targets. In recent years, small retailers looking to increase their market share, and a growing number of corporations looking to offset their emissions, have actively sought new power purchase agreements.

14 Australian Energy Market Operator: Quarterly Energy Dynamics Q4 2019.
15 Power purchase agreements are commercial agreements and not all may be publicly disclosed.

Figure 3: Types of power purchase agreements supporting new renewables, 2015 to 2019*



*Based on the year the power purchase agreement was signed.

Over 500 megawatts of new utility-scale renewable capacity in 2019 was underpinned by large corporations seeking to hedge electricity costs and reduce carbon emissions. The majority of this capacity was signed by supermarket chains with a portfolio of premises across the country. A power purchase agreement is often preferred over installing solar PV systems on individual premises for corporations who do not own their buildings. It removes the complexity and cost of negotiating with multiple landlords. Indications in 2020 suggest a growing subsector of large resource corporations looking to power off-grid mines with renewables either through power purchase agreements or their own installations.

State renewable energy targets also support investment in new renewable energy projects. The Australian Capital Territory commenced a second reverse auction after the success of the first reverse auction in 2015. In Victoria successful projects from the 2018 Renewable Energy Auction Scheme began construction in 2019. Approximately 700 megawatts of the total 886 megawatts contracted is expected to be delivered in 2020.

In 2019, as part of the Powering Queensland plan, the Queensland government established CleanCo. CleanCo is a publicly owned energy retailer in the state that will own, operate and grow the renewable energy assets required to meet their target of 50 per cent renewables by 2030. CleanCo is also responsible for progressing the state's 400 megawatts of renewables and 100 megawatts of energy storage reverse auction process.

Off-grid solar PV systems

Off-grid solar PV installations demonstrated their potential as a new growth area with capacity doubling from three megawatts in 2018 to seven megawatts in 2019. The off-grid nature of these projects shields them from the revenue risks associated with volatile market conditions and transmission congestion issues that the industry has faced in recent times. Fuel switching for resource sites is expected to remain a financially attractive option as renewables offer both a zero-cost fuel and zero carbon risk. The latter is an important consideration as consumers continue to demand low emissions intensive supply chains, placing pressure on large resource corporations to maintain low emissions operations.

Santos deploys solar and batteries to power Cooper Basin oil wells

Santos is reducing its greenhouse gas emissions from oil and gas production with an Australian-first rollout of 100 per cent renewable energy to power its oil wells in the remote Cooper Basin in South Australia and Queensland.

A pilot has been running at Limestone Creek in South Australia since August 2018 and uses solar cells and batteries to power the beam pump that brings oil to the surface from deep underground reservoirs.

Santos Managing Director and Chief Executive Officer Kevin Gallagher said the pilot had proven that solar PV and batteries can maintain reliability and availability in the harsh, off grid environment of the Cooper Basin.

"This nation-leading project is good for the environment, it's good for reducing fuel consumption and it is good for the bottom line," Mr Gallagher said.

"This was Australia's first oil well running on solar and battery, and following the success of the pilot, Santos has converted 22 more wells to solar in 2019 with a total of 2.1 megawatts of capacity. A further 34 conversions planned for this year."

The project will cost just over $16 million and received a grant of just over $4 million from the Australian Renewable Energy Agency's Advancing Renewables Program that supports a range of development, demonstration and pre-commercial deployment projects with the potential to provide affordable and reliable renewable energy in Australia.

Santos plans to commercialise this technology through supply chain and execution synergies that come with scale.

There are over 200 existing beam pumps across the Cooper Basin that could be converted and Santos aims to use solar power as the standard energy source for new onshore oil wells.

Converting oil well pumps to solar power will deliver environmental and commercial benefits by reducing crude oil consumption, long distance fuel haulage and greenhouse gas emissions associated with burning crude oil.

This content was provided by Santos.

Royalla Solar Farm, Australian Capital Territory. Photo: Clean Energy Regulator.

Voluntary large-scale generation certificate demand grows

Total voluntary surrender of large-scale generation certificates in 2019 increased by seven per cent over 2018.

Sustainability goals are motivating corporations to reduce or offset emissions by voluntarily surrendering large-scale generation certificates. In 2019 the first large-scale generation certificates were voluntarily surrendered to offset scope 2 electricity emissions under the Climate Active Carbon Neutral Standard[16] (previously known as the National Carbon Offset Scheme).

Voluntary surrender is also giving business the flexibility to meet renewable energy commitments under programs such as RE100, a global initiative for companies committed to sourcing 100 per cent of their electricity from renewable energy sources.

Table 3: Voluntary surrender of large-scale generation certificates, 2018–2019.

	2018	2019
Climate Active Carbon Neutral Standard	0	54,018
GreenPower	590,863	486,963
Desalination	62,437	95,441
Other	34,516	73,528
State and territory	0	12,746
Renewable Energy Commitment	0	13,271
Total	**687,816**	**735,967**

Throughout 2019, market participants have reported to the Clean Energy Regulator that businesses are contemplating new models to utilise large-scale generation certificates as an offset. Large-scale generation certificates have an inherent carbon value as they represent one megawatt hour of generation which displaces one megawatt hour of fossil fuel generation. Entities purchasing certificates with the intention to offset scope 2 emissions voluntarily surrender these certificates through the REC Registry. Existing programs such as Climate Active or GreenPower accept the surrender of large-scale generation certificates as proof of renewable electricity use for offsetting purposes.

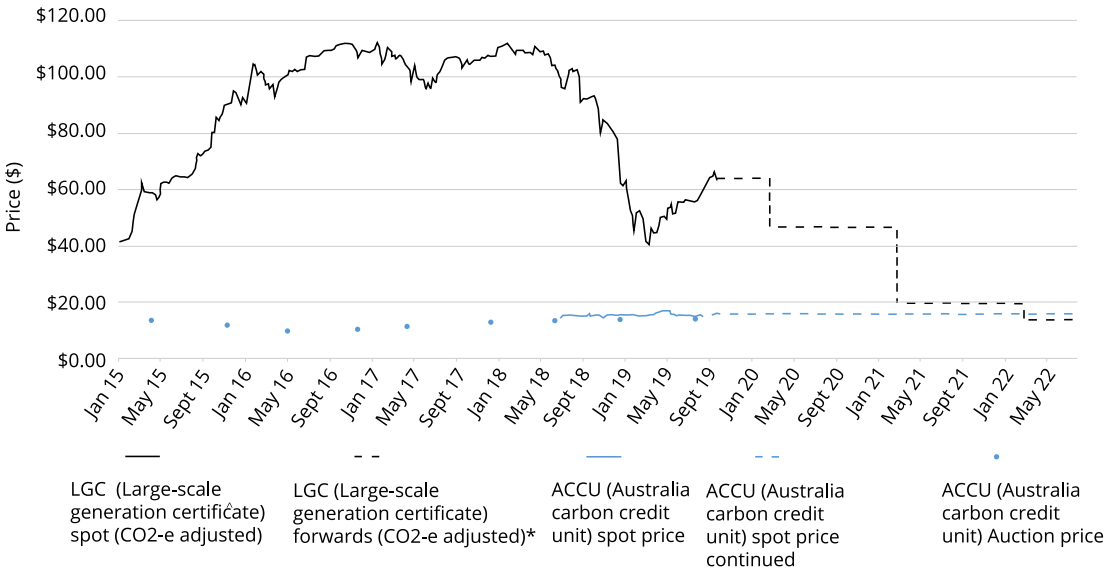
Large-scale generation certificate prices had remained high for several years as a result of tight certificate liquidity to meet the 2020 target. Large-scale generation certificate prices declined in the second half of 2019 as it became clear the target would be exceeded and a surplus of certificates will arise in the future. Based on current forward declining certificate prices, and assuming no changes to the policy landscape, large-scale generation certificates could reach a price equivalence[17] with Australian carbon credit units at some time in the early 2020s.

16 Prior to 2019 only Australian carbon credit units or other international abatement units were surrendered to meet requirements under the Climate Active program.

17 When large-scale generation certificates are converted to carbon abatement equivalent prices based on the emissions intensity of the National Electricity Market.

Tomago Aluminium smelter producing approximately 25% of Australia's aluminium. Photo: Tomago Aluminium.

Figure 4: Estimated Large-scale generation certificate and Australian Carbon Credit Unit convergence



Legislated demand

The combined surrender rate for both large and small-scale schemes was 89 per cent, down five per cent on the surrender rate of 93.3 per cent for the 2018 assessment year. The reduction in surrender rate is mostly a result of increased paid shortfall in the Large-scale Renewable Energy Target, which had a surrender rate of 76.6 per cent with 7.7 million large-scale generation certificates taken as shortfall.

Tesla battery installation at the Lake Bonney Wind Farm in South Australia. Photo: Infigen Energy.

The actual Large-scale Renewable Energy Target liability required to be acquitted for the 2019 assessment year was 2.1 million certificates above the expected level of 31.2 million large-scale generation certificates. This was due to higher actual liable electricity demand (up two per cent) and lower emissions-intensive trade-exposed exemption (down three per cent) from when the renewable power percentage was set in March 2019. This will result in downward adjustments in setting the 2021 renewable power percentage.

Some liable entities also surrendered additional large-scale generation certificates in 2019 to claim a refund on shortfall charges paid for the 2016 assessment year. 2.3 million large-scale generation certificates were surrendered to redeem a refund of approximately $143 million. There is now $713 million in consolidated revenue from shortfall charges paid for the 2017, 2018 and 2019 assessment years. Of this, $412 million relates to the payment of shortfall charges for 3.4 million large-scale generation certificates for the 2019 assessment year.

The *Renewable Energy (Electricity) Act 2000* allows exemptions from Renewable Energy Target liability for companies conducting eligible emissions-intensive trade-exposed activities. Companies eligible for exemption are issued with an exemption certificate. For the new electricity use method, the certificate details how to determine the amount of exemption in megawatt hours. The old production calculation method provides the exemption amount in the issued certificate.

Emissions-intensive trade-exposed entities agree to a commercial arrangement with their electricity retailer (a liable entity), who can then use the exemption certificate to reduce their obligation under the Renewable Energy Target.

The number of emissions-intensive trade-exposed entities increased from 93 in 2018 to 98 in 2019. The exemptions for 2019 represent 38,300 gigawatt hours of electricity that can be used to reduce electricity retailers' relevant acquisitions. This is a two per cent reduction from the 39,100 gigawatt hours of exemption in 2018.

Hornsdale Power Reserve – a grid-connected energy storage system co-located with the Hornsdale Wind Farm. Photo: Clean Energy Finance Corporation.

Addressing challenges in transmission to enable a higher penetration of renewables

The Australian Energy Market Operator began the foundation work for long-term planning of the electricity network through the release of the 2020 Draft Integrated System Plan. The Integrated System Plan identified "no-regret" new and augmented transmission infrastructure that provides value to the electricity grid in its current state and any future states. Some of these "no-regret" investments progressed further in late 2019. Announcements were made to upgrade the New South Wales – Queensland interconnector and to construct a new interconnector between New South Wales and South Australia.

The augmentation to the New South Wales – Queensland interconnector has also considered the use of grid-scale batteries as they can be completed in half the time of standard physical upgrades and at a lower cost. The battery option was not adopted in this case but presents a new alternative way to support grid infrastructure as battery costs decline.

Unexpected network outages demonstrated the ability of grid-scale batteries to provide essential short to medium grid stabilisation capabilities and avoid rolling blackouts. In late 2019, the tripping of the Heywood interconnector between Victoria and South Australia resulted in South Australia becoming islanded. In addition to the re-routing of gas generation, blackouts were prevented in part due to the grid-scale batteries in the State—Hornsdale Power Reserve, Lake Bonney Battery System and Dalrymple Battery System—quickly switching from charging to discharging in a manner that maintained frequency within allowable limits. Solar and wind generation also picked up in the short term to allow for baseload plants to ramp up and provide the synchronous generation required.

Australian government agencies have continued to diversify funding priorities to align with the new requirements in a transforming electricity network. The Australian Renewable Energy Agency and Clean Energy Finance Corporation have directed their investment strategies and priorities for the coming years to focus on storage technologies to support the transition of the electricity grid towards a higher penetration of renewables.

The Clean Energy Finance Corporation investing in the grid to support more renewable energy

The Clean Energy Financial Corporation continues to bring a unique combination of financial expertise, technical knowledge and industry experience to address some of the nation's most intractable energy and emissions challenges.

The Clean Energy Financial Corporation finance remains central to filling market gaps, whether driven by technology, development or commercial challenges. In supporting the continued growth of the renewables sector, we are also increasingly focused on renewable energy projects which operate in the most strategic parts of the grid, and those that potentially benefit from a hybrid of technologies across solar, storage and wind.

The critical transition to a lower emissions grid must include investment in additional solar and wind renewables, as well as firming technologies such as pumped storage which address constrained systems and declining thermal capacity. There are also significant investment requirements in delivering scale-efficient electricity network infrastructure and connecting proposed Renewable Energy Zones to load centres.

In parallel, market interest in battery and pumped hydro storage gathers pace, alongside measures to harness distributed energy resources, deliver virtual power plants and enhance demand management. Appropriate and planned investment in these technologies, including those outlined in the Australian Energy Market Operator Integrated System Plan, all have the potential to deliver a higher penetration of renewables as we transition to a cleaner energy market.

While awaiting further direction on the Australian Government's proposed $1 billion Grid Reliability Fund, the Clean Energy Financial Corporation is looking ahead. This includes investigating emerging investible opportunities such as pumped storage, biofuels and hydrogen, alongside our continuing focus on the next wave of investment in renewable energy and energy efficiency opportunities.

This content was provided by the Clean Energy Financial Corporation.

Commercial solar panel installation, Australian Capital Territory. Photo: Clean Energy Regulator.

Workers on site at Coopers Gap Farm. Photo: PARF Group.

Record rates of solar PV installations at both the residential and commercial level are also presenting challenges in performance management of some distribution networks. Before the wide-scale uptake of rooftop solar PV, distribution networks experienced electricity flow in one direction from predictable electricity sources. Rooftop solar PV introduces variable and often uncontrolled bi-directional electricity flow and voltage fluctuations.

In Victoria commitments to upgrade key distribution networks to plan for 95 per cent of households to install solar PV have been announced by Powercor, United Energy and CitiPower. This forward planning will assist in a smooth transition to a high penetration of solar PV in those distribution networks by allowing for necessary distribution network capacity changes to be made and greater scrutiny of the types of solar PV systems being installed. This will support greater visibility and controllability of solar PV systems to network service providers and may avoid the need for measures such as zero export limits being enforced. A substantial number of batteries are being piloted as virtual power stations to assess the benefits to customers and network performance.

The future for renewables

The records set in 2019, and continued strong investment in early 2020, shows the ability of the renewables industry to mobilise, adapt and overcome market challenges. As sectors of the economy shift to electrification, including the transport sector, new opportunities to utilise low cost renewable electricity will open up. It is also expected that renewables will be the key to unlock new export industries such as clean hydrogen, ammonia or steel.

The wide-scale deployment of solar PV at the residential and commercial levels as well as the utility-scale level has exacerbated low demand in the middle of the day when solar generation is at its peak – this effect is known as the 'duck curve'. The result leads to low wholesale electricity prices in the middle of day. Existing technologies such as storage (including pumped hydro and batteries), demand management and improved interconnection/transmission can address some of these challenges. Broader market reforms that appropriately enable and value the services provided by these technologies will be required.

At the time of writing, the world is facing a new and unprecedented challenge from the COVID-19 pandemic. At the time of finalising the report, renewables at both the small and large-scale continue to perform during this very difficult period.

EVOLUTION OF DISTRIBUTED ENERGY RESOURCES

Residential solar installation.
Photo: Jonathan Mandl, Clean Energy Regulator.

Residential solar panel installations - part of a community microgrid. Photo: Mondo.

2019 was another record year for total rooftop solar PV power stations less than five megawatts with 2.4 gigawatts delivered. This surpasses the previous record of 1.7 gigawatts delivered in 2018. There is now 10.7 gigawatts of rooftop solar PV installed under the Renewable Energy Target, the equivalent generating capacity of the largest coal fired generation plant in Australia.

Distributed energy resources are shifting the production and management of electricity in Australia, as electricity generation moves from centralised power stations to millions of decentralised sources including households and businesses. Distributed energy sources have given consumers greater control over their energy use and supported the decarbonisation of the electricity grid. However, this shift to decentralisation increases the operational complexity for Australian Energy Market Operator and the Distribution Network Service Providers.

Residential solar PV installation trends

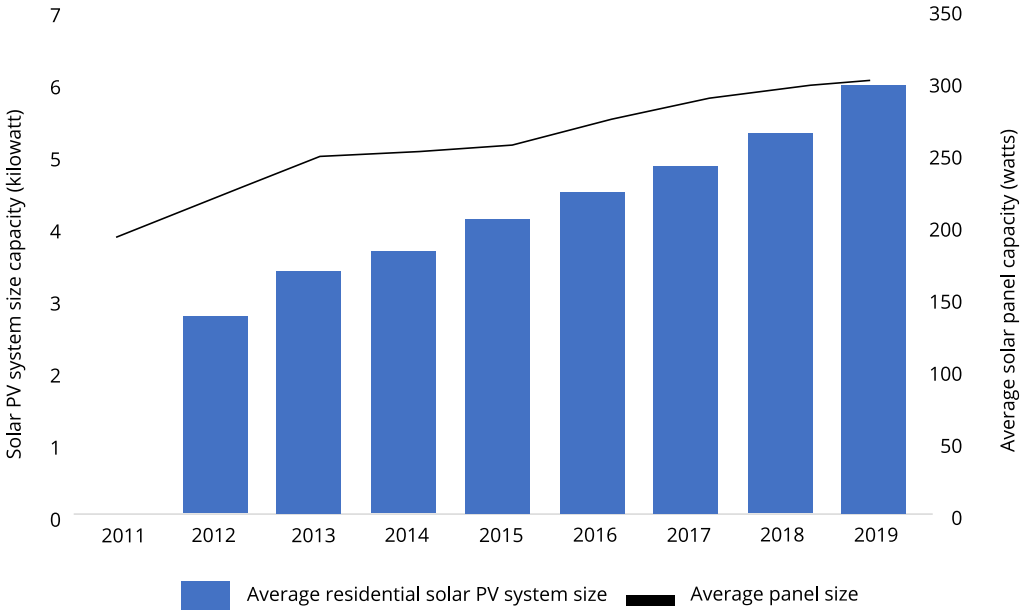
As solar PV costs have continued to decrease, it is more affordable for homeowners to purchase a larger system that covers a higher proportion of their energy consumption. The average residential solar PV[18] system size has risen from 5.8 kilowatts in 2018 to 6.4 kilowatts in 2019.

The market has settled combining a five kilowatt inverter with six to 6.5 kilowatts of solar panels is the cost effective 'sweet spot' for a standard installation. Increasing the capacity of panels up to 33 per cent over the inverter capacity provides a higher level of generation earlier and later in the day; as well as at peak times for more than half of the year when solar irradiance is not high. Stepping up to the next size inverter (eight kilowatts) with a higher solar PV capacity adds significantly to system cost and is only likely to be cost effective for very large households with significant load during the day or where battery storage is added.

18 Solar PV systems under 15 kilowatts that are installed on residential homes are classified as residential solar PV systems.

Efficiency of panels for residential installations has also increased from a historical average of approximately 15 per cent, approaching 20 per cent in 2019[19]. The average capacity of each panel installed increased 6 per cent from 289 watts in 2018 to 306 watts in 2019.

Figure 5: Average residential solar PV system capacity and average solar panel capacity, 2011 to 2019



To date, solar PV systems for residential use have primarily been installed by homeowners at their place of residence. The demand for solar PV by renters has continued to increase. In July 2019, the Victoria Solar Homes Program introduced rebates for installations on rental properties to ensure the benefits of solar PV can be enjoyed by as many people as possible. The Victorian Government also supported the Community Energy Hubs Program. At the end of 2019, the first installation under this program was completed with 52 apartments sharing the benefit of a combined solar PV and battery system in the apartment block.

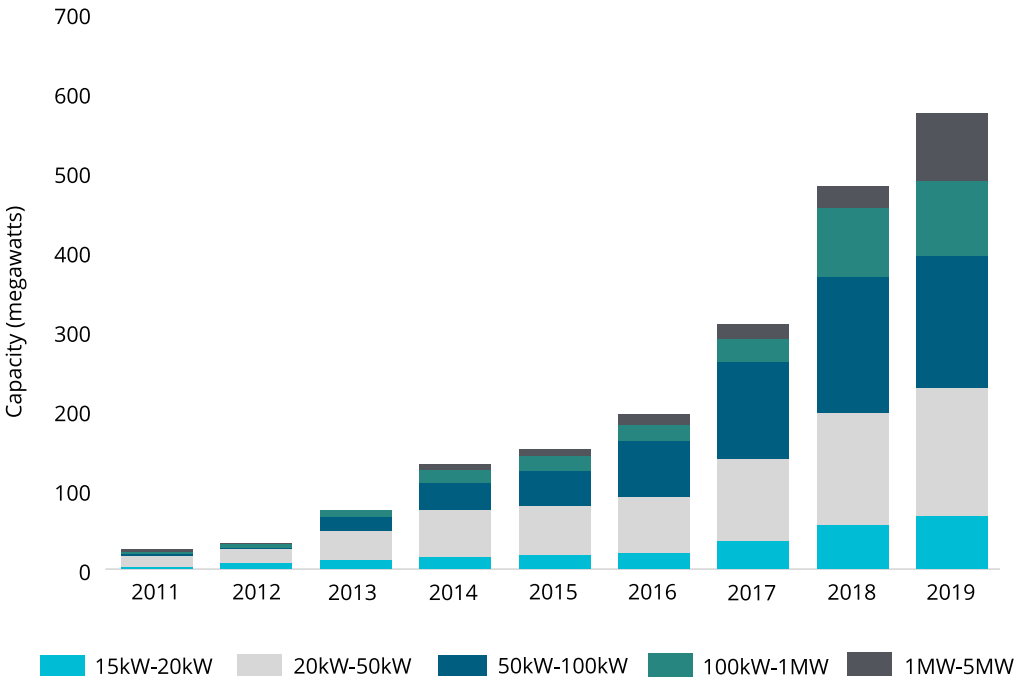
If successful, these initiatives will help to expand and diversify the residential solar PV market in Australia, keeping installation rates high.

19 Clean Energy Reviews, Most Efficient Solar Panels 2020, available at: https://www.cleanenergyreviews.info/blog/most-efficient-solar-panels.

Mid-scale commercial and industrial solar PV, wide scale uptake

Mid-scale commercial and industrial solar PV (15 kilowatts to five megawatts) saw steady growth in 2019 with 11,491 systems installed with a total capacity of 572 megawatts. This was a 12 per cent increase in the number of mid-scale solar PV systems installed, and a 19 per cent increase in capacity compared to 2018.

Figure 6: Mid-scale solar PV installations by capacity band



The growth in 2019 is partly attributable to the growing market for retail businesses deploying mid-scale solar PV across their portfolio of stores with a 64 per cent increase in solar PV installations compared with 2018. In 2019 the mid-scale market continued to diversify with more participation from large corporations with a portfolio of solar PV installations across their buildings nationwide.

Bunnings Solar Rollout

Bunnings began trialling renewable micro generation projects back in 2009.

These included a solar PV system at Bunnings Warehouse Belconnen (Australian Capital Territory), and wind turbines at Bunnings Warehouse Port Kennedy and Bunnings Warehouse Rockingham (Western Australia).

In 2014 a new generation solar PV system was installed at Bunnings Warehouse Alice Springs (Northern Territory) to further gauge the viability of solar generation.

Since that time 67 solar PV systems have been installed across Bunnings' Australian network. The systems are generating up to 30 per cent of each store's energy needs.

In addition to this, the solar PV system at Bunnings Warehouse Alice Springs was expanded in 2019 from 100 kilowatts to 475 kilowatts, and battery storage was introduced; the first of its kind for the network. The system and battery storage are now producing up to 80 per cent of the store's energy needs.

Bunnings is currently targeting a reduction of 10 per cent of emissions by 30 June 2025, based on a 2018 baseline, which factors in the continuing growth of its store network. This work is part of ongoing efforts to reduce emissions which includes investment in LED lighting and motion sensor technology to minimise electricity consumption.

In the 2021 financial year Bunnings will install further solar PV systems across its store network.

This content was provided by Bunnings Group.

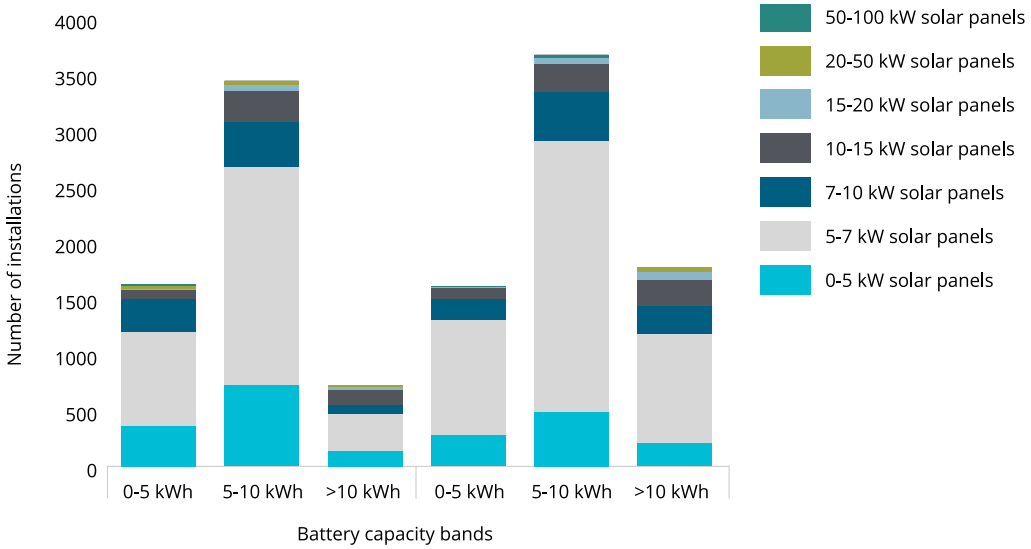
Rooftop solar at Bunnings Warehouse, Alice Springs. Photo: Bunnings Group Limited.

Batteries integrate into the grid

Batteries continue to be deployed at all levels, from concurrent battery and solar PV installations on households to utility-scale batteries directly connected to the transmissions network. State schemes play a key role in uptake at the residential level. Batteries can increasingly be economically integrated into the electricity system providing essential grid stabilisation abilities at crucial times. This has assisted in the growth of community and grid-scale batteries.

There were 7563 concurrent solar PV and battery installations in 2019, a 33 per cent increase in the 5689 battery installations in 2018[20]. Most concurrently installed batteries are installed on solar PV sized between five and 10 kilowatts. This combination of technologies unlocks the most additional value by storing excess electricity generated during the day for use during peak evening hours.

Figure 7: Number of concurrent battery installations by solar PV system size and battery capacity



20 This is based on data disclosed voluntarily to the Clean Energy Regulator on batteries installed concurrently with solar PV.

When consumer-owned energy storage devices are combined with rooftop PV, they can be aggregated and operate together as virtual power plants. The central management of these aggregated systems allows dispatch or consumption of electricity to manage local voltage or frequency variations, providing flexibility and stability to the electricity grid. The South Australia virtual power plant exemplified these traits. In October 2019, during an unexpected outage of the largest generating unit in the National Electricity Market, Kogan Creek in Queensland[21]. Subsequently the power system frequency immediately dropped below the normal operating range. The South Australia virtual power plant detected this frequency variation and responded immediately to inject power into the system to assist in frequency recovery.

The early success of the South Australia virtual power plant in demonstrating frequency control capabilities across multiple unexpected outages has underpinned the expansion of the state's virtual power plant from 1,100 to a planned 50,000 systems[22]. This success has led to further trials in New South Wales and the Australian Capital Territory.

Ballarat Energy Storage System. Photo: Consortium comprising AusNet Services, Spotless, EnergyAustralia and Fluence.

Domestic battery.
Photo: Jonathan Mandl, Clean Energy Regulator.

21 Australian Energy Market Operator, AEMO Virtual Power Plant Demonstration, March 2020, available at: https://aemo.com.au/-/media/files/electricity/der/2020/aemo-knowledge-sharing-stage-1-report.pdf?la=en&hash=AB41C8AF00D7745A26E5C193DEA75BBA.
22 South Australia Department of Energy and Mining, South Australia's Virtual Power Plant, available at: https://virtualpowerplant.sa.gov.au/.

MAINTAINING THE INTEGRITY OF THE RENEWABLE ENERGY TARGET IN A GROWING MARKET

Cycling through Macarthur Wind Farm, Victoria. Photo: Powering Australian Renewables Fund (PARF).

Inspections program

As required under the legislation, the Clean Energy Regulator inspects a statistically significant sample of solar panel systems installed within the last 12 months that have received incentives under the Small-scale Renewable Energy Scheme. The inspections assess conformance with scheme eligibility requirements, including whether or not they meet state and territory electrical safety requirements.

Of the 1910 inspections conducted in 2019, 41 were found to be unsafe or potentially unsafe. This is an unsafe or potentially unsafe rate of 2.1 per cent, down slightly from 2.2 per cent in 2018. Unsafe is the most adverse rating in the program and is the basis for identifying safety risks. The agency's experience has shown there is a small number of inspections where a solar PV system does pose an imminent safety risk at the time of inspection, such as when there are exposed live parts or unsecure PV panels.

However, the majority of such PV systems found to be potentially unsafe do not pose an imminent safety risk. Most were due to water ingress in DC isolators. Of these, the degree of water ingress varies and in most cases the DC isolator may become unsafe without timely maintenance but should not pose an imminent risk. Nevertheless, this risk is more than would be attributable to a substandard system and the practice has been to characterise such instances as unsafe.

For these reasons, the Clean Energy Regulator distinguishes between PV systems that were unsafe at the time of the inspection and PV systems that were potentially unsafe at the time of the inspection.

Table 4: Inspections by state, 2019

State	Systems safe	Systems substandard	Systems unsafe and potentially unsafe	Number of systems inspected
ACT	36	5	2	43
NSW	323	53	10	386
NT	15	2	0	17
QLD	246	67	8	321
SA	170	57	5	232
TAS	14	14	0	28
VIC	510	100	14	624
WA	204	53	2	259
Total	**1,518**	**351**	**41**	**1,910**

Inspecting a solar PV installation. Photo: ECG Electrical.

The Clean Energy Regulator provides the results of unsafe and substandard inspections to the relevant state and territory electrical safety regulators that are responsible for electrical safety. The Clean Energy Regulator also provides this information to the Clean Energy Council, which manages the accreditation of solar panel installers and approves the key components used. The Clean Energy Regulator otherwise does not have a safety regulation role.

Innovating for efficient and effective participation in the scheme

The Clean Energy Regulator continues to support Renewable Energy Target participants by improving processes to reduce regulatory burden while maintaining the integrity of certificate entitlements.

Table 5: Key administrative improvements in the Renewable Energy Target, 2019

Action	Description	Outcome
Expanding solar panel validation initiative	The solar panel validation initiative allows installers to verify the panels being installed on households are eligible under Australian standards for quality and performance. During 2019 we introduced the fast track system for agents submitting claims for small-scale technology certificates where they used solar panel validation. At the end of 2019 there were 35 brands of solar PV panels participating in solar panel validation, an increase from 10 brands in 2018.	Manufacturer participation in solar panel validation has reached a new record; approximately 95 per cent of solar PV panels associated with small-scale technology certificate claims under the Small-scale Renewable Energy Scheme can be verified using the solar panel validation. We are seeing a lower rate of errors (25 per cent less) in small-scale technology certificate claims for solar systems where SPV is used compared to non-solar panel validation claims. Agents are benefiting from significant savings, reduced effort and streamlined processes from using solar panel validation with their certificate claims. At the time of writing, the solar panel validation initiative is used to validate 50 per cent of claims.
Simplifying small-scale technology certificate claim process for supporting documentation	During the small-scale technology certificates claim process, agents may be required to provide additional documentation to support their claim. This has been completed via a manual process outside of the REC Registry system. In 2019, a new document upload functionality was released in the REC Registry. This new functionality allows agents to upload supporting documents directly into the REC Registry. This functionality also supports the manual pathway for solar panel serial number verification.	The document upload enhancement has saved agents time and effort and reduced small-scale technology certificates processing times. This functionality provides an alternative pathway to solar panel validation, allowing small-scale technology certificate claims to be submitted with manual evidence of verified solar panel serial numbers. However, claims submitted with manual evidence will not be processed through the fast track system.

Action	Description	Outcome
Guidance on fast-tracking accreditation applications	The growing market for mid-scale solar PV installations has resulted in new participants under the Large-scale Renewable Energy Target who were not aware of the requirements for accreditation. Mid-scale solar PV applications make up the majority of the applications under the Large-scale Renewable Energy Target. The large number of incomplete applications was resulting in processing delays for all participants seeking accreditation. In 2019 an accreditation checklist was released in the REC Registry that defines the information and documentary requirements for an application to be "properly made" under the Act.	The upfront availability of required information for accreditation has assisted in improving the number of complete mid-scale solar PV applications under the Large-scale Renewable Energy Target. Consequently, applications have been processed faster, ensuring that participants can be accredited and subsequently secure entitlements under the scheme in a timely manner.
Enhanced compliance program to verify large-scale generation certificates	In 2019 the Clean Energy Regulator completed its compliance program to provide additional assurance over claims made by nominated persons for large-scale generation certificates. Under this program, information was sourced directly from metering data providers, or other custodians of metered electricity data, to verify previous claims made for large-scale generation certificates.	The Clean Energy Regulator did not identify any cases of non-compliance under the program, providing ongoing assurance over the integrity of the scheme. The program results allow further work to continue to increase the efficiency of submitting large-scale generation certificates, including through new bulk creation functionality.
Investigations into fraudulently created small-scale technology certificates	The Clean Energy Regulator retains a zero tolerance for fraudulently created small-scale technology certificates. In 2019 we enhanced our data matching capabilities allowing the identification of some installers that had falsely claimed to have conducted solar installations when they were not present. The Clean Energy Regulator has continued to widen its investigations to a larger group of accredited Clean Energy Council installers who may have been involved in this at-risk behaviour.	One investigation led by the Clean Energy Regulator resulted in a 48 year old Wagga Wagga man being sentenced to an 18 month Good Behaviour Bond and fined $5,000 by the Wagga Wagga local court. We have disclosed relevant information from our investigations to the Clean Energy Council and the relevant state and territory electrical safety regulators and fair-trading bodies.

APPENDICES, GLOSSARY AND INDEX

Above-ground methane gas storage, Tasmania. Photo: Clean Energy Regulator.

Appendix A: The year in numbers

The following details from 2019 provide a quick reference for key data on the administration of the Renewable Energy Target.

Large-scale Renewable Energy Target

Supply

	Description	Metric
2019	Large-scale renewable energy power stations accredited	391
	Large-scale renewable energy power stations accredited by energy source	7 biomass 2 hydro 372 solar 10 wind
	Large-scale renewable energy capacity delivered	4.1 gigawatts
	Large-scale generation certificates validated	29,616,131
	Large-scale renewable energy power station above baseline generation	28,300 gigawatt hours
Cumulative	Cumulative number of accredited large-scale renewable energy power stations	1464
	Cumulative large-scale renewable energy capacity accredited	22.9 gigawatts
	Committed and probable construction of new large-scale renewable energy power stations announced since 1 January 2016	12.5 gigawatts

Demand

	Description	Metric
2019	Large-scale generation certificates required to be surrendered against renewable power percentage	32,100,000
	Large-scale generation certificates acquitted	25,579,404
	Large-scale generation certificates voluntarily surrendered (mainly for GreenPower)	735,967
	Large-scale Renewable Energy Target on-time surrender	76.6 per cent
	Total large-scale certificate shortfall charge	$412 million
	Exemption issued to emissions-intensive trade-exposed activities	38,337 gigawatt hours

Small-scale Renewable Energy Scheme

Supply

	Description	Metric
2019	New small-scale systems installed	339,062
	Small-scale systems installed by type	278,096 solar panel systems 41,001 solar water heaters 19,964 air source heat pump 1 wind
	Total capacity for small-scale generation units installed	2.2 gigawatts
	Average capacity of solar panel systems	7.6 kilowatts
	Number of residential (0–15 kilowatt) solar PV system installations and capacity	Installations: 266,605 Capacity: 1.72 gigawatts
	Number of mid-scale (15–100 kilowatt) solar PV system installations and capacity	Installations: 11,491 Capacity: 430 megawatts
	Number of small-scale solar PV system installations by state and territory	4348 Australian Capital Territory 72,008 New South Wales 3224 Northern Territory 71,226 Queensland 25,706 South Australia 2733 Tasmania 60,919 Victoria 37,932 Western Australia
	Small-scale technology certificates validated	35,798,974
	Percentage of small-scale technology certificates validated using Solar Panel Validation Initiative	6 per cent
Cumulative	Cumulative number of installed small-scale systems	3,544,375
	Cumulative number of installed small-scale systems by type	2,319,988 solar panel systems 950,605 solar water heaters 271,707 air source heat pumps 424 wind systems 18 hydro systems
	Cumulative capacity for small-generation units	10.3 gigawatts
	Generation and displacement by small-scale systems	16,121 gigawatt hours

Small-scale Renewable Energy Scheme (continued)

Demand

	Description	Metric
2019	Small-scale technology certificates required to be surrendered against small-scale technology percentage	37,466,219
	Small-scale technology certificates acquitted	38,072,313
	Small-scale technology certificates purchased through the clearing house	2703

Scheme integrity

	Description	Metric
2019	Inspections of small-scale systems	1910 inspections 41 unsafe and potentially unsafe (2.1 per cent) 351 substandard (18 per cent)

Appendix B: Shortfall list

Large-scale generation certificate shortfall of more than 10 per cent for 2019

Liable entity	Large-scale generation certificate liability (No. of certificates)	Large-scale generation certificate shortfall (No. of certificates)	Large-scale generation certificate shortfall (percentage of total liability)	Value of large-scale generation certificate shortfall charge ($)
Alinta DEWAP Pty Ltd	96,057	96,057	100	$6,243,705
Alinta Energy Retail Sales Pty. Ltd.	931,470	686,374	74	$44,614,310
Alinta Energy Transmission (Roy Hill) Pty Ltd	46,956	46,956	100	$3,052,140
Alinta Sales Pty Ltd	519,068	519,068	100	$33,739,420
AUSTRALIAN POWER PARTNERS B V and Others	3,536	3,536	100	$229,840
Change Energy Pty LTd	13,146	13,146	100	$854,490
ELECTRICITY GENERATION AND RETAIL CORPORATION	1,524,205	513,049	34	$33,348,185
ERM Power Retail Pty Ltd	3,054,765	2,545,164	83	
IPOWER 2 PTY LIMITED and IPOWER PTY LIMITED TA Simply Energy	582,256	582,256	100	$37,846,640
Lumo Energy (NSW) Pty Ltd	731	731	100	$47,515
Lumo Energy (QLD) Pty Ltd	1,323	1,323	100	$85,995
Lumo Energy (SA) Pty Ltd	39,350	39,350	100	$2,557,750
Lumo Energy Australia Pty Ltd	154,186	154,186	100	$10,022,090
Mojo Power Pty Ltd	6384	3300	52	$214,500
Mount Isa Mines Ltd	64,323	63,269	98	$4,112,485
Perth Energy Pty Ltd	205,542	147,353	72	$9,577,945
Power Club Limited	409	409	100	$26,585
Progressive Green Pty Ltd	146,702	146,579	100	$9,527,635
Red Energy Pty. Limited	953,996	688,882	72	$44,777,330
Sanctuary Energy Pty Ltd	1,687	1,687	100	$109,655
Synergen Power Pty Limited	54	54	100	$3,510
Total Gas & Power Australia Pty Ltd	124,539	91,000	73	$5,915,000

Glossary

Accredited power station

Power stations that generate electricity from an eligible renewable energy source can apply to participate in the Large-scale Renewable Energy Target by applying to become an accredited power station. Accredited power stations can create large-scale generation certificates for electricity generated from their renewable energy sources.

Baseline

The baseline is the amount of eligible electricity that an accredited power station must generate during a year before large-scale generation certificates can be created. The Clean Energy Regulator determines baselines for power stations that operated before 1997 as prescribed by the Renewable Energy (Electricity) Regulations 2001.

Certificate spot price

Certificate spot price refers to the current market price for large-scale generation certificates and small-scale technology certificates.

Committed projects

Committed projects are 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.

Delivered capacity

Refers to the capacity installed under the Small-scale Renewable Energy Scheme or accredited under the Large-scale Renewable Energy Target. Utility-scale capacity delivered may not reach full generation capacity until later years.

Displaced/displacement

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

Generation from accredited renewable energy power stations

Accredited power stations can create large-scale generation certificates up until the end of the calendar year after the year in which they generated the electricity.

The number of large-scale generation certificates reported for a year may be adjusted in future.

Gigawatt

A gigawatt is a measurement of power. Power is the rate at which electrical energy is generated or used. One gigawatt is equal to 1 million kilowatts or 1,000 megawatts.

Gigawatt hour

A gigawatt hour is a measure of electrical energy equivalent to 1,000 megawatts being used for 1 hour.

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.

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 1,000 watts.

Kilowatt hour

A kilowatt hour is a measure of electrical energy equivalent to 1,000 watts being used for 1 hour.

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.

Megawatt

A megawatt is a measurement of power. Power is the rate at which electrical energy is generated or used. One megawatt is equal to 1 million watts or 1,000 kilowatts.

Megawatt hour

A megawatt hour is a measure of electrical energy equivalent to 1,000 kilowatts being used for 1 hour.

Power purchase agreement

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

Probable projects

Probable 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.

Renewable power percentage

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

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 $65 per megawatt hour of shortfall and is not tax deductable.

Small-scale technology percentage

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

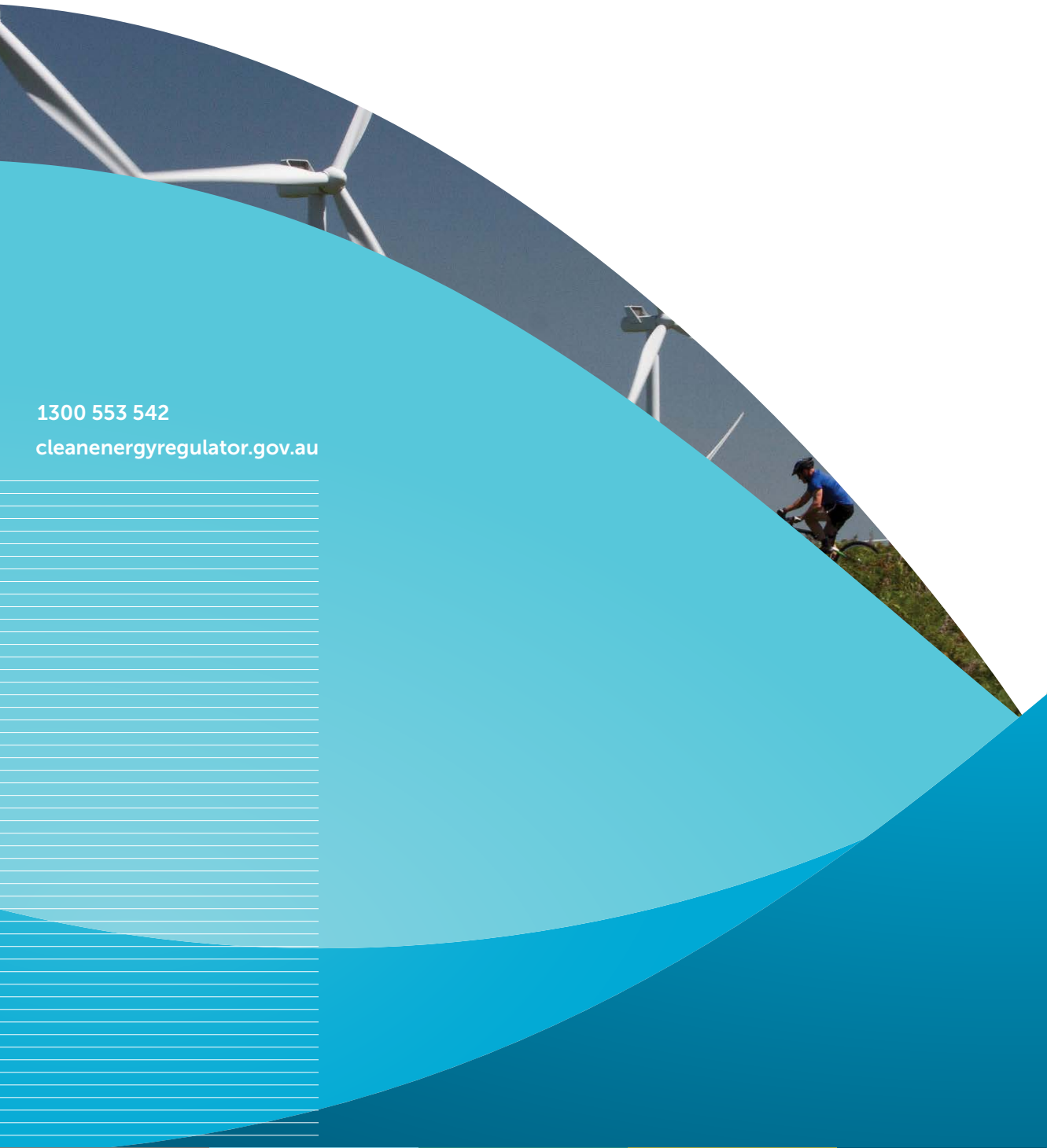
Substandard

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 and potentially unsafe

PV systems with any of the following checklist items marked unsafe have been categorised as unsafe: exposed live parts, and PV panels not securely mounted to the roof. PV systems can also be rated unsafe due to other reasons that do not have a specific checklist item. For example, a system may have a number of non-compliant wiring checklist items that individually are not a safety risk but together make a system unsafe. These systems are also categorised as unsafe. PV systems with the following items marked unsafe have been categorised as potentially unsafe: water ingress in the DC isolator enclosure near the inverter, water ingress in the rooftop (array) DC isolator enclosure, and water ingress in cable junction boxes.

Index



1300 553 542
cleanenergyregulator.gov.au