Australian Government
Clean Energy Regulator

CLEAN ENERGY REGULATOR

Quarterly Carbon Market Report

September Quarter 2020

Table of Contents

Report objective

Carbon markets play a key role in Australia's efforts to reduce emissions. The Clean Energy Regulator has prepared this report to support the effective operation of Australia's carbon markets.

This report consolidates information across the three national carbon markets that the Clean Energy Regulator administers for the September Quarter 2020 (July 2020 to September 2020) and provides information on supply and demand trends and opportunities to inform market decisions.

Further information on Australia's carbon markets is available on the Clean Energy Regulator's website.

Report disclaimer

All figures are sourced from the Clean Energy Regulator unless otherwise referenced. All statements in this report reflect current policy settings, other than in specific instances where the Government has announced or is consulting on proposed policy changes.

This Quarterly Carbon Market report represents the views of the Clean Energy Regulator at the date of publication. The Clean Energy Regulator is providing this information to the market to increase market transparency, help identify genuine low-cost carbon abatement opportunities, and assist entities that produce or need to source units and certificates under the schemes the Clean Energy Regulator administers. The Clean Energy Regulator has used its best endeavours to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness. The Quarterly Carbon Market report is not legal, business or financial advice. You should obtain independent professional advice your particular circumstances markets before making any investment decisions. The information is provided as general information only. Neither the Clean Energy Regulator nor the Commonwealth of Australia will accept liability for any direct, incidental or consequential loss or damage resulting from the Quarterly Carbon Market report, or the information provided through Quarterly Carbon Market report, or the availability or non-availability of Quarterly Carbon Market report.

Version history

Version	Date	Changes
1.00	25 November 2020	

Executive summary

The Quarter 3 report confirms several trends foreshadowed in the June 2020 Quarterly Carbon Market Report:

- A return to sizable Emissions Reduction Fund (ERF) auctions.
- Soil carbon as a growth area for ERF project registrations.
- A surge in demand for large-scale generation certificates (LGCs) and Australian carbon credit units (ACCUs), from the private sector and states and territories.
- Total financial close capacity for large scale renewables for 2020 exceeds 2019 levels.
- Emergence of phased gigawatt scale renewables projects.

Substantial growth in ERF project registrations

In Quarter 3, 44 ERF projects were registered, taking the total registration for 2020 to 87, more than double the number of projects registered in all of 2019.

The surge in registrations was, in part, driven by participants registering projects in time for Auction 11, an increase in auction prices at Auction 10, and growing confidence of the industry including as a result of optional delivery contracts. The 44 projects are estimated to deliver 36 million tonnes of abatement over their lifetime.

New upfront support for soil sampling is likely to have contributed to the increased interest in soil carbon projects. Eligible soil carbon projects can secure a contract through an ERF auction, or link to an existing fixed delivery contract to receive an upfront payment of up to $5000.

There are now 23 soil carbon projects registered and more coming with a further 50 applications under assessment at the end of Quarter 3 2020.

2.5 million ACCUs were issued in Quarter 3, bringing 2020 supply to 10.9 million. An additional 2.9 million ACCUs were issued in October 2020. Supply remains on track for an estimated 16 million ACCUs in 2020.

ERF Auction 11 result

ERF Auction 11 took place on 9 to 10 September securing 7 million tonnes of abatement, the biggest volume contracted since Auction 6 in December 2017. The average price paid per tonne of abatement was $15.74, slightly lower than Auction 10 ($16.14).

A total of 35 contracts were awarded. The optional delivery contract again dominated as the preferred contract type with 29 contracts and 90% of the 7 million tonnes.

More detail can be found in Chapter 1 on ACCUs.

Rooftop solar PV growth continues despite installation restrictions in Melbourne

Small scale rooftop solar PV remains on track to install 2.9 GW this year. Increased installations in New South Wales, South Australia and Western Australia countered the decline in installations in Metropolitan Melbourne.

A remarkable 750 megawatts (MW) was installed in Quarter 3 2020, 42% more than Quarter 3 2019.

Metropolitan Melbourne's rate of installations dropped by around 40% during the period of stage-4 COVID-19 restrictions. Unsurprisingly, total Victorian installed capacity was down 22% during the quarter to 106 MW.

Installations in Quarter 4 2020 should rebound strongly in Victoria as restrictions on installations in metropolitan Melbourne were removed on 23 October 2020 and there is a backlog of demand.

New modelling - total installed rooftop solar capacity may double in 4 years.

Modelling commissioned by the Clean Energy Regulator to provide a near term outlook for small-scale (0-100kW) and mid-scale (100 kW to 30 MW) solar suggests that investment in rooftop solar PV may remain strong for the foreseeable future with an average of 3.2 GW added each year for the next 4 years. If realised, this investment would effectively double

rooftop solar capacity, to 26 GW, by the end of 2024.

Further detail is available in the Chapter 4 spotlight on small and mid-scale solar.

Outlook for large-scale renewables strengthens

Projects with more than 1.1 GW of capacity reached financial close in Quarter 3 2020. With a total of 2.5 GW financed by the end of October 2020, this is already within the range the Clean Energy Regulator expected for 2020 (between 2- 3 GW) and may exceed 3 GW this year.

The outlook for renewables looks strong with an additional 2.3 GW of capacity with Power Purchase Agreements (PPAs,) but yet to reach financial close. This is quite an achievement given the added risk and cost facing project connections.

Very large staged renewable energy projects are now a clear feature of the investment environment, with first phase approvals for 3 projects exceeding 500 MW capacity. It is likely some of these very large projects may need grid constraints to be resolved and/or Renewable Energy Zones (REZs) to come online if they are to be built to their full capacity.

These large-scale project developments included the announcement of the South Australian Goyder renewables project (1.2 GW) first stage (backed by a 100 MW first stage PPA with the ACT government); and Clarke Creek wind farm first stage 400 MW (all stages 1200 MW) during the quarter and following previous announcements of the MacIntyre wind farm (all stages 1 GW).

In addition, a potential Victorian reverse auction for at least 600 MW of additional capacity and another potential New South Wales REZ for New England were announced in the quarter, indicating more renewable investment may be on the horizon.

Low capacity factors, grid and other issues affect record large-scale renewables generation in 2020

The Clean Energy Regulator estimates the 2020 target of 33 TWh of large-scale generation is likely to be met and, notwithstanding a number of constraints, set another record compared to 2019 generation of just over28 TWh.

Many factors may impact the final result including weather conditions and the ramp up of new generation. The final number will not be known until the end of February 2021 after all generation data is available including above baseline hydro generation. There is plenty of installed capacity to meet and exceed the target.

Factors that have reduced large-scale generation so far this year include:

- Wind speeds down 2% year to date from last year.
- Increasing time delays in many new power stations being connected and allowed to ramp to full production.
- Abundant rooftop solar generation in some regions at times dampening demand for large-scale generation, including from renewables.
- Incidents at a number of wind and solar farms that have forced periodic shut downs.

Quarter 3 saw continued low wind conditions with a 7% drop in average wind speeds compared to Quarter 3 2019. However, owing to continued addition of new wind capacity over the year, a new wind generation record was still set in August (1.98 TWh) and broken in September (2.06 TWh) in the National Electricity Market (NEM). This record was 20% higher than the previous one set in July 2019 (1.72 TWh).[1]

At the end of Q3 2020, 22.6 TWh of renewable energy was generated compared to 20.1 TWh generated by the end of Q3 2019. This is a 12% increase year on year; a solid result so far given the downside impact outlined.

[1] AEMO data sourced from OpenNEM

LGC supply is expected to be circa 32 million in 2020. This is unchanged from the previous Quarterly Carbon Market Report estimates.

More analysis is in Chapter 2.

Voluntary market takes off

Quarter 3 voluntary private and state and territory surrender of ACCUs and LGCs grew strongly to set a new record. A total of 3.6 million units and certificates (0.2 million ACCUs and 3.4 million LGCs) were surrendered in Quarter 3 2020. This result was driven by ACT government bulk surrender of LGCs against its renewable energy target for 2019-20, a surge in LGCs for desalination and Greenpower and increased levels of ACCU surrender under the Climate Active program.

This quarterly report includes a 2019 voluntary private and state and territory market - year in review. In 2019, the voluntary private and state and territory markets share of the total carbon market increased from 12% in 2018 to 16%.[2]

International units continued to dominate the voluntary market in 2019 at 84% of all voluntary surrenders, likely due to their very low price. Most of these low-cost units originated from renewable energy projects in India.

See Chapter 5 for more detail on voluntary market trends.

Emissions reduction in 2020

Emissions reduction from the schemes administered by the Clean Energy Regulator is estimated at 54 million tonnes of CO_2-e in 2020, up 13% compared to 47.7 million tonnes delivered in 2019. This is a conservative estimate.

Clean Energy Regulator to develop new ERF methods and a new exchange platform

In the 2020-2021 Budget the Clean Energy Regulator was allocated $40.4 million over 10 years from 2020-21 to develop more ERF methods, build an exchange platform focussed on ACCUs and upgrade and streamline supporting IT systems.

By streamlining and accelerating the method development process, investment opportunities to reduce emissions across the economy will increase. The Department of Industry, Science, Energy and Resources will continue to advise the Minister on method priorities. The Minister remains the rule maker. An exchange platform[3], streamlined processes and new systems will unlock new abatement and reduce transaction costs in the market, making emissions reduction units cheaper, more accessible and highly visible across the market.

Unit and certificate prices

The ACCU spot price rose slightly to $16.10 at the close of Quarter 3 2020, up by less than 1% from end of Quarter 2 2020 (see Table 1).

The LGC spot price saw some volatility before settling at $42.25 at the end of the quarter up by 5% from end of Quarter 2 2020 due to lower than expected LGC supply and high voluntary demand for 2020.

STC spot prices were $38.50 at the close of Quarter 3, recording a 2% increase despite the STCs surplus continuing to grow to 5.2 million STCs following the Quarter 3 surrender date of 28 October 2020.

Table 1: Price trend, Q3 2020

Certificate type	Spot price AUD (30 September 2020)[4]	Quarterly trend[5]
ACCU	$16.10	+$0.25 (+1.6%)
LGC	$42.25	+$2.25 (+5.6%)
STC	$38.50	-$0.95 (+2.4%)

[2] Data from the Clean Energy Regulator and Department of Industry, Science, Energy and Resources
[3] Currently units are traded through over the counter contracts.
[4] Data sourced from Jarden and TFS Green.
[5] This is the quarterly trend from the end of Quarter 2 2020 to the end of Quarter 3 2020.

1. Australian carbon credit units

- ERF Auction 11 held in September contracted the largest volume since Auction 6 in 2017.
    - 7 million tonnes of abatement were secured from 35 contracts and 33 projects at an average price of $15.74 per tonne.
    - The optional delivery contract dominated with 6.3 million tonnes of abatement from 29 contracts and 29 projects.
- 44 projects were registered in Quarter 3 2020 taking total registration in 2020 to 87, more than double the total number of projects registered in 2019.
    - Soil carbon projects nearly doubled, with 12 projects registered in Quarter 3 2020, taking total registration to 23.
- With 2.5 million ACCUs issued in Quarter 3 2020 and an additional 2.9 million ACCUs issued in October, supply in 2020 remains on track for 16 million ACCUs.
- Spot ACCU prices increased from $15.85 at the end of Quarter 2 to $16.10 at the end of Quarter 3 2020 before climbing to $16.15 at the end of October.
- In the 2020-2021 Budget the Clean Energy Regulator was allocated $40.4 million over ten years to accelerate development of ERF methods, build an exchange platform focussing on ACCUs, and upgrade and streamline supporting IT systems to reduce timeframes for project registration and crediting.

1.1. Supply and demand balance

Quarter 3 2020 saw ACCU supply increase by 2.5 million, taking total supply in 2020 to 10.9 million for the first three quarters. ERF contract deliveries and voluntary surrender for ACCUs of 3.5 million exceeded supply (see Figure 1).

The balance of ACCUs held in the Australian National Registry of Emissions Units (ANREU) decreased by 1.1 million to 6.4 million at the end of Quarter 3 2020 (see Table 2).[6]

Table 2: Balance of supply and demand at Quarter 3 2020 close[7]

Balance/supply of ACCUs from Quarter 2 2020[8]	7,503,502
ACCUs issued Quarter 3 2020	2,483,569
Emissions Reduction Fund contract deliveries	-3,280,185
Safeguard surrender[9]	0
Voluntary surrender	-216,020
ACCU relinquishment[10]	-96,991
Net balance at the end of Quarter 3 2020	6,393,875

[6] The 6.4 million ACCUs available in ANREU accounts may not be available for sale as a portion of these ACCUs may be held or banked for future needs (e.g. for delivery under contract, future safeguard mechanism liability or voluntary cancellation).
[7] Within a specified period, supply of ACCUs refers to ACCUs issued. Demand of ACCUs incorporates three sources including Commonwealth ERF contract deliveries, Safeguard mechanism surrender and state and private sector voluntary cancellation.
[8] Balance as at end of Quarter 2 has been revised from 7,479,661, as reported in the June 2020 Quarterly Carbon Market Report, to 7,503,502 to include the reversal of a delivery from Quarter 1.
[9] Safeguard mechanism surrender does not include deemed surrender. A 'deemed surrender' occurs when ACCUs issued under an Emissions Reduction Fund project at a Safeguard facility, in a particular year, are delivered to the Commonwealth under an Emissions Reduction Fund contract.
[10] For more information see ACCU relinquishments.

ACCUs held by project proponents in ANREU accounts reduced from 5.5 million to 4.2 million, while holdings by 'Business and Government enterprise' and 'Intermediary' groups remained stable over the quarter (see Figure 2).[11]

Figure 1: ACCU supply and demand balance, Q3 2018 to Q3 2021

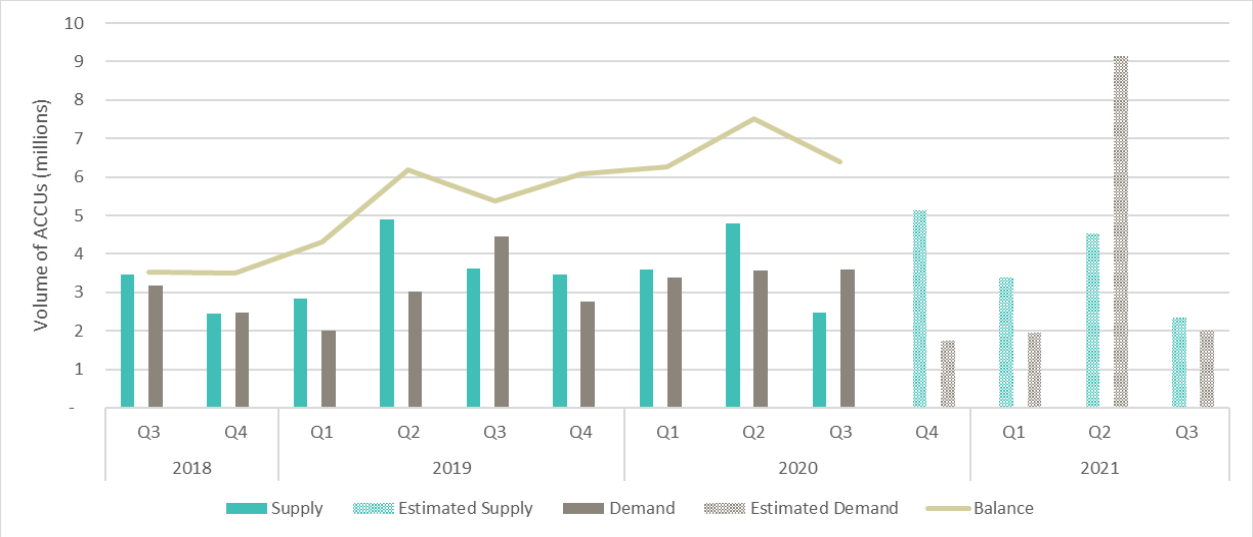
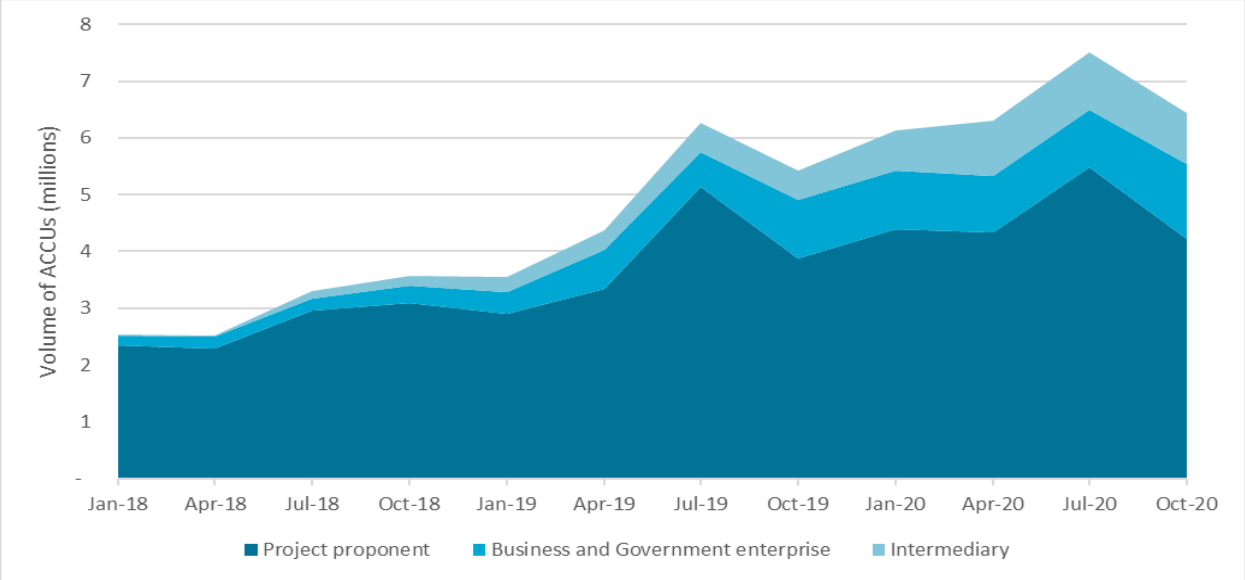


Figure 2: Breakdown of ACCU holding by market participation, Q1 2018 to Q3 2020



[11] For the definition of market participation groups, see the September 2020 Quarterly Carbon Market Report Workbook.

1.2. Factors impacting supply

Crediting

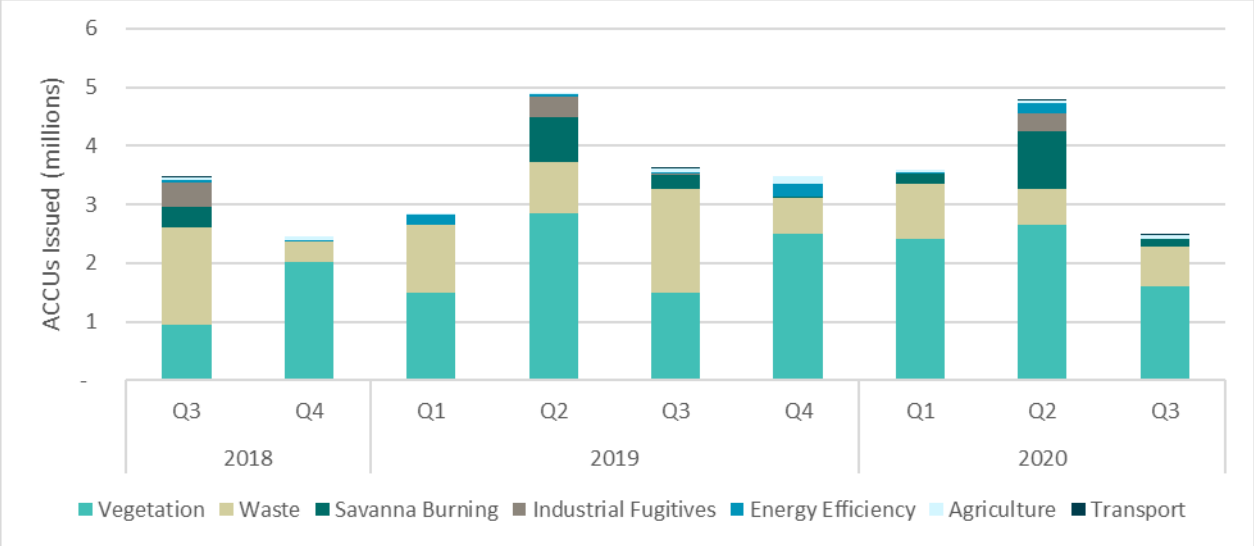
Issuances for vegetation projects continued to dominate, representing 64% of the 2.5 million ACCU supply in Quarter 3 2020 (see Figure 3). Following the end of the quarter, an additional 2.9 million ACCUs were issued in October. Supply for 2020 remains on track for 16 million ACCUs.

Eight projects were credited for the first time in Quarter 3 2020, contributing 130,000 ACCUs to supply. This includes the first issuance of credits to Western Australia based 'Human Induced Regeneration' projects.

Supply from vegetation projects in Western Australia is expected to progressively increase with conditions removed from 5 projects in Quarter 3 2020. A further 62 projects in Western Australia are conditionally registered.[12]

Across the portfolio of 857 projects, 493 projects are generating ACCUs and 364 projects are yet to be credited.[13] Of the 364 projects yet to receive ACCUs, 108 are unconditionally registered, while 256 are registered with conditions that must be removed before ACCUs can be issued.[14]

Figure 3: ACCUs issued per method type, Q3 2018 to Q3 2020



[12] In December 2019, the Western Australian government announced it would provide eligible interest holder consent to individual projects that meet its approved assessment requirements, allowing carbon farming to be undertaken on pastoral lands.

[13] For many projects to be issued credits they are first required to meet certain project conditions (e.g. eligible interest holder consents). Projects are also required to submit a report to receive credits within certain time periods depending on the method. If projects do not meet their conditions or report within their allotted time periods, then these projects may not proceed and may be revoked.

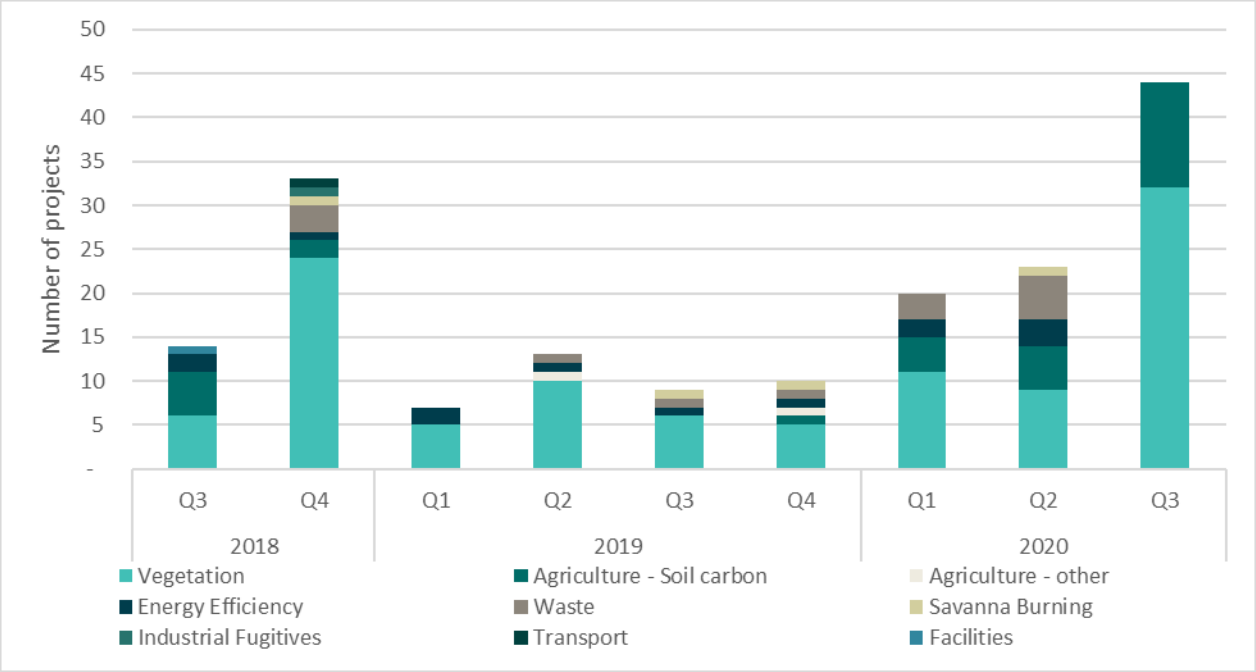
[14] Projects generally take one to two years from when they are registered before they are issued their first ACCUs. Once projects are registered, they have a crediting period between 7 to 25 years depending on the method.

Projects

Quarter 3 2020 saw the highest quarterly registration (44 projects) since Quarter 2 2018 (62 projects; see Figure 4). Project registration in 2020 stands at 87, more than double the number of projects registered in 2019.

The 44 projects registered in Quarter 3 2020 are estimated to deliver 36 million tonnes of abatement over their lifetime, compared with 9 million tonnes estimated from the 39 projects registered in 2019.

Figure 4: New registered projects per method type, Q3 2018 to Q3 2020



The surge in registrations was driven, in part, by participants registering projects for Auction 11, increase in auction prices at Auction 10 and growing confidence in the industry as a result of the optional delivery contract option.

Increasing interest in soil carbon has also contributed to project uptake. In Quarter 3 2020, 12 projects were registered under the 'measurement of soil carbon sequestration in agricultural systems' method, taking total registration under this method to 23. [15] An additional 50 applications under this method were under assessment at the end of Quarter 3 2020.

New upfront support for soil sampling is likely to contribute to increased interest in soil carbon projects. Eligible soil carbon projects can establish a contract through an ERF auction, or link to an existing fixed delivery contract to receive an upfront payment of up to $5,000.

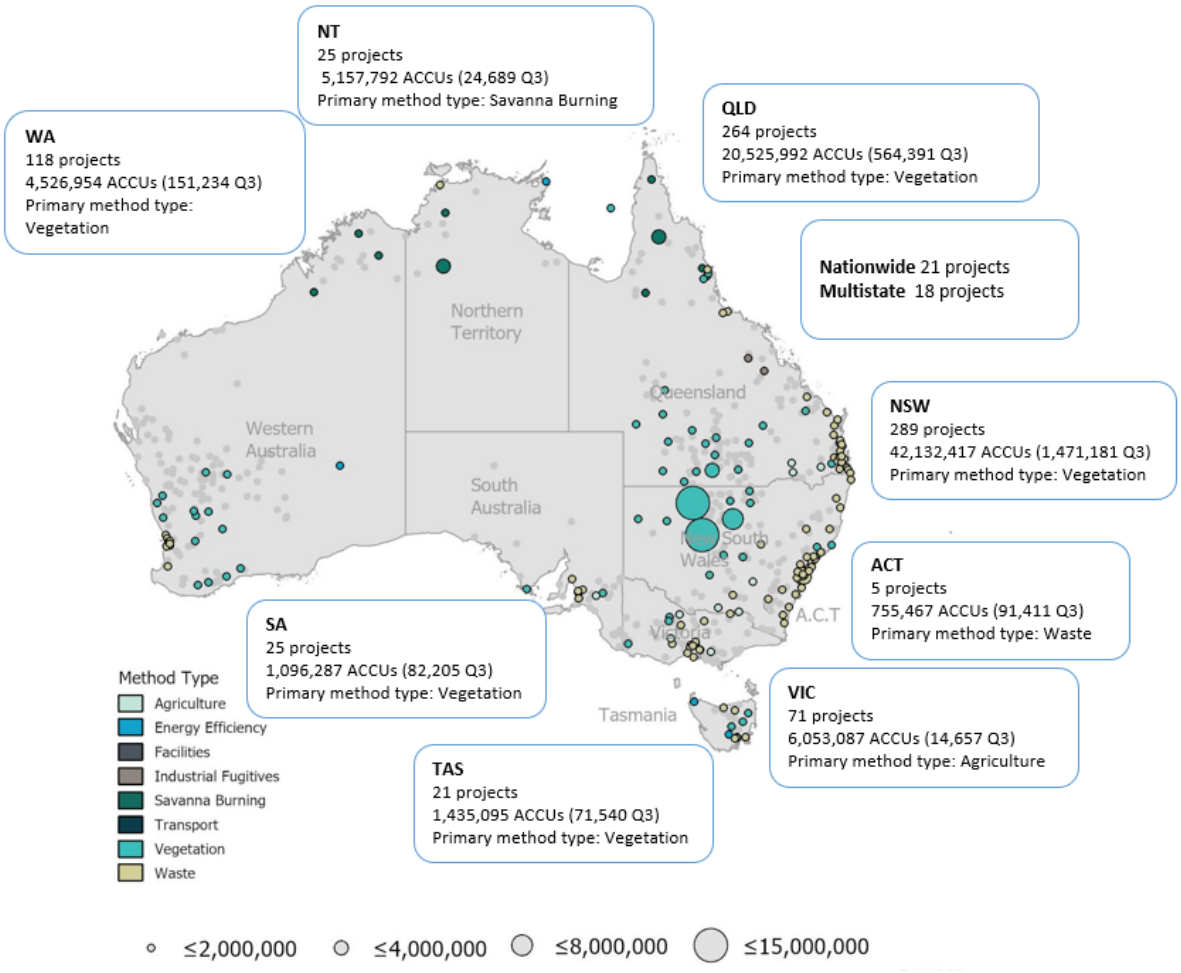
Two soil carbon projects secured ERF contracts at Auction 11.

Further information on the incentive and eligibility criteria for the soil carbon advance payment is available on the Clean Energy Regulator's website.

A snapshot of the ERF project portfolio across Australia for Quarter 3 2020 is shown in Figure 5.

[15] In addition to the 23 projects registered under the 'measurement of soil carbon sequestration in agricultural systems method', 43 soil carbon projects are registered under the 'Sequestering Carbon in Soils in Grazing Systems' method.

Figure 5: Total number of ACCUs issued per method type by location, Q3 2020 and scheme to-date



1.3. Factors impacting demand

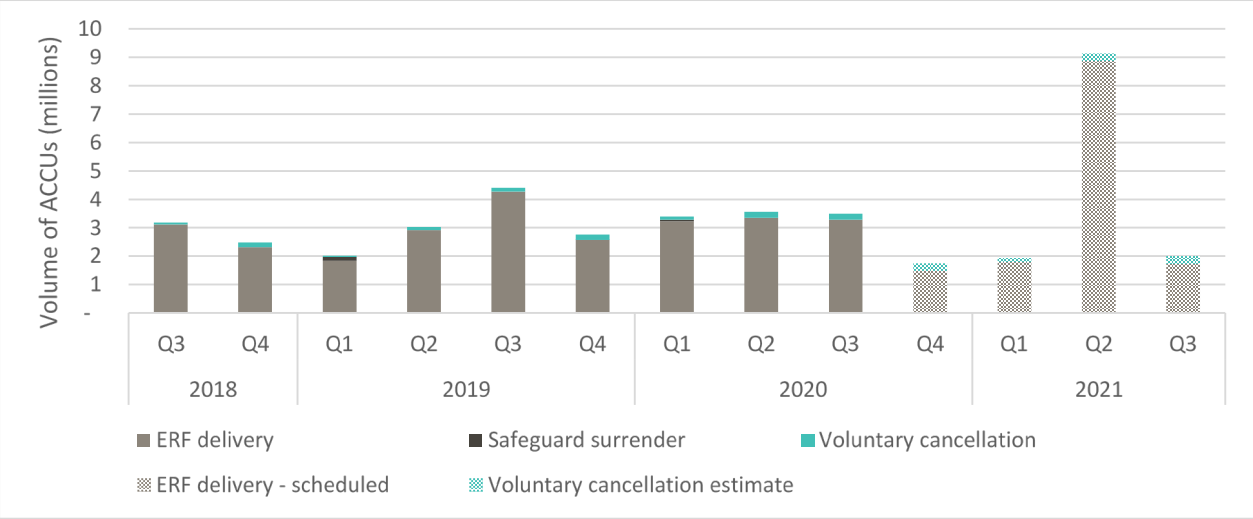
Total demand of 3.5 million ACCUs in Quarter 3 2020 was 21% lower than the same quarter in 2019 (see Figure 6). Commonwealth contracts remained the largest source of demand at 94%. The share of voluntary and state and territory demand increased from 3% in Quarter 3 2019 to 6% in Quarter 3 2020.

With 3.3 million ACCUs delivered to the Commonwealth in Quarter 3 against contracts, delivery in 2020 totals 9.9 million, up 9% over the same period in 2019. Of the 3.3 million ACCUs delivered in Quarter 3 2020, 1.6 million ACCUs were delivered earlier than the scheduled milestone.[16] ACCUs surrendered against Commonwealth contracts is estimated to reach 11.3 million in 2020, similar to the volume seen in 2019. However, early deliveries could increase this demand.

Demand from state and territory governments gained momentum with the Queensland Government committing nearly $93 million across 19 projects through the Land Restoration Fund's (LRF) 2020 Investment Round. Projects contracted under the LRF can also seek contracts with the Commonwealth through the ERF auctions.

[16] Of the 3.3 million delivered in Quarter 3 2020, 1.6 million were delivered against a milestone that was set beyond this quarter. The commonwealth contract allows a degree of flexibility enabling delivery of ACCUs early than scheduled delivery milestones. While contract delivery schedules are determined at auction registration stage, variations to the delivery schedule can be negotiated with the Clean Energy Regulator in accordance with the Contract Code of Common Terms.

Figure 6: Actual and estimated demand for ACCUs, Q3 2018 to Q3 2021



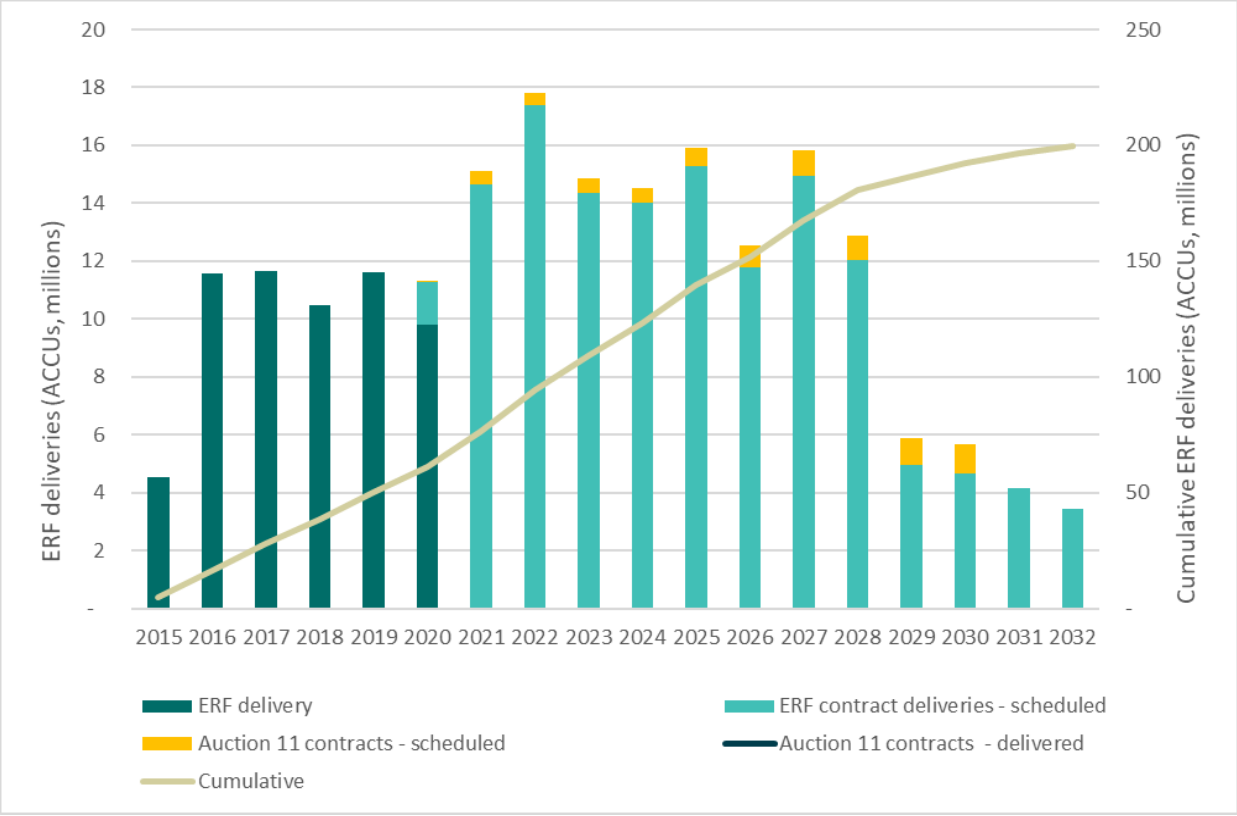
Commonwealth demand

The volume of ACCUs contracted under the ERF has reached 200 million with 60 million ACCUs already delivered under contract.

Auction 11 (further details below) added 7 million ACCUs to contracted volume, 72% of which is scheduled to be delivered in 2025 and beyond (see Figure 7).

Scheduled demand from ERF contracts is rising over the medium term, with delivery volume increasing from 11.3 million expected in 2020 to 15.1 million in 2021 and 17.8 million in 2022.

Figure 7: Commonwealth delivery for current portfolio of projects, 2015 to 2032



Emissions Reduction Fund auctions

The Clean Energy Regulator held ERF Auction 11 on 9-10 September 2020, contracting to purchase 7 million tonnes of carbon abatement, continuing a trend of increased volumes purchased at auction. A total of 35 contracts were awarded for 33 projects at an average price of $15.74 per tonne, a decrease of $0.40 from ERF Auction 10 (see Figure 8), reflecting the more competitive nature of auction bids. However, prices remained higher than past auctions.

There was a clear market preference for the optional delivery contract with 29 of the 35 contracts being optional, representing 90% (6.3 million tonnes of carbon abatement) of the contracted volume.

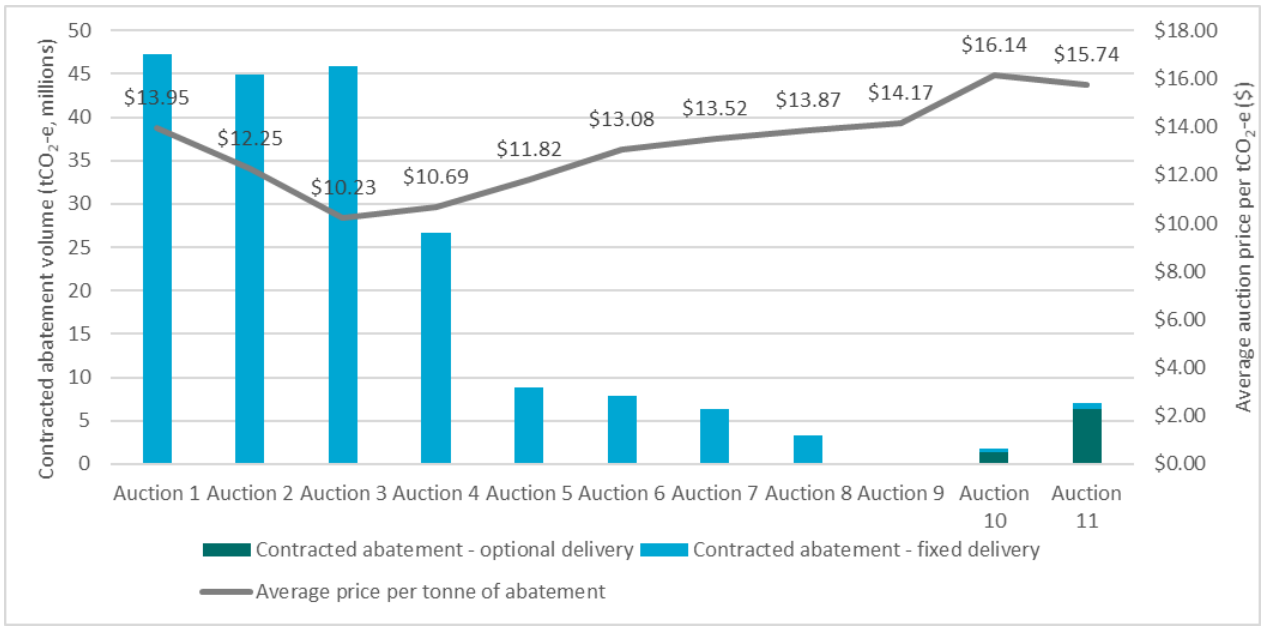
The average price paid for optional delivery contracts ($15.77) was higher than the average price paid for fixed delivery contracts ($15.53). The somewhat unexpected result of a higher average price for optional delivery contracts simply reflects differences in the size and spread of successful bids for both contract types.

Two projects were successful in securing both a fixed and optional delivery contract. To access this arrangement, sellers must apportion abatement from a single project across the two bids. This contracting model allows project developers greater flexibility in managing risk.

Vegetation projects dominated Auction 11, accounting for 27 of the 33 contracted projects.

Western Australia had the highest number of projects contracted within a single state accounting for 13 of the 33 contracted projects.

Figure 8: ERF auction results



Voluntary Surrender

Voluntary private and state and territory cancellations totaled 216,000 ACCUs in Quarter 3 2020, a 63% increase on the volume cancelled in Quarter 3 2019. Growth in voluntary demand for ACCUs in 2020 is expected to continue with volume cancelled in Quarter 4 typically surpassing that in Quarter 3. The Clean Energy Regulator estimates that more than 750,000 ACCUs will be cancelled in 2020.

More information on the voluntary carbon market is in Chapter 5.

Policy development

Following consultation earlier in the year, the Clean Energy Regulator updated its approach to the interpretation of regulatory additionality[17] requirement under the *Carbon Credits (Carbon Farming Initiative) Act 2011*. The new approach will help facilitate participation in the ERF among entities with state or territory emissions reduction or offsetting requirements. Project proponents may be able to demonstrate their project is additional by taking ACCUs that are relevant to the state and territory requirement out of circulation.

The Clean Energy Regulator's new role

The Clean Energy Regulator has been allocated $40.4 million over 10 years from the 2020-2021 Budget to speed up ERF method development and build an exchange platform for emissions reduction units. Supporting IT systems will be upgraded and streamlined to reduce timeframes for project registration and crediting.

The exchange platform will simplify buying and selling of ACCUs and increase transparency of key market metrics including supply, volumes traded and price. This is expected to reduce transaction costs in the market placing downward pressure on ACCU prices and unlocking new abatement.

The Clean Energy Regulator will accelerate method development through a co-design process with industry. Regular reporting will increase transparency on progress. The independent Emissions Reduction Assurance Committee will continue their important role in assessing methods against the Offsets Integrity Standards. The Minister for Energy and Emissions Reduction remains the method rule maker and will determine the method development priorities with the support of the Department of Industry, Science, Energy and Resources. More information will be available on the Clean Energy Regulator website.

[17] For more information see Regulatory additionality and government programs.

Market trading

Following a relatively subdued Quarter 2 2020, the market rebounded in Quarter 3 2020 with 1 million ACCUs transacted, 2.5 times the volume transacted in Quarter 2 2020 (see Figure 9). The number of transactions also increased by 61% from 38 transactions in Quarter 2 2020 to 61 in Quarter 3 2020.

Spot price

The ACCU spot price increased from $15.85 at the end of Quarter 2 to $16.10 at the end of Quarter 3 2020, off thin volume and a low number of trades. Market activity was subdued at the start of the quarter, likely in anticipation of a price signal from Auction 11 (see Figure 10).

Figure 9: ACCU market transactions (excluding ERF transactions)[18], Q3 2018 to Q3 2020

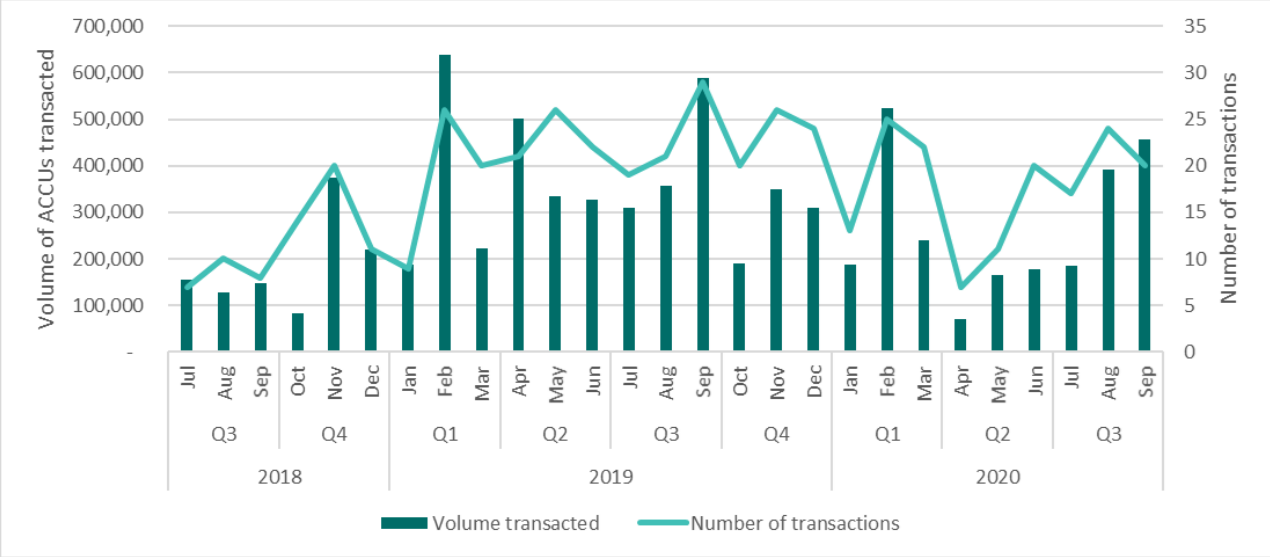


Figure 10: ACCU spot prices, Q3 2020

[18] ACCU market transactions refer to the transfer of ACCUs between separate entities or groups and does not include issuances and surrenders of ACCUs. Transactions involving the transfer of ACCUs between project proponents, between project proponents and project developers, and between accounts belonging to the same company and/or subsidiaries are excluded.

1.4. Key dates

Date	Event	Significance
2-4 December 2020	**Carbon Market Institute's Australasian Emissions Reductions Summit**	The 2020 Emissions Reduction Summit, Accelerating to Zero, is scheduled for December 2020. The program and registration details are on the Carbon Market Institute's event page.
1 February 2021	Safeguard multi-year monitoring period deadline	Deadline for Safeguard entities to submit multi-year monitoring period declaration applications, starting 2019–20.
28 February 2021	Safeguard compliance ACCU surrender deadline.	Deadline for safeguard entities to surrender ACCUs under the Safeguard Mechanism to avoid excess emissions situation.

2. Large-scale generation certificates

- 1.1 GW of projects reached financial close in the Quarter and a further 0.49 GW has since been committed.
    - 2.5 GW has been financed in 2020[19], exceeding 2.3 GW capacity financed in 2019.
- Two gigawatt-scale projects signed PPAs for partial capacity, Clarke Creek Wind and Solar Farm and the Goyder South Renewable Energy Project.
- Eligible large-scale renewable energy generation is likely to meet the 2020 target of 33,000 GWh, with multiple factors affecting the final result.
- September was a record high month for renewable energy generation, accounting for 31% of total NEM generation.
- Supply increased by 7.3 million LGCs in Quarter 3 2020, an 8% increase on Quarter 3 2019 (see Figure 11).
- Voluntary private and state and territory surrender for LGCs increased to 1.2 million LGCs, 85% higher compared to Quarter 3 2019.
    - A further 2.3 million LGCs were surrendered by the ACT Government in Quarter 3 2020 to demonstrate achievement of their 100% renewable energy target for 2019-20 financial year.

2.1. Supply and demand balance

LGC supply remains unchanged in Quarter 3. An estimated 39.4 million LGCs are expected to be available for the 2020 assessment year, this includes 7.4 million LGCs carried over from previous years.

Based on current trends, 32 million LGCs are expected to be validated in 2020. The Clean Energy Regulator will allow power stations to create LGCs for December generation before the end of the year. If all power stations choose to take up this option, LGC supply could increase by up to 2 million.

Legislated demand is 33.6 million LGCs.[20] Liable entities eligible for shortfall refunds may potentially increase demand by a further 1.1 million LGCs.

As highlighted in the June 2020 Quarterly Carbon Market Report, voluntary demand reached record levels with 1.2[21] million LGCs surrendered in Quarter 3, an 85% increase compared to Quarter 3 2019. A further 2.3 million LGCs were surrendered by the ACT government.

Total 2020 voluntary private and state and territory LGC surrenders stands at 3.9 million. Voluntary demand is expected to be 4 million LGCs in 2020.

The increased voluntary surrender, other than by the ACT government, has halved the

[19] As at the end of October 2020.
[20] Legislated demand has been revised down from 33.7 million LGCs to 33.6 million LGCs due to the processing of a number of 38AF applications and 38AG applications (new liable entities), where liable electricity is lower than expected for a liable entity. This revision is primarily due to lower electricity demand from customers for some electricity retailers during the COVID 19 pandemic.
[21] The 2.3 million LGCs surrendered by the ACT government have been excluded from quarter on quarter comparisons.

estimated balance of LGCs available after surrender to 0.7 million, down from 1.45 million reported in the June 2020 Quarterly Carbon Market Report (see Table 3). This balance assumes no shortfall is taken for the 2020 assessment year.

However, given the arbitrage opportunity due to lower forward LGC prices, material shortfall is expected for the 2020 compliance year.

Table 3: LGC supply and demand balance

	Supply	Demand
LGC balance 14 February 2020	+7.4 million	
Expected LGC supply (available for 2020 surrender)	+32.0 million	
Legislated demand		-33.6 million
Shortfall charge refunds[22]		-1.1 million
ACT Government scheme[23]		-2.3 million
GreenPower		-0.5 million
Other voluntary surrenders		-1.1 million
Total balance		**+0.8 million**

2.2. Factors impacting supply

LGC supply

Supply increased by 7.3 million LGCs in Quarter 3 2020, an 8% increase on Quarter 3 2019 (see Figure 11). There were 22.3 million registered LGCs in the REC Registry at the end of Quarter 3 2020.

The June 2020 Quarterly Carbon Market Report noted several challenges facing renewable power stations in the NEM. These challenges have continued to negatively impact on generation and are examined further in the *Tracking towards the 2020 target* section below. Supply of LGCs is on track to meet the estimated 32 million in 2020.

Despite this, September was a record high month for total renewable energy generation, accounting for 31% of total NEM generation[24] as rooftop solar PV generation reaches new highs.

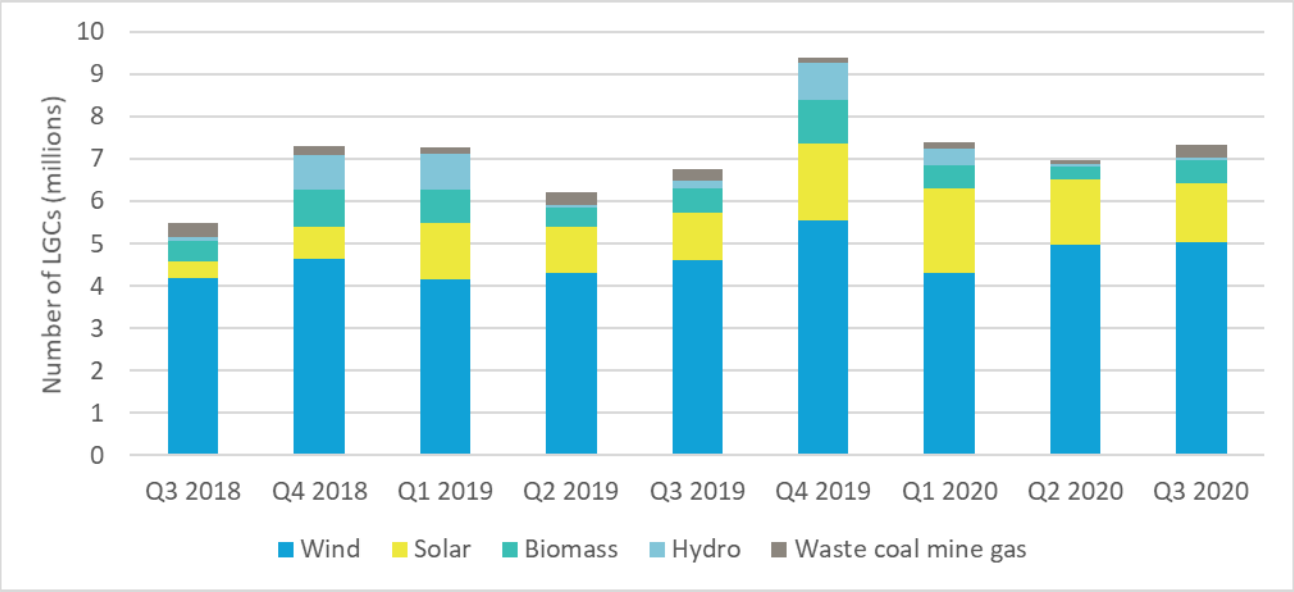
LGCs must be created by 31 December 2020 if they are to be used for surrender on 14 February 2021.

To maximise LGCs available for surrender, the Clean Energy Regulator allows LGC claims for the first part of the month's generation to be submitted throughout December. If participants utilise this option, LGC supply for 2020 could increase by up to 6%.[25]

Liable entities seeking to surrender LGCs for shortfall charge refunds due in 2021, can surrender LGCs created in early January 2021. Similar to partial December claims, the Clean Energy Regulator will allow partial LGC claims for generation in the first part of January.

[22] This is the amount of paid shortfall from previous assessment years that entities may surrender to receive a refund. Forward prices are lower than current prices, so an incentive remains to take paid shortfall for the 2020 assessment year.
[23] This is the expected annual accumulation of LGCs held by the Australian Capital Territory government that is not expected to be available for surrender.
[24] This includes rooftop solar, utility-scale wind and solar, hydro and biomass.
[25] This is based on the percentage of generation in 2019 that was not created until 2020.

Figure 11: LGCs validated by technology type, Q3 2018 to Q3 2020



Accreditation

53 power stations were accredited in Quarter 3 2020, with a cumulative capacity of 689 MW (see Figure 12). This has taken total accredited capacity to 2.8 GW for 2020 (see Figure 13). Accreditations remain on track for the expected 3.4 GW of capacity in 2020 with 460MW of capacity under application at the end of Quarter 3.

The Clean Energy Regulator received 71 applications over the quarter to accredit power stations under 30 MW, consistent with the number of new applications received over Quarters 1 and 2 2020. The outlook for mid-scale power stations over coming years is explored in more detail in Chapter 4.

The largest power station accredited in Quarter 3 2020 was Kiamal Solar Farm in Victoria, with a capacity of 256.5MW.

Figure 12: Power station accreditation across the states in Q3 2020

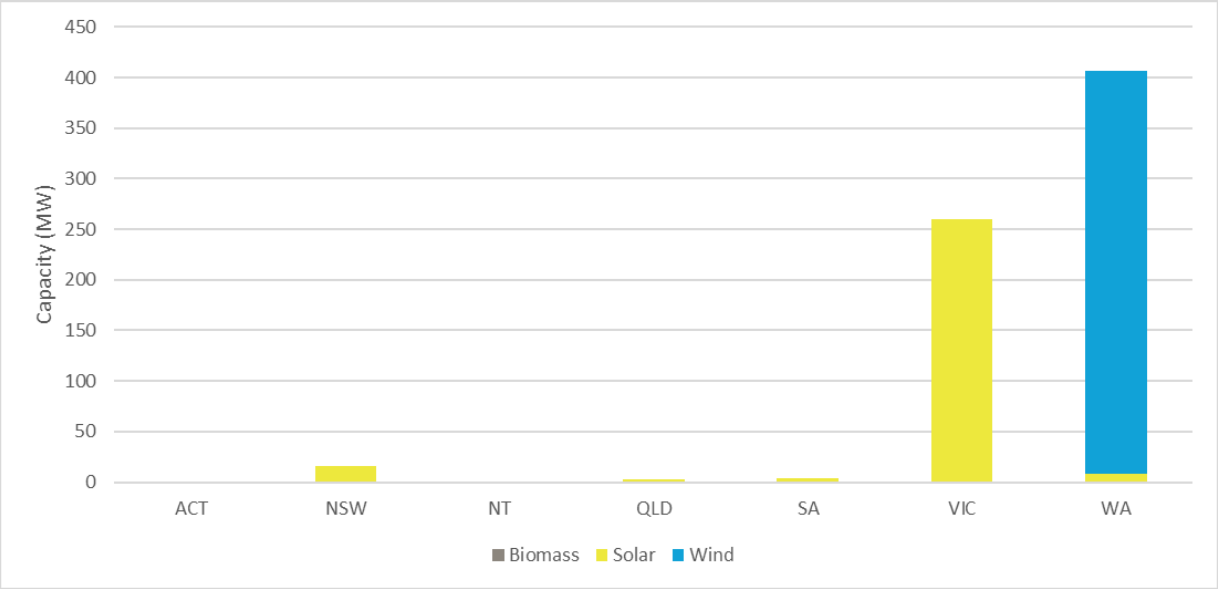
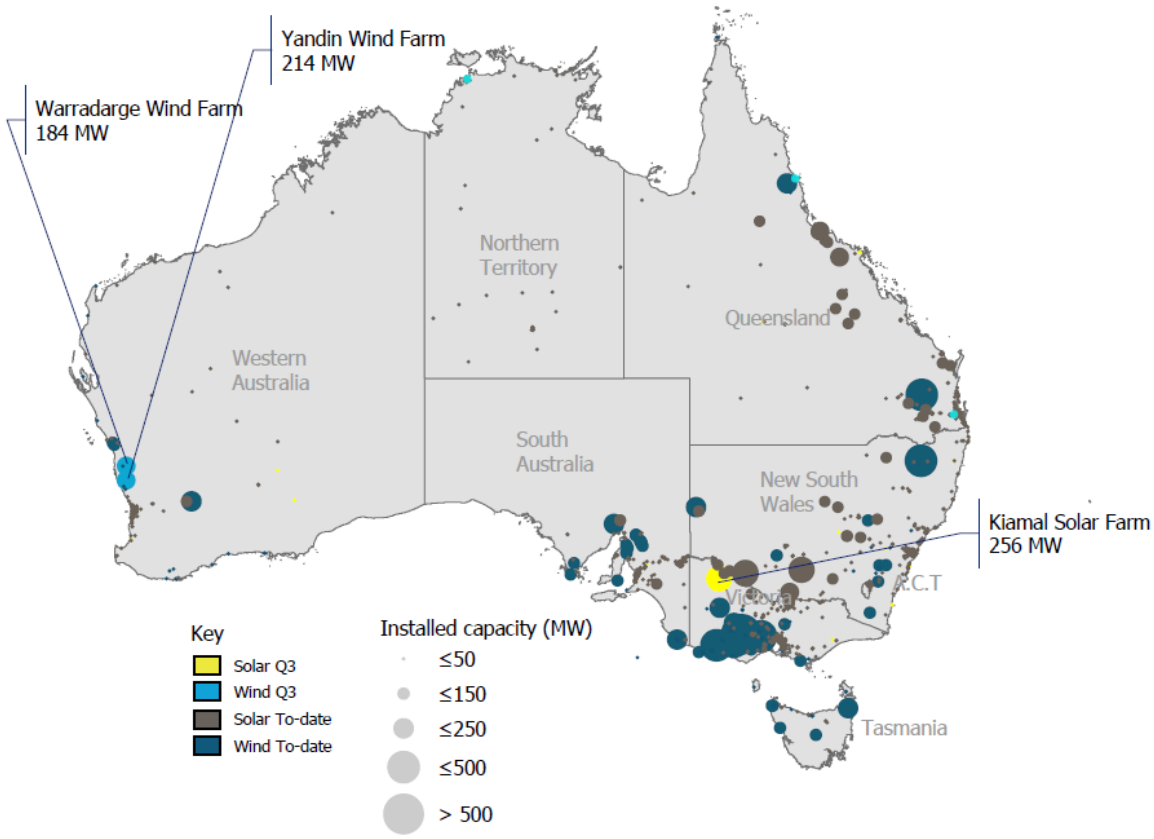


Figure 13: Wind and solar power stations accredited capacity by location, Q3 2020 and scheme to date



Committed and probable projects

Quarter 3 saw a surge of 1099 MW of capacity reaching financial close (see Figure 14), with a further 490MW reaching financial close in early October. This brings the total capacity of projects committed in 2020 to 2.5 GW, exceeding the 2.3 GW financed in 2019.

Figure 14 shows that quarter by quarter comparisons of financial close announcements are meaningless. These are commercial processes and can be 'lumpy' from quarter to quarter. The four-quarter moving average line in Figure 14 demonstrates recent changes in the rolling annual average committed capacity. Further financial close announcements in Quarter 4 should continue this upwards trend.

More power stations are expected to reach financial close in Quarter 4 2020, and capacity could exceed the Clean Energy Regulator's upper bound estimate of 3 GW for the year.

It remains difficult for new utility-scale projects to reach financial close and connect to the grid once constructed in some locations given the current transmission challenges. Achieving 2.5 GW financed, with the possibility of more to come, is a strong result given increased project costs and risks.

The total capacity of projects backed by a PPA but yet to reach financial close was 2.9 GW at the end of Quarter 3.[26]

In November the International Energy Agency (IEA) released its outlook for renewables[27] indicating an expected 13.6 GW of new capacity installed in Australia in the period 2021 to 2025 (4.2 GW wind and 8.4 GW solar). Comparatively,

[26] This fell to 2.4 GW in early October, with 490 MW capacity reaching financial close in early October backed by a PPA.
[27] Renewables 2020, Analysis and Forecasts to 2025, IEA

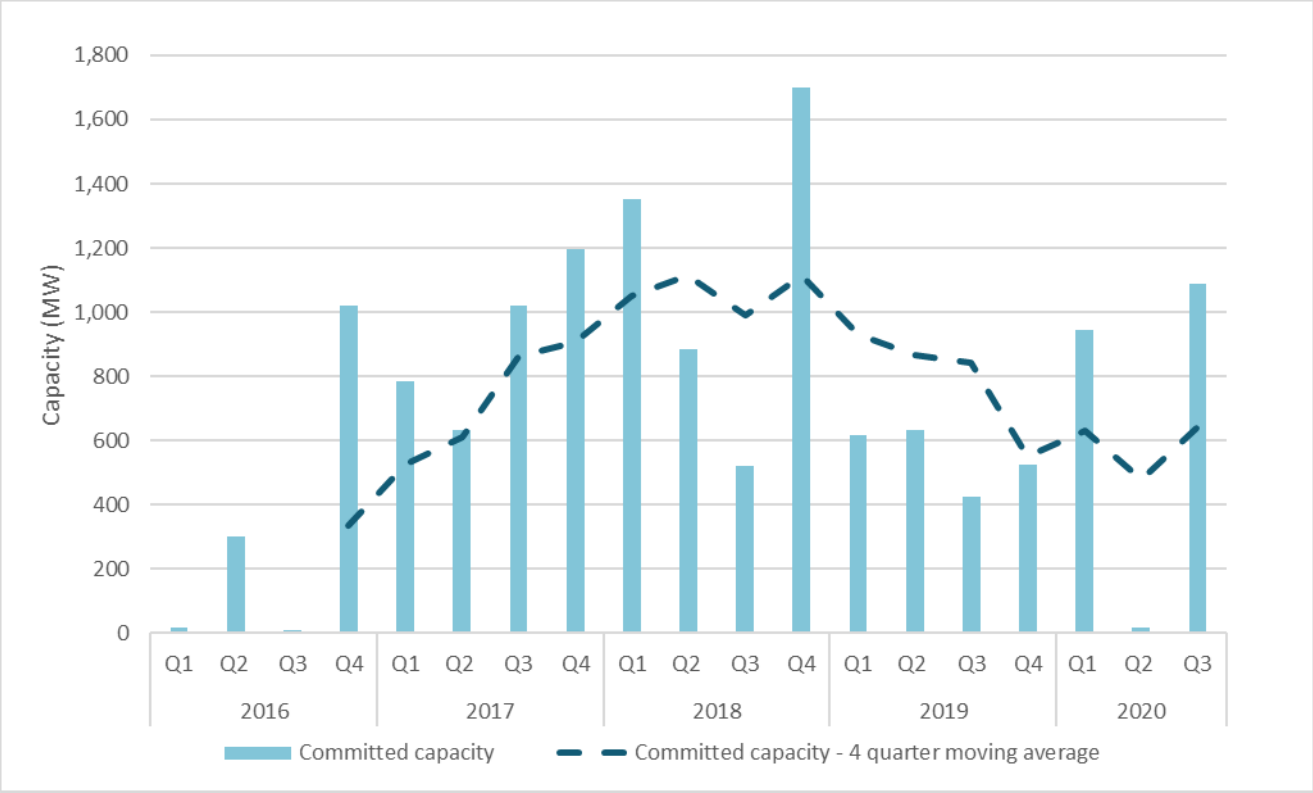
the Clean Energy Regulator expects at least 17.6 GW to be installed in this time period (2.4 GW wind and 15.6 GW solar). This estimate is based on utility-scale projects currently financed or underpinned by power purchase agreements and recent modelling results for rooftop and mid-scale (100 kW – 30 MW) solar PV.

Further announcements in utility-scale projects are expected over the coming years and as such the utility-scale estimates are expected to increase materially across this period.

Federal and state governments announcements during Quarter 3 may continue to drive new renewable investment.

- The 2020-21 Federal Budget announced an extension of the instant asset tax-write off for assets valued up to $150,000 to include businesses with a turnover of up to $500 million (up from $50 million)[28]. This could improve project economics for behind the meter solar projects below 30 MW in both the small- and large-scale schemes, and support batteries for existing wind and solar power stations.
- The NSW Government announced plans to develop the New England Renewable Energy Zone (REZ), which will support 8,000 MW of additional investment.
- The Victorian Government announced its intention for a second VRET auction, to foster development of at least 600MW of large-scale project in Victoria.[29]

Figure 14: Capacity committed per quarter and 4 quarter moving average, Q1 2016 to Q3 2020



[28] Australian Taxation Office, Instant asset write-off for eligible businesses, 19 August 2020.
[29] PV Magazine, VRET-2 takes shape as a part of Victoria's Covid-19 recovery plan, 2 September 2020.

The changing scale of future renewables

2020 has seen the arrival of gigawatt scale projects to the Australian renewables landscape. These very large, multiple stage renewable projects are beginning to reach financial close, and sign PPAs throughout Australia (see Figure 15). Gigawatt scale projects can better spread and absorb the costs of grid connection and grid stabilisation technologies, such as synchronous condensers and utility-scale batteries compared to conventional utility scale renewable generation.

Very large projects benefit from greater economies of scale. The benefits gained include cheaper installation, dilution of fixed costs over a large capacity and cheaper hardware costs through volume-based discounts.[30]

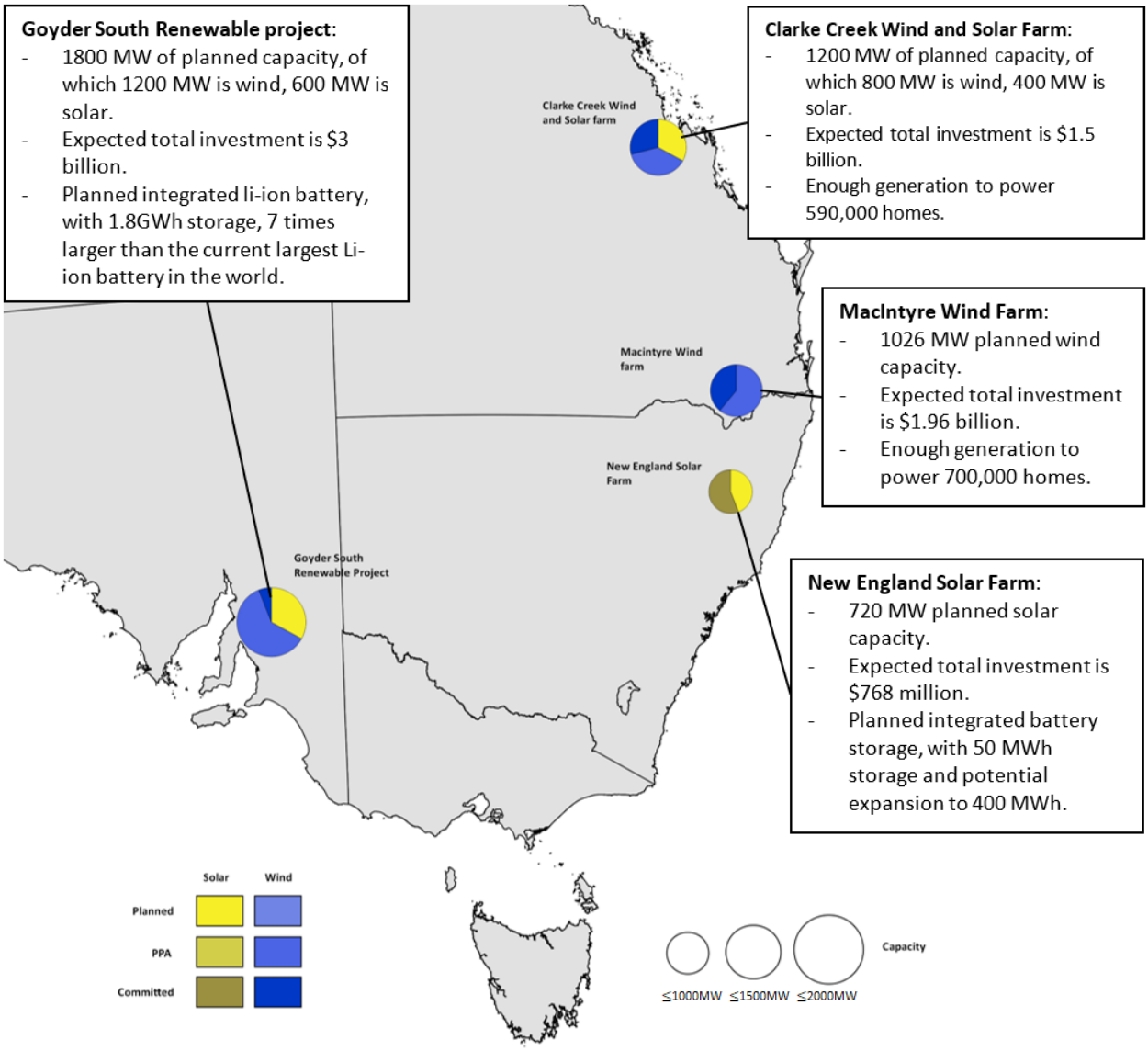
Quarter 3 saw 2 gigawatt-scale projects secure PPAs for part of the total planned capacity. The Clarke Creek Wind and Solar Farm signed a PPA for 350MW of its 1.2GW total planned capacity. The Goyder South Renewable Project signed a PPA for 100MW of its 1.8GW total planned capacity.

MacIntyre Wind Farm has a similar model, signing a PPA for 400 MW of its 1 GW total planned capacity in Quarter 2. That means 0.95 GW of new PPAs have been signed for a total 4GW of planned capacity from just these 3 projects.

Quarter 3 also saw the first stage, 400MW, of the New England Solar Farm in NSW reach financial close. This project will have a total capacity of 720MW once fully commissioned.

[30] Rystad Energy, Module power and project scale to propel utility PV capex reductions.

Figure 15: Very large-scale projects currently tracked by the Clean Energy Regulator



Tracking towards the 2020 Large-scale Renewable Energy Target (LRET)

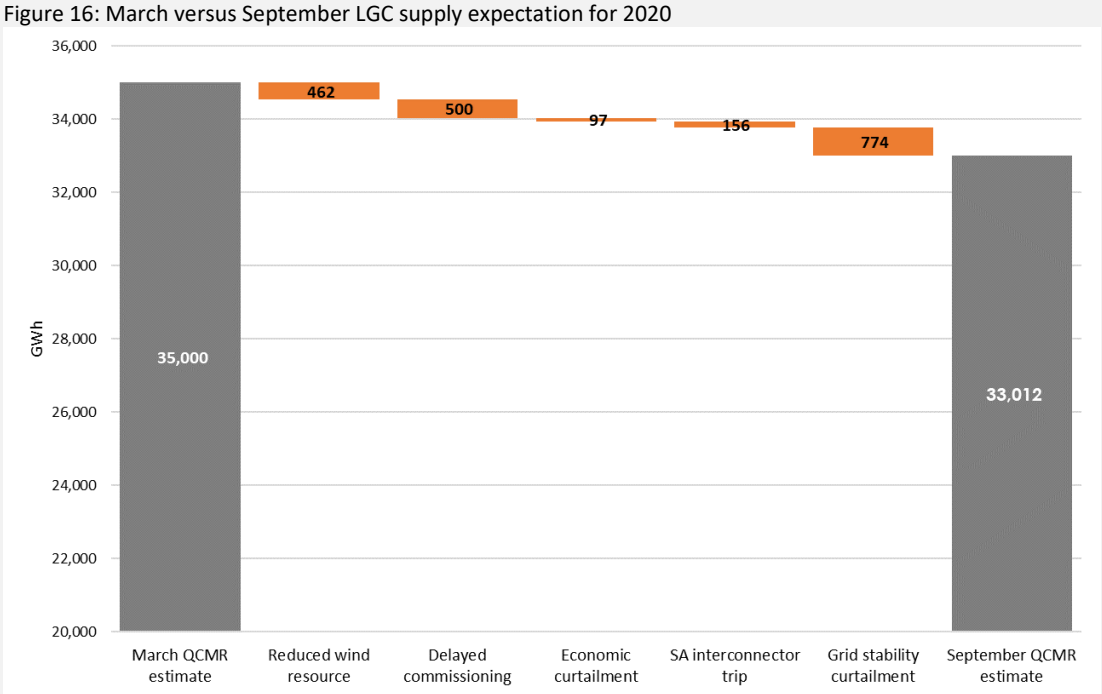
Australia's transition to renewable energy is ten times faster than the global average measured as watts per capita. Total renewable energy generation is expected to be approximately 30% of all generation by the end of 2020 or approximately 60,000 GWh when large-scale, rooftop solar and below baseline[31] generation are included.

At the end of Q3 2020, 22.6 TWh of renewable energy was generated compared to 20.1 TWh generated by the end of Q3 2019. This is a 12% increase. Eligible large-scale renewable energy generation in 2020 is expected to be approximately 33,000 GWh.[32] This is equivalent to the legislated renewable energy target. It is difficult to forecast renewable generation precisely as there are a multitude of positive and negative factors that can affect production. For that reason, the expected range of renewable generation for 2020 is 32,500 GWh to 33,500 GWh.

The Clean Energy Regulator had previously estimated in the March Quarter 2020 Quarterly Carbon Market Report that generation for 2020 would be between 34,000 GWh and 36,000 GWh. The reduction to 33,000 GWh has been caused by a series of downside impacts on renewable energy generation throughout 2020 (see Figure 16).

Given the events discussed below, it is a great result to be on track to meet the target this year. In 2021, the Clean Energy Regulator expects the target to be materially exceeded, with a potential 40,000 GWh potentially generated in 2021.

Figure 16: March versus September LGC supply expectation for 2020



Multiple factors have reduced generation from new and existing generators in 2020.

[31] Renewable electricity generation levels prior to 1998 are ineligible under the Large-scale Renewable Energy Target.
[32] This estimate assumes typical seasonal conditions prevail in Quarter 4 and no further material grid connection delays or curtailment of existing power stations.

- **Lower wind resources reduced expected generation by 462 GWh.** Weather conditions have a direct impact on renewable generation. Average wind speeds across Australia were marginally slower (2%) on average year on year, with average wind speeds reduced by 7% in Quarter 3 2020 compared to Quarter 3 2019, typically the windiest quarter. These changing wind conditions have reduced generation by an estimated 462 GWh so far in 2020.
- **Delayed registration and commissioning of new projects reduced expected generation by 500 GWh.** Earlier generation estimates assumed power stations would export to the grid once fully constructed. However, some power stations constructed in 2019 and 2020 are not yet able to export to the electricity grid or are limited in their ability to export at full capacity as they are not yet registered or are operating under a notifiable exemption. Impacted projects include Darlington Point Solar Farm (333 MW), Sunraysia Solar Farm (255 MW) and Kennedy Energy Park (78 MW).
- **Further curtailment of connected generators reduced expected generation by 1026 GWh.** Curtailment in Quarter 3 2020 increased to 5.5% compared with 3.2% in Quarter 2 2020.There are various categories of curtailment, affecting renewable generation in different ways.
  - » Economic curtailment – where generators choose to shut down due to negative wholesale electricity prices – increased in Quarter 3 2020. To date in 2020, there has been more than double the negative price events compared to 2019. This is mostly due to the extraordinary growth of residential solar PV reducing daytime demand and subsequently wholesale electricity prices. An estimated 97 GWh in reduced generation is attributable to these events.
  - » Outage event curtailment occurred in Quarter 1 2020 when a tornado brought down a series of transmission lines in Victoria resulting in the outage of the Heywood interconnector between South Australia and Victoria. Wind and solar power stations had their output curtailed to maintain grid stability in response to this event. An estimated 156 GWh is attributable to curtailment from this outage event.
  - » Grid stability curtailment occurs when renewable power stations are directed by AEMO to generate below their maximum capacity to maintain grid strength in weak areas of the grid. Curtailment has affected clusters of projects in areas such as the West Murray Zone and North Queensland. This has reduced expected generation by an estimated 774 GWh.
- **Operational incidents reduce generation**. Operational incidents are events that occur within the boundary of a power station that temporarily reduces or halts generation. Four windfarms have experienced blade drops and one recently connected solar farm halted generation following technical issues with the inverter. Such incidents are difficult to predict.

The unpredictable and often interrelated nature of these factors makes it difficult to accurately estimate the amount of renewable generation in a year. Factors that could contribute to generation in 2020 falling within the 32,500 to 33,500 GWh range are set out below.

Table 4: Potential upside and downside risks to 2020 generation

Potential Upside impacts	Potential Downside impacts
Increased Hydro above baseline generation owing to rainy La Niña weather patterns.	Reduced solar generation owing to cloudy La Niña weather patterns.
Faster connection and ramping of projects.	Ramping and connection occur slower than current estimates.
Stronger wind speeds compared to typical Quarter 4 trends.	Lower wind speeds compared to typical Quarter 4 trends.
Low curtailment in Quarter 4.	Unexpected system outage event that reduces or curtails renewables output.
	Unanticipated operational incidents halt or reduce generation.
	Unfavourable weather delays construction.

2.3. Factors affecting demand

Voluntary demand

Quarter 3 saw a record 1.2 million LGCs voluntarily surrendered, 58% more than the total number of LGCs voluntarily surrendered in 2019. A further 2.3 million LGCs were voluntarily surrendered by the Australian Capital Territory government against their 100% renewable energy target for 2020 and previous years.

Voluntary surrenders for the first three quarters of 2020 (3.9 million LGCs) have effectively increased LGC demand for 2020 by 12% above the legislated target of 33.7 million LGCs. For a detailed breakdown of voluntary surrenders, see Chapter 5 Voluntary private and state and territory markets

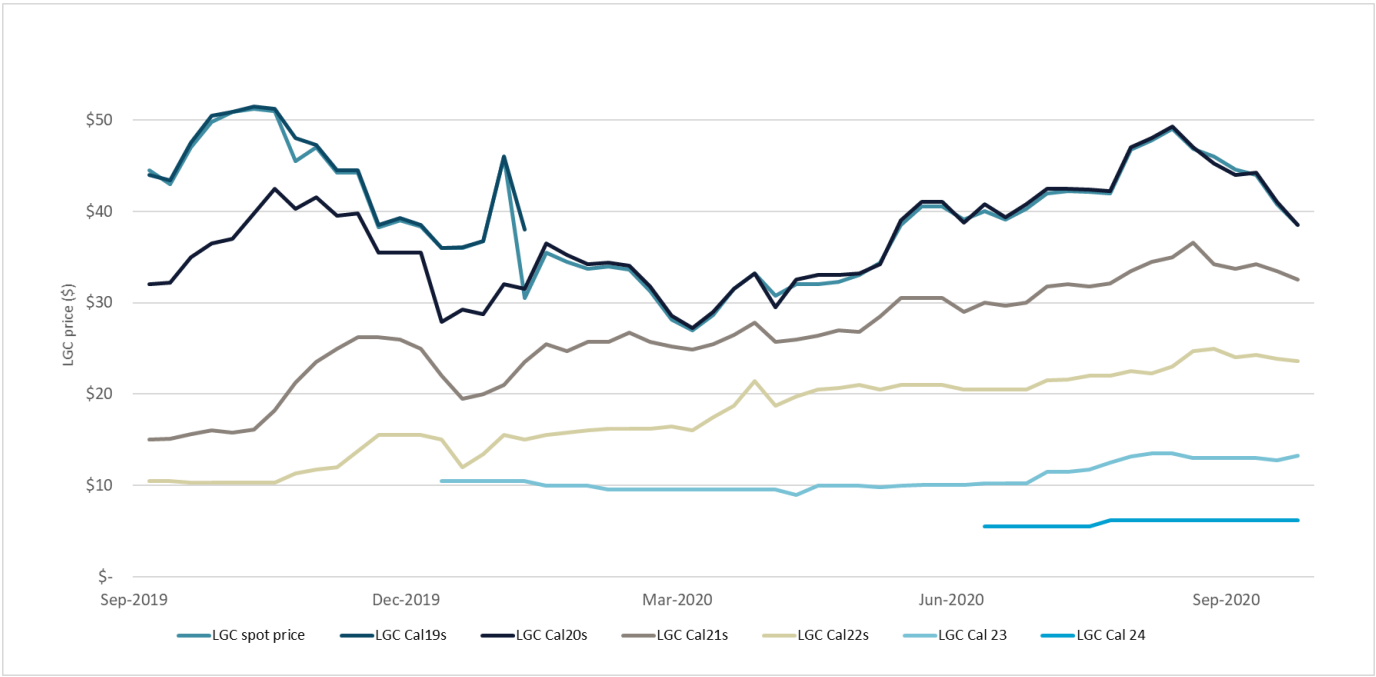
2.4. Market trading

The LGC spot price experienced an 18% increase in Quarter 3 2020, closing the quarter at $46.00 compared to $40.50 at the end of Quarter 2 (Figure 17). Prices were volatile throughout September in particular, trending upwards to $49.00 before dropping quickly down to $46.00.

The price volatility in the quarter and beyond is consistent with expectation of tight LGC supply and demand balance, as liable entities consider their options to take shortfall.

Since the end of Quarter 3 2020, LGC prices have dropped significantly to $38.10 at the end of October, suggesting that some liable entities have chosen to take shortfall positions for the year.

Figure 17: LGC spot and forward prices, Q3 2019 to Q3 2020 ($AUD)



2.5. Key dates

Date	Event	Significance
26 June to 28 August 2020	**Participating in Australia's carbon market to meet corporate climate goals: virtual-seminar series**	The virtual seminar series, are led by the Carbon Market Institute and Clean Energy Regulator. The seminars provide foundational information about Australia's carbon markets and opportunities for voluntary participation.
14 February 2021	Lodgement of energy acquisition statement and surrender of LGCs Submit Electricity Generation Returns	This will be the final date for liable entities to: • lodge their energy acquisition statement(s) and surrender LGCs for the assessment year, and • pay any applicable shortfall charges for the assessment year.
30 March 2021	The RPP is published on or before this date	The RPP aims to meet the annual target for renewable electricity set out in the legislation each year.

3. Small-scale technology certificates

- Rooftop solar PV installations have accelerated in Quarter 3 with 93,500 installations for an estimated total installed capacity of 750 MW. This is more than the 748 MW small-scale solar PV capacity installed across Australia in 2016.
    - 2020 is on track for 2.9 GW installed nationally.
- Despite Stage 4 COVID 19 restrictions in metropolitan Melbourne, increased installations in New South Wales, South Australia and Western Australia (up 21%, 23% and 22% respectively on Quarter 2 2020) more than compensated for 22% drop in installations in Victoria.
- A balance of 5.2 million STCs remained in the market after the 28 October 2020 Quarter 3 surrender of approximately 10.7 million STCs.
- STC prices remained stable ending the quarter at $38.45 despite a growing surplus.

3.1. Supply and demand balance

A balance of 5.2 million STCs remained in the market after the 28 October 2020 Quarter 3 surrender of approximately 10.7 million STCs.

The rate of rooftop solar PV installations accelerated further to an estimated 750 MW in Quarter 3 2020, 37% higher than Quarter 3 2019. This is a strong result considering the impact of stage 4 COVID-19 restrictions in the metropolitan Melbourne region for most of the quarter.

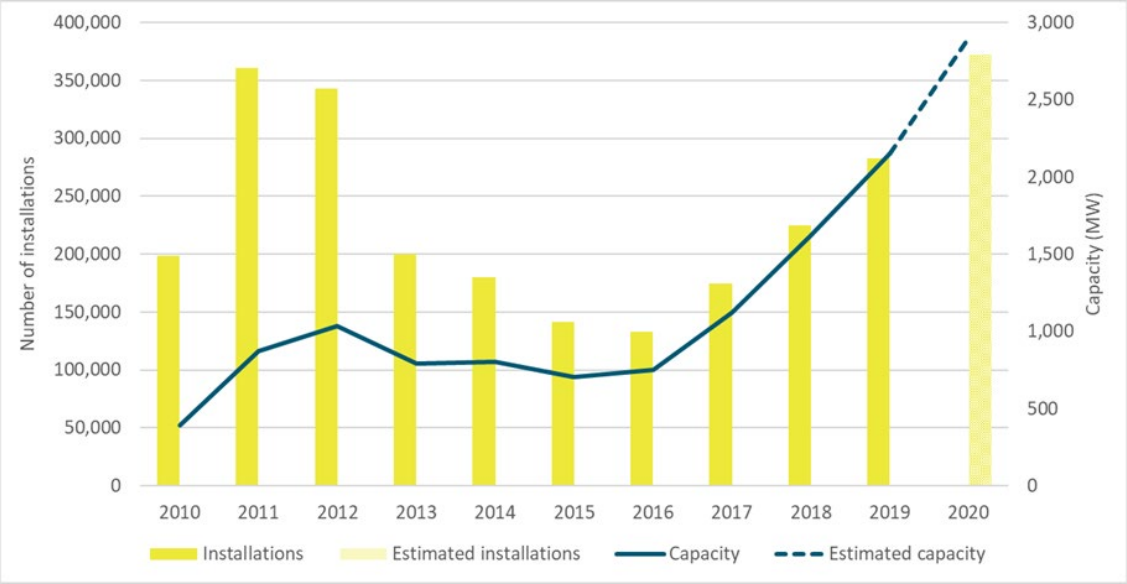
Estimated total installed capacity for 2020 remains at 2.9 GW as shown in Figure 18.

Expectations for 2021 are at a similar level to 2020 with 2.9 GW potentially to be installed.

This should not be taken as an estimate for the small-scale technology percentage (STP) as the modelling for the 2021 STP will not be completed until early 2021.

The non-binding 2021 STP of 19.40% released in March 2020 was based on an estimate of 2.35 GW to be installed in 2021. Given the capacity used in this estimate, and the estimated STC surplus post Quarter 4 surrender on 14 February 2021, the non-binding STP for 2021 should be disregarded.

Figure 18: Small-scale solar PV installations and capacity, 2010 to 2020



3.2. Factors impacting supply

Small-scale market dynamics

Increased daytime household electricity consumption and falling interest rates remained a feature in Quarter 3[33]. These factors combined to improve the economic case to install solar PV.

The escalating rooftop solar penetration rates (now 30% of suitable dwellings[34]) throughout Australia has led to a new record minimum demand level of 15,365 MW across the NEM[35] at around 1.30 pm on 29 August 2020. Alongside these record minimum levels, the average daily operational demand during peak solar generation times have also continued to decline by an estimated 1.4% compared to the same period last year.[36]

As noted in the June 2020 Quarterly Carbon Market Report[37], the growing penetration of rooftop solar PV is starting to create localised grid stability concerns for some distribution networks. New initiatives this quarter to address grid stability include:

- The Western Australian Government introduced the Distributed Energy Buyback Scheme (DEBS) offering higher feed-in tariffs of up to 10 cents per kWh for electricity exported between 3pm and 9pm and a 3 cent feed-in tariff for electricity exported between 9am and 3pm.[38] The DEBS incentivises the integration of batteries to help smooth the peak generation profile of rooftop solar PV into the afternoon-evening peak period.
- The South Australian Government commenced inverter standards changes on 28 September 2020. New solar PV installations are required to have inverters with remote disconnection and reconnection capabilities and voltage ride-through mechanisms.
- Two urban large-scale batteries in Western Sydney[39] and the Australian Capital Territory[40] as well as several community scale batteries in New South

[33] For more information see the June 2020 Quarterly Carbon Market Report.
[34] For more information see the June 2020 Quarterly Carbon Market Report.
[35] AEMO, A record breaking winter weekend, 1 September 2020.
[36] Australian Energy Market Operator, Quarter 3 2020 Quarterly Energy Dynamics Report, 21 October 2020.
[37] For more information see the June 2020 Quarterly Carbon Market Report.
[38] Government of Western Australia, WA Government launches Distributed Energy Buyback Scheme, 31 August 2020.
[39] Energy Magazine, Large-scale grid battery headed for Western Sydney, 26 October 2020.
[40] Renew Economy, Home battery trial set to launch in all-electric, all-solar Canberra suburb, 17 September 2020

Wales were announced in Quarter 3 2020. These batteries will assist in grid stabilisation by using excess solar PV generation to charge in the middle of the day and discharge during peak hours.

The changes to feed-in tariffs and inverter standards also present a potential downside risk for continued solar PV uptake in states with high penetration rates.

Solar PV and installations

Quarter 3 2020 installed capacity grew to a new record across all quarters with a total estimated installed capacity of 750 MW. This is more than the 748 MW of rooftop solar PV capacity installed across Australia in 2016, and 11% higher than the capacity installed in Quarter 2 2020. There were 93,500 rooftop solar PV installations in the quarter. A total of 2 GW has been installed to date in 2020.

Solar PV capacity and installations have increased by 42% and 36% respectively compared to Quarter 3 2019 (see Figure 20).

The implementation of Victorian Stage 4 COVID-19 restrictions on 2 August 2020 has largely halted residential solar PV installations in the metropolitan Melbourne region. Both installations and capacity in the metropolitan Melbourne region decreased by 40% in Quarter 3 2020 compared to Quarter 2. As expected, this comes from a reduction in residential installations.

Victoria, more broadly, saw a 22% decrease in capacity in Quarter 3 2020 compared to Quarter 2 2020 (see Figure 19). The COVID-19 restrictions allowed solar PV installations on new or uninhabited residential and commercial buildings and posed no restrictions for installations in regional Victoria. Small commercial solar PV (15 to 100 kW) continued at pace throughout the quarter, as well as solar water heater installations.

As at 20 October, rooftop solar PV installations will recommence in metropolitan Melbourne. A big backlog of rooftop solar PV installations (approximately 15,000 installations) is expected to drive a large Quarter 4 2020 in Victoria. The Clean Energy Regulator will continue to work with regulators to monitor compliance of installations during this anticipated peak.

Despite the restrictions, Victoria remained one of the top 3 states and territories in capacity installed in the quarter (see Table 5). Increases of installations in other states has offset the reduction in Victoria.

Figure 19: Solar PV capacity (MW) installed by state, Q3 2018 to Q3 2020

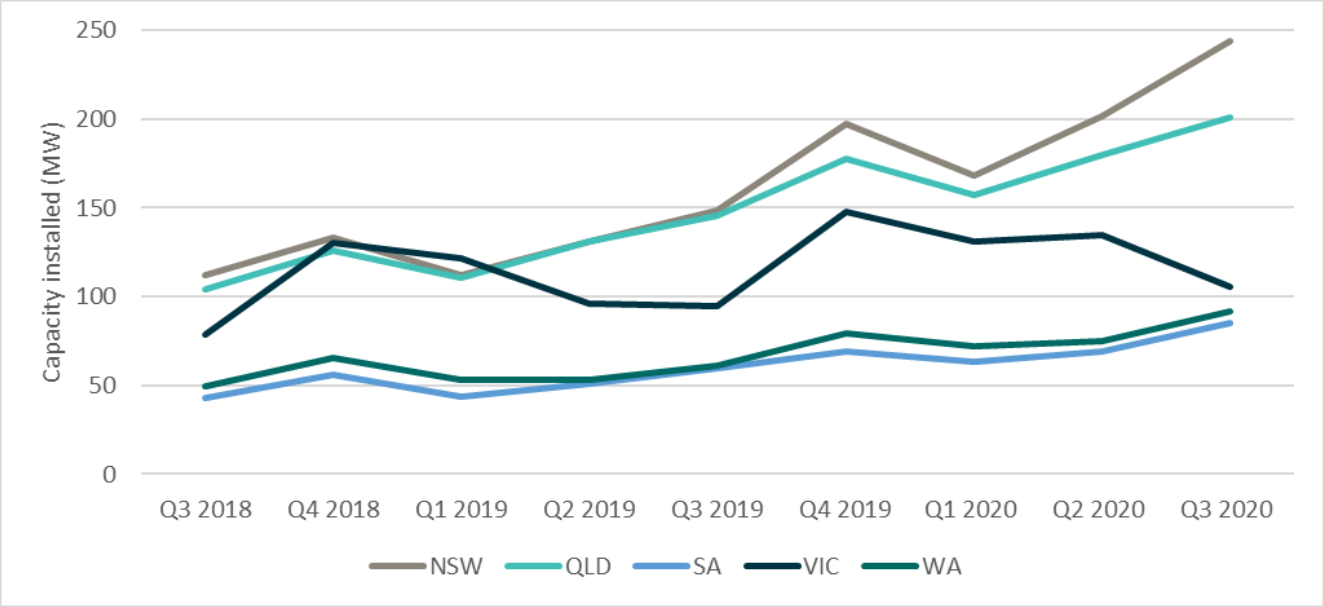


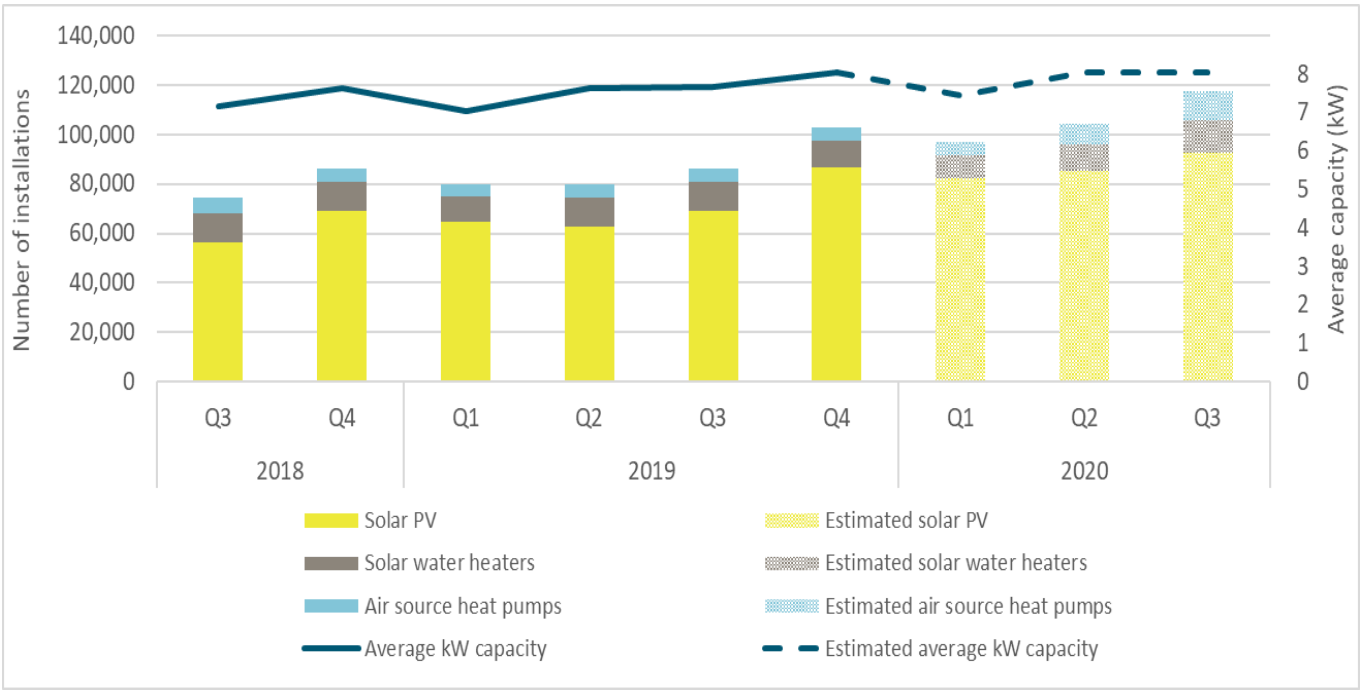
Table 5: Estimated rooftop solar PV (<100 kW) capacity by state, Quarter 3 2020

	Estimated capacity (MW)
ACT	12
NSW	244
NT	5
QLD	201
SA	85
TAS	6
VIC	106
WA	92
Total	**750**

New South Wales has achieved the most growth in solar PV installations in 2020 with a 64% increase in capacity in Quarter 3 2020 compared to the same quarter last year and increased by 21% compared to Quarter 2 2020. South Australia and Western Australia have also experienced increased growth in Quarter 3 2020 compared with Quarter 2 2020, with capacity increasing by 23% and 22% respectively.

There were an estimated 2,509 concurrent battery installations in Quarter 3 2020, a 7% increase on the 2,355 concurrent batteries installed in Quarter 3 2019.

Figure 20: SRES installations and average kW capacity, Q3 2018 to Q3 2020



3.3. Factors impacting demand

Quarterly surrender

Approximately 10.6 million STCs were required to be surrendered by liable entities to meet their obligations on 28 October 2020 (see Figure 21). 10.6 million STCs were surrendered by 122 liable entities, a 100% compliance rate. The post Quarter 3 surrender balance was 5.2 million STCs.

There are sufficient STCs in the REC Registry to meet Quarter 4 surrender obligations on 14 February 2021. The balance of STCs, following surrender, is estimated at 12 million if the current rate of STC creation continues throughout Quarter 4.

3.4. Spot price

STC spot prices were relatively stable during Quarter 3 2020 ranging between $39.00 to $39.90 and ending the quarter at $39.45 (see Figure 22). STC prices remain high despite the growing STC surplus for 2020. Prices have since dropped to $37.75 at the end of October 2020, following the announcement that Victoria was restarting metropolitan Melbourne rooftop installations.

Figure 21: Estimated STC surplus after quarterly surrender (millions), 2020

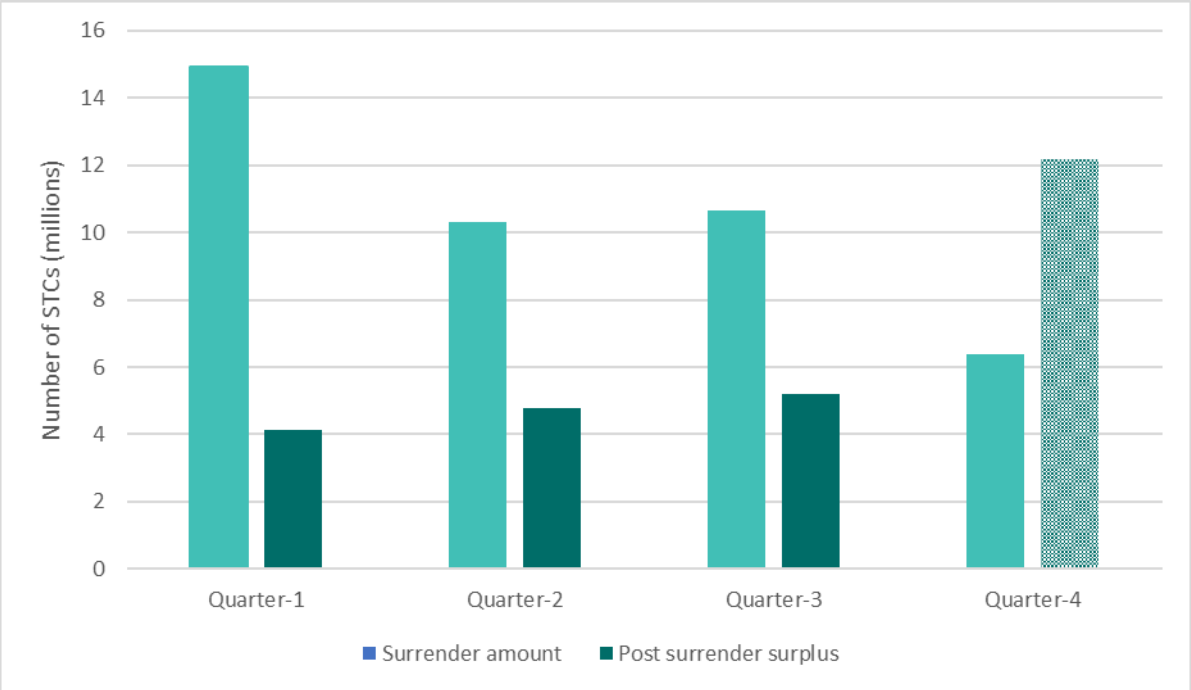


Figure 22: STC spot and clearing house prices, Q2 2018 to Q3 2020

3.5. Key dates

Date	Event	Significance
29 July to 28 October 2020	Quarter 3 surrender period	A liable entity must surrender 25% of liability for the year in the REC Registry for this quarter.
29 October 2020 to 14 February 2021	Quarter 4 surrender period	A liable entity must surrender 15% of liability for the year in the REC Registry for this quarter. STC surrender liability for the fourth quarter of an assessment year must be made with the liable entity's energy acquisition statement for the year.
31 December 2020	Application for liable entity required surrender amount due	The final date for liable entities to apply to set their required surrender amount for quarters one to three where no energy acquisition statement was lodged by 1 April of the assessment year.
30 March 2021	STP announced on or before this date	The SRES aims to balance supply and demand by requiring all STCs that are created to be surrendered over time. To do this, the STP is set each year to require liable entities to surrender to the Clean Energy Regulator the same number of STCs as the number that are estimated to be created in that year, plus or minus an adjustment for previous under- or over-surrender.

4. Market spotlight: Small and mid-scale solar PV installation outlook

Investment in small (0 -100 kW) and mid-scale (100 kW to 30 MW) solar PV has continued to grow, with more than 3 GW capacity expected to be installed in 2020. This is 4 times the additional capacity installed in 2016.

Most forecasts of small and mid-scale installations of solar PV over recent years have consistently and dramatically underestimated demand for rooftop and small grid connected solar.[41] This underestimation has real consequences, as it has resulted in grid-stability issues, price and revenue implications and under investment in grid infrastructure. Modelling to date has not provided the early warning needed to plan and prepare for a highly distributed energy future.

The Clean Energy Regulator continues to work with energy sector modellers to identify ways to refine the existing models to better capture consumer behaviour and demand for solar PV. The Clean Energy Regulator has, for the second year, commissioned modelling of the small and mid-scale sectors to help inform its key stakeholders of the future potential for rooftop and small grid connected solar.

Modelling approach

Modelling input was sought from 3 modellers: GHD, Green Energy Markets (GEM) and Jacobs Group. Modelling reports are now available on the Clean Energy Regulator's website.[42]

This year, modellers have adopted new techniques and 2 have used agent-based modelling[43] to help predict near term uptake from 2020-24. Further, modellers have evaluated the accuracy of their predictions in previous years against actual historical capacity and revised their approaches to improve the forecast accuracy.

Results

Overall results from this modelling suggest that investment in rooftop solar is likely to remain high for the foreseeable future with an average of 3.2 GW likely to be added each year for the next 4 years. If realised, based on the average across all 3 modellers, this investment would effectively double small and mid-scale solar capacity, to 26 GW, by the end of 2024 and dramatically change the energy landscape in Australia.[44] Modellers' forecasts of the expected cumulative capacity by 2024 ranged from 23GW to 28GW.

About 75% of all solar capacity in 2020 is expected to come from small and mid-scale sectors, with only 919 MW of installations anticipated in the large-scale sector (>30 MW).

It is important to note that this modelling will not inform the STP. The modelling to inform the STP will be completed in early 2021.

---

[41] For more information see the June 2020 Quarterly Carbon Market Report.

[42] For more information see Small-scale technology percentage modelling reports.

[43] Agent based modelling uses micro-level factors to simulate customer decision making.

[44] While the investment outlook for small and mid-scale solar PV is promising, this investment will only be realised if existing issues relating to grid stability, including technical standards, are addressed. This topic was explored in the June 2020 Quarterly Carbon Markets Report.

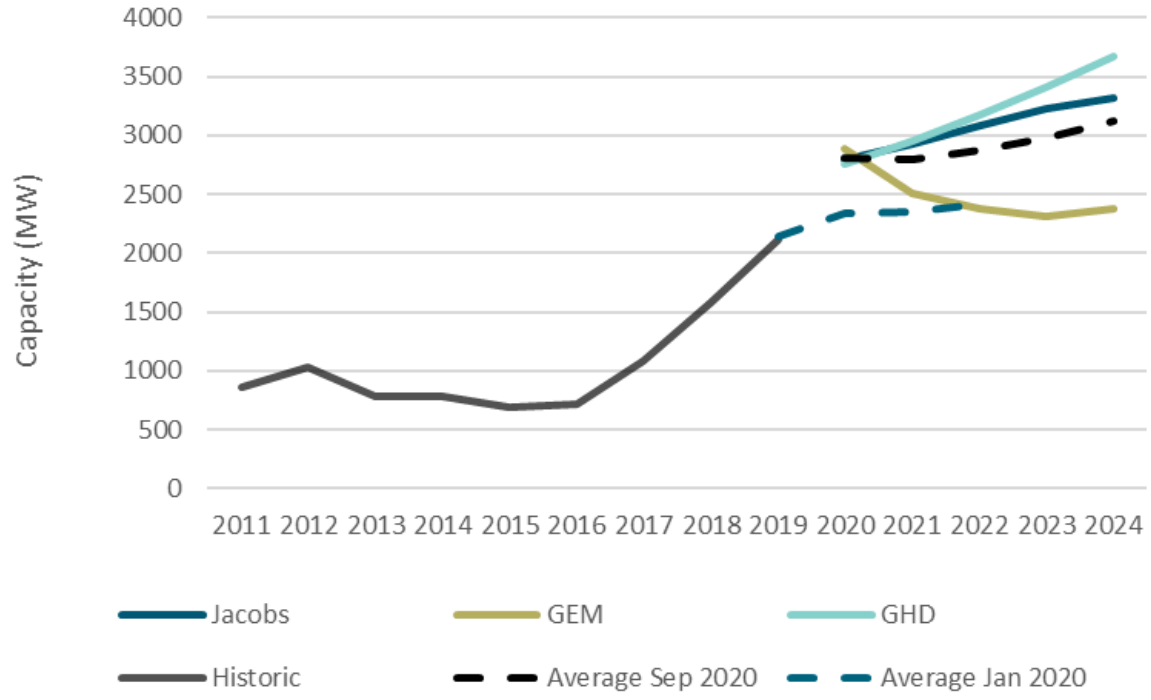
Small-scale (0 – 100 kw) results

Using the average[45] across the modelling results (See Figure 23), investment in the small-scale sector, which comprises more than 90% of total installations from small and mid-scale, would add an average of 3 GW capacity each year from 2020 to 2024. This is about 450 MW higher per year than that was previously estimated by the modellers in early 2020 for 2020-22.[46]

Modelling suggests that growth in small-scale installed capacity could moderate in the near term with an average of 3% each year from 2020-2024. Small scale rooftop solar saw consistent growth in installed capacity over the past 4 years from 2016-2019, averaging 43% on year by year basis.

Key drivers of the near-term growth in small scale solar include government incentives, low interest rates, continued decline in capital costs and shorter paybacks. Further, COVID-19 appears to have had a net positive impact on the rate of installations with increased daytime energy consumption and spending on household items being key drivers of the near-term uptake.[47] However, it remains to be seen if these trends will continue.

Figure 23: Small scale (≤100 kW) installed capacity (MW) additions, 2011-2024



[45] In the Clean Energy Regulator's view, the average of 3 modellers reflects a reasonable assessment of the small-scale capacity that could occur in the near term, noting that there is substantial divergence of views across modellers. This approach is used in setting the STP each year.
[46] For more information see Small-scale technology percentage modelling reports.
[47] For more information see the June 2020 Quarterly Carbon Market Report.

Mid-scale (100 kW to 30 MW) results

Mid-scale installed capacity surged in the last few years with 280 MW installed in 2019.

Modelling results for mid-scale solar PV reflect divergent views of the near-term future and the difficulty in predicting the pace of growth for this still immature 100 kW to 30 MW market segment (see Figure 24).[48] The mid-scale sector is expected to add about 1.3 GW of cumulative capacity over the 2020-24 period. Compared to 2016-2019, the mid-scale sector could see modest (6.0% per annum) growth in installed capacity over the 2020-24 period.

A key driver of mid-scale growth is larger behind the meter systems.

The Clean Energy regulator is now tracking the construction of 3 large behind-the -meter systems (larger than 5 MW[49]):

- McCain 8.2 MW combined solar and co-gen plant at their Ballarat facility.[50]
- Melbourne airport 12 MW solar farm.[51]
- SA Water Corporation's Including the 12 MW Happy valley reservoir solar farm as part of its roll-out of 154 MW across its properties.

Modelling suggests that the near-term outlook for behind the meter systems remains strong despite the falling wholesale electricity prices.

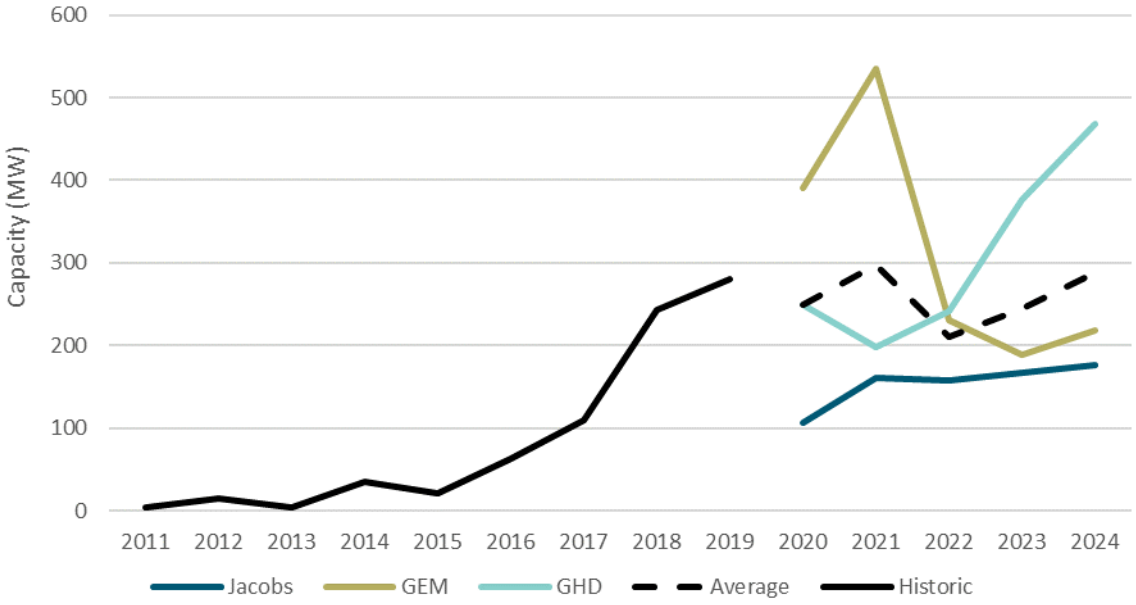
[48] The average capacity is expected to peak in 2021. This is reflective of the known installations coming in 2021 including SA Water's 154 MW solar roll out and Melbourne Airport's 12.4 MW solar project. Results in 2022-24 are based on modelled outcomes and longer-term trends. If new large portfolios like the SA water are repeated, outcomes in 2022-24 could be much higher.

[49] Existing behind-the-meter systems larger than 5 MW are located at mine sites and include the 10.6 MW Degrussa Solar Farm and 6.7 MW Nova Nickel Solar Farm, both of which are 'off-grid' power stations and are coupled with diesel generation. Brisbane Airport's 5.7 MW system is Australia's largest completed behind-the-meter system.

[50] Renew Economy, McCain Foods Australia goes big on solar, in bid to quit coal by 2025, 17 July 2020.

[51] Melbourne Airport, Melbourne Airport's Sustainable Solar Approach, 4 August 2020.

Figure 24: Mid-scale solar PV (100 kW–30 MW) capacity (MW) additions, 2011-2024



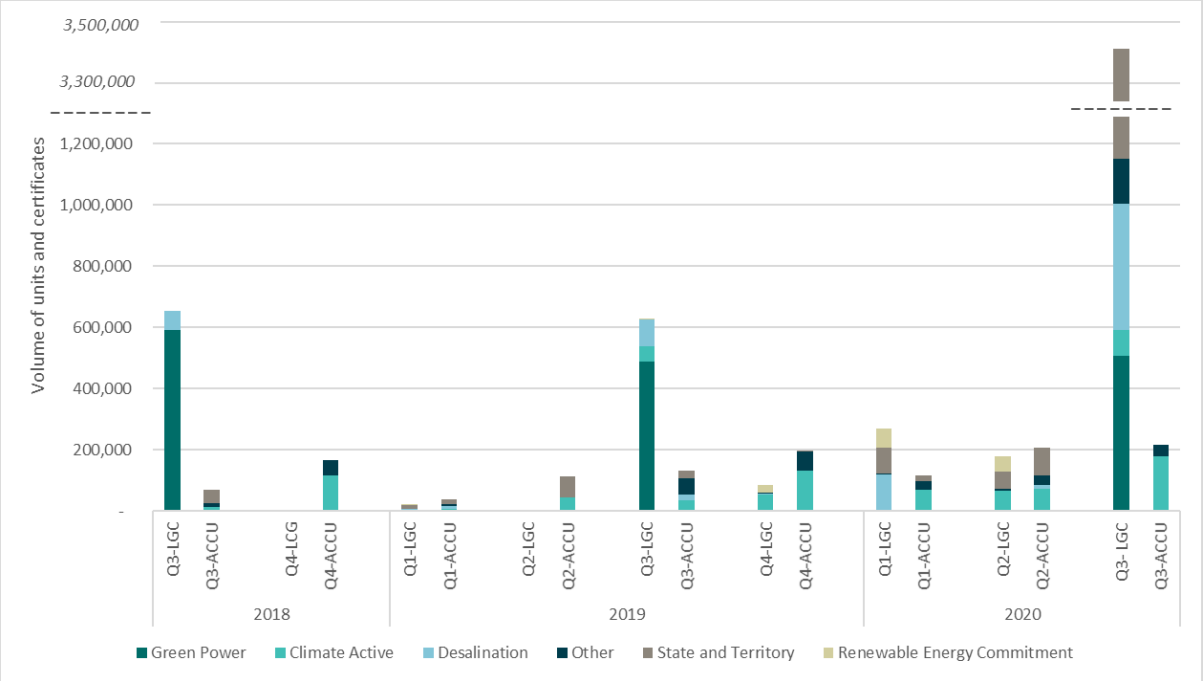
5. Voluntary private and state and territory government markets

5.1. Domestic carbon market

The voluntary private and state and territory government demand was very high in Quarter 3 2020 with a record surrender totalling 3.6 million LGCs and ACCUs. This was primarily driven by 2.3 million bulk LGCs surrendered by the ACT government for their 100% renewable energy target for 2019-20.

In addition to the ACT government surrender, 1.3 million LGCs and ACCUs were surrendered in Quarter 3 2020, nearly double the volume surrendered in Quarter 3 2019. Of note, Climate Active participants surrendered a record 264,000 LGCs[52] and ACCUs demonstrating the shift towards corporate carbon neutral ambitions.

Figure 25: Voluntary private and state and territory government demand for ACCUs and LGCs^, Q3 2018 to Q3 2020[53]



^Dashed lines indicate a break in the y-axis. Q3 2020 State and Territory LGC demand totals 2.3 million.

LGC demand

A record 3.4 million LGCs were voluntarily surrendered in Quarter 3 2020 (see Figure 25). Notably, 2.3 million of these LGCs were surrendered by the ACT Government to meet its 100% renewable energy target for 2019-20 financial year. The ACT government has been accumulating these LGCs to meet their 2019-20 target since 2017, when the first of the projects contracted through their 2015 reverse auction were delivered. The ACT

[52] LGCs are used to reduce emissions associated with electricity use. For Climate Active, LGCs cannot be used as offsets for other emissions.

[53] LGC surrender classifications reported in earlier Quarterly Carbon Market Reports have been revised to incorporate new information. For more information see the September 2020 Quarterly Carbon Market Report Workbook.

Government will surrender LGCs annually to demonstrate 100% of the energy used in the territory has been sourced from renewable energy sources.

Quarter 3 2020 also saw record surrenders for desalination. Victoria Desalination Project surrendered 412,000 LGCs to offset electricity consumed on site.

Quarter 3 also marks the surrender period for GreenPower obligations. GreenPower surrenders increased by 4% compared to 2019 with 506,000 LGCs surrendered. GreenPower was rebranded in the quarter with a new logo and more accessible website to enhance participation. With LGC prices expected to fall in coming years, demand for GreenPower could increase, however it is still competing with other green products offered by energy retailers which typically offset emissions with cheaper international units, including products under Climate Active.

A further 85,000 LGCs were surrendered by Climate Active participants to reduce scope 2 emissions, the largest quarterly surrender of LGCs for this scheme.

ACCU demand

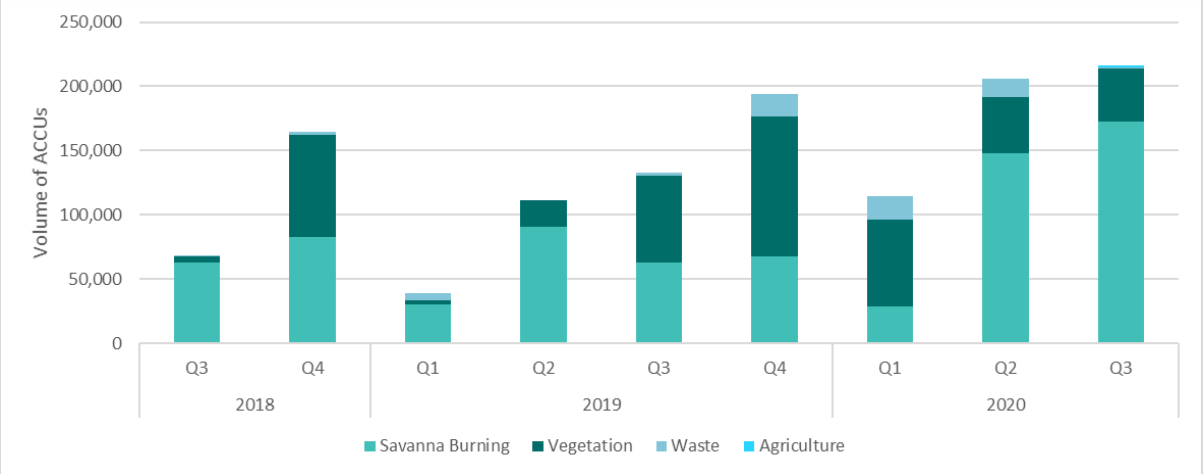
Voluntary private and state and territory government ACCU cancellations totalled 216,000 in Quarter 3 2020, an increase of 63% compared to Quarter 3 2019 (see Figure 26).

Quarter 3 2020 saw record cancellations of 179,000 ACCUs for Climate Active, comprising 83% of the total.

Savanna burning projects continue to dominate the voluntary ACCU market owing to their associated co-benefits, making up 80% of the cancellations in Quarter 3 2020 (see Figure 26).

The first use of agriculture offsets in the voluntary market was recorded in Quarter 3 2020 when 1,500 ACCUs from a soil carbon project were cancelled.

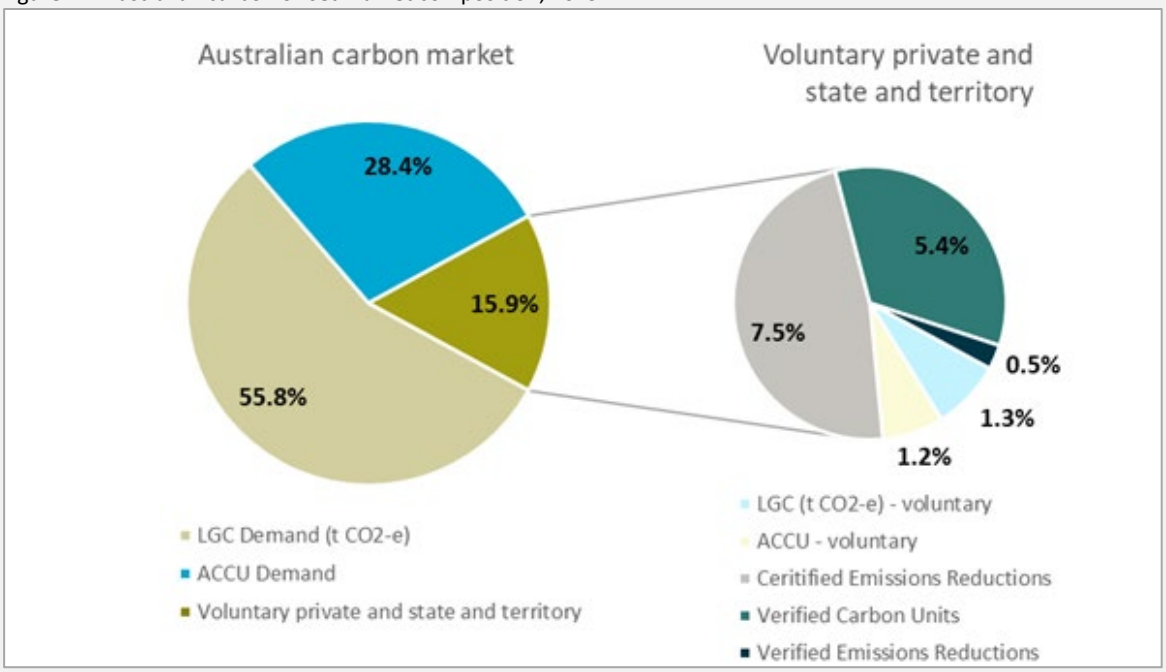
Figure 26: Voluntary, state and territory government ACCU demand by method type, Q3 2018 to Q3 2020



2019 voluntary private and state and territory market - year in review

Total voluntary private and state and territory government demand for certificates and units rose from 12% of Australia's carbon market in 2018[54] to 16% in 2019 (see Figure 27). The voluntary private and state and territory government units and certificates surrendered in 2019 represented 6.6 million tonnes of emissions abatement.[55] Climate Active was the main source of voluntary demand, making up 63% of voluntary surrenders in 2019.

Figure 27: Australian carbon offset market composition, 2019[56]



International units dominated the voluntary carbon market with 84% of the market share (5.5 million), likely because of their availability in high-volumes at low-cost (see Table 6).[57] Almost 74% of international units originated from renewable energy projects.

[54] For more information see the September 2019 Quarterly Carbon Market Report.

[55] Data is aggregated from the Clean Energy Regulator and the Department of Industry, Science, Energy and Resources. The international unit total is a conservative estimate and includes CERs, VERs and VCUs surrendered for Climate Active for the 2018-19 and 2019 reporting period, and CERs surrendered in ANREU for other domestic purposes. CERs surrendered in ANREU for international purposes or where there is insufficient information provided to determine the reason of cancellation are excluded. Other voluntary surrenders made in registries not administered by the Clean Energy Regulator or for Climate Active are excluded. This includes approximately 100,000 VCUs surrendered for various purposes for 2019 by Australian businesses.

[56] LGC demand (tCO2-e) refers to legislated demand from the Renewable Energy Target. ACCU demand refers to demand from Commonwealth contract deliveries from the Emissions Reduction Fund.

[57] Ecosystem Marketplace, Voluntary Carbon and the Post-Pandemic Recovery, September 2020

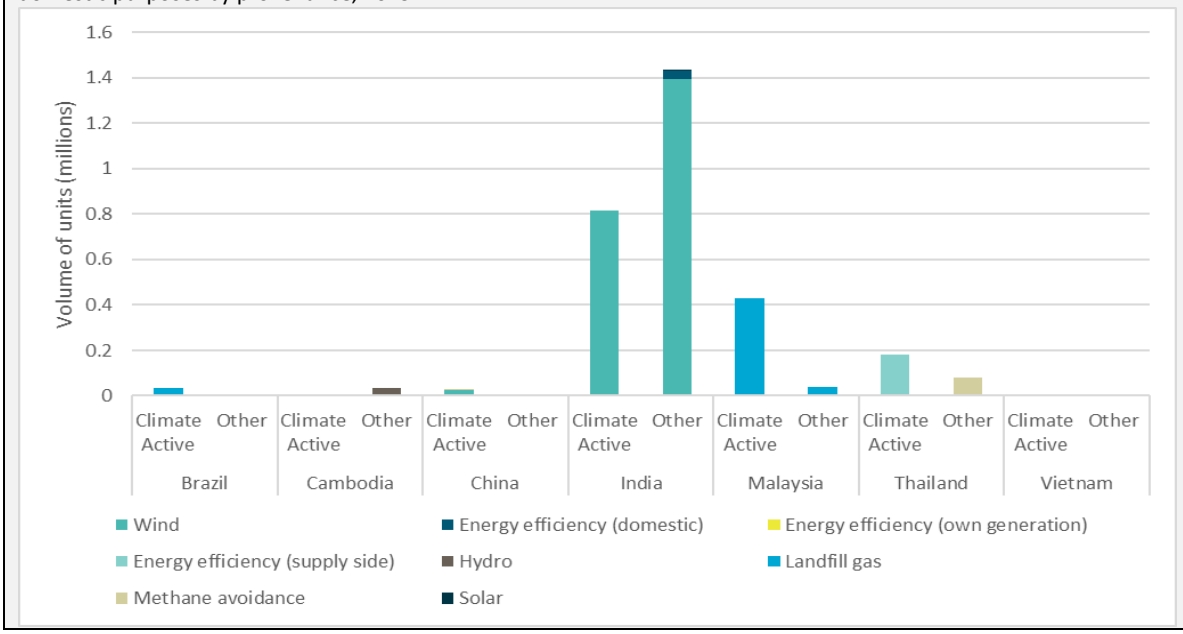
Table 6: Provenance of units surrendered in the voluntary, state and territory market, 2019

Certificate	Renewable energy generation	Methane destruction and other emission avoidance^	Land-based projects	Total volume*
ACCU	-	25,000	452,000	**477,000**
LGC (t-CO_2 - e)[58]	543,000	-	-	**543,000**
CER	2,280,000	803,000	-	**3,114,000**
VER	153,000	21,000	3,000	**190,000**
VCU	1,655,000	440,000	79,000	**2,239,000**
Total*	**4,631,000**	**1,289,000**	**534,000**	**6,563,000**

^Includes energy efficiency and other large and small scale emissions avoidance methods.
*Unit provenance is provided where data is available. Data is incomplete for surrenders made in registries not administered by the Clean Energy Regulator, and as such the provenance data may not sum to the total for 2019.

Certified Emission Reductions (CERs) were the most common unit surrendered, with 47% of the voluntary private and state and territory government market share in 2019.[59] Figure 28 shows the majority of CERs surrendered in 2019 (72%) originated from wind energy projects in India, 15% from landfill gas projects in Malaysia and a further 6% originated from energy efficiency projects in Thailand.

Figure 28: Volume of Certified Emission Reduction units surrendered in ANREU for Climate Active certification and other domestic purposes by provenance, 2019[60]



[58] LGCs are converted into the carbon abatement equivalent by multiplying the unit by the emissions intensity factor for the Australian electricity network.
[59] CERs are issued under the United Nations Clean Development Mechanism. CERs surrendered in external registries for Australian purposes are not included in this analysis.
[60] CERs surrendered in ANREU include 1.5 million surrenders for Climate Active certification for the 2018-19 and 2019 reporting period, 1.4 million CERs surrendered for state and territory government compliance and 0.2 million CERs surrendered for other domestic purposes. CERs surrendered in ANREU for international purposes, or where there is insufficient information provided to determine the reason of cancellation are excluded.

The market share of Verified Carbon Units (VCUs) and Voluntary Emission Reductions (VERs) increased from 32% in 2018 to 37% in 2019, possibly demonstrating an increasing preference for units with additional co-benefits. VCUs and VERs are issued by international voluntary offset standards administered by Verra and Gold Standard respectively, which promote projects that deliver emissions reduction as well as environmental, social and economic co-benefits aligned with the sustainable development goals. VCUs and VERs were sourced from a range of method types including small and large scale emissions avoidance and carbon sequestration projects (see Table 6). Most units were sourced from renewable energy projects predominantly located in India, China and Turkey.

Domestic units and certificates made up 16% of the voluntary market share in 2019, comprising 0.5 million ACCUs and 0.5 million LGCs (tonnes CO_2-e). Total LGCs surrendered increased by 7%. ACCU surrenders decreased 10%, owing to large surrenders of ACCUs for desalination in 2018 that were not repeated in 2019.

Looking forward

Over time, the supply of units from international renewable projects is expected to decrease as new large-scale renewable projects are no longer eligible under voluntary offset standards administered by Verra[61] and Gold Standard[62], except where carbon finance is required for implementation. Until Article 6 of the Paris Agreement is finalised, there is uncertainty around the Clean Development Mechanism and the long-term use of CERs from all methods.

As noted in this chapter, total ACCU and LGC surrenders have already seen significant growth in 2020. ACCUs and LGCs are high-integrity domestic units, underpinned by Government legislation. Many ACCUs also deliver environmental, social and economic co-benefits, providing additional value sought after by participants in the voluntary market. Demand for ACCUs and LGCs is expected to continue to increase as business and state governments look to demonstrate progress against their voluntary emissions reduction commitments.

5.2 Growth in voluntary market

Corporate commitments continued to emerge in Quarter 3 2020 that will support further growth in voluntary carbon markets. Notable announcements include:

- 16 major institutional investors representing more than $850 billion in assets launched a 10-year initiative, Climate League 2030, to reduce emissions by 230 million tonnes annually by 2030, in line with a net zero emissions by 2050 target.
- Wesfarmers announced emissions reduction targets covering scope 1 and 2 emissions, with retail businesses aiming to reach net zero emissions by 2030 and industrial businesses aiming to reach net zero emissions by 2050.
- Four Australian businesses set emissions reductions targets under the Science Based Target initiative[63], including ASX20 companies Woolworths and Transurban.

[61] Verra, Revision to Scope of VCS Program, April 2019.
[62] Gold Standard, Renewable Energy Eligibility, August 2019.
[63] For more information see Science Based Targets.

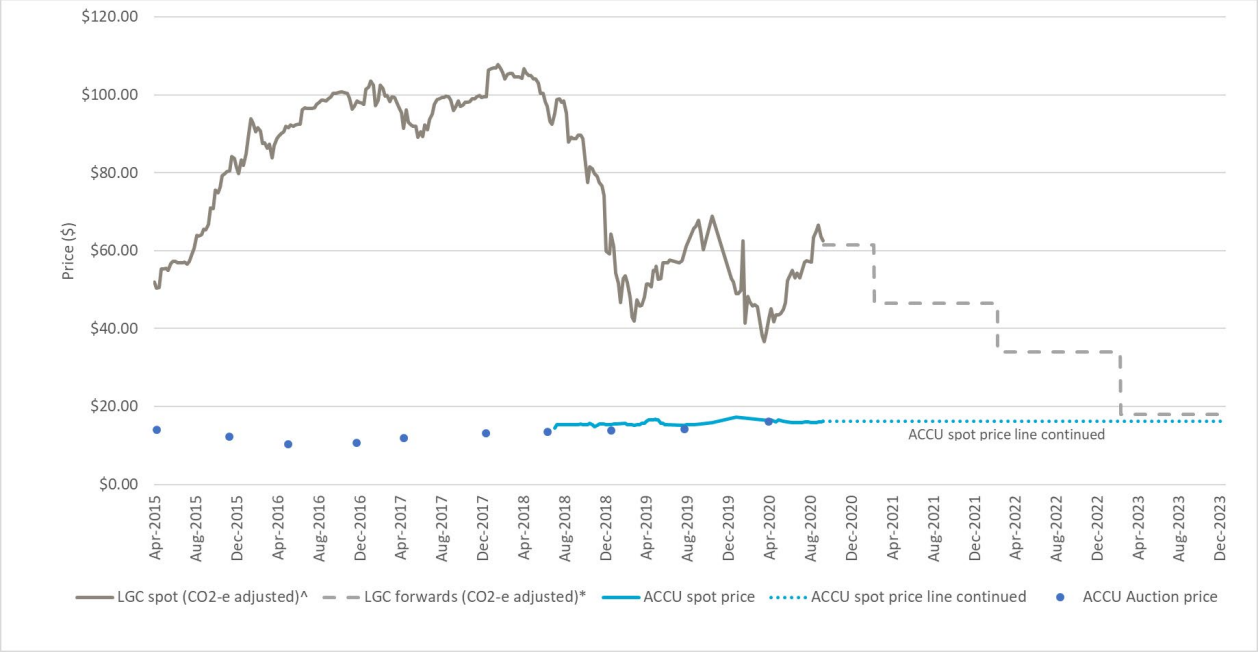
5.3 Prices

LGC spot and forward prices increased across Quarter 3 2020. This is due, in part, to high statutory and voluntary demand for LGCs seen this quarter and tight supply throughout 2020 as examined in Chapter 2.

ACCU spot prices also increased to $16.10, with a small number of trades occurring late in Quarter 3 2020.

Carbon adjusted LGC and ACCU prices are estimated to converge in the early 2020s when the supply of LGCs is expected to increase significantly owing to static statutory demand. Increasing forward prices suggest this may occur in 2024 (see Figure 29).

Figure 29: ACCU and LGC price convergence, 2015 to 2024^



^The convergence may occur earlier or later depending on the actual future LGC and ACCU prices. The estimate is based on continuation of current ACCU spot prices, as forward prices for ACCUs are not available. If, for example, ACCU prices rise and LGC prices fall further over this period the convergence will occur earlier.

5.4 Other units

The price of European Union Allowances (EUAs) has fluctuated across Quarter 3 2020 due to changing demand for units as a result of economic pressures associated with COVID-19, ending the period at $43.15 (see Table 7). New Zealand carbon unit (NZU) spot prices remained high across the quarter, ending Quarter 3 2020 at $32.60.

Prices of Korean Allowance Units (KAUs), used in the South Korean emissions trading scheme (ETS), have seen substantial decreases throughout 2020, from $47.74 in January to a low of $20.46 in August, owing to an oversupply of units. That oversupply is associated with decreases in emissions from the electricity sector in 2019 and as a result of COVID-19 economic pressures in 2020. Additionally, the inclusion of CERs from Korean-owned project has also reduced demand for KAUs in the ETS.

The Doha Amendment to Kyoto Protocol was ratified on 2 October 2020. Parties' targets for the second commitment period become legally binding on 31 December 2020. This provides increased certainty for existing Clean Development Mechanism projects in the short-term, as eligible CERs can be used to meet Kyoto Protocol Targets.

Table 7: Domestic and international carbon market spot prices

Product	Spot price AUD (30 September 2020)[64]	Quarterly trend[65]
ACCU	$16.10	$0.25 (+1.6%)
LGC (CO2-e)	$62.46	$7.46 (+13.6%)
ESC	$24.75	$2.35 (+10.5%)
VEEC	$30.20	$2.80 (+10.2%)
CER	$0.49	-$0.03 (-5.7%)
EUA	$43.15	$2.71 (+6.7%)
NZU	$32.60	$2.71 (+9.1%)
KAU	$27.12	-$9.84 (-26.6%)

CERs - Certified emissions reduction units (CERs) are issued through the Clean Development Mechanism.
EUA - European Union Allowances (EUA)
NZU - New Zealand Carbon Units (NZU)
KAU - Korean Allowance Units (KAU)
ESC - Energy Saving Certificates (NSW)
VEEC - Victorian Energy Efficiency Certificates

[64] Prices are converted to Australian dollars and were correct at time of conversion at 30 September 2020. Data sourced from Jarden, TFS Green, ICE, Korea Exchange.
[65] This is the quarterly trend from the end of Quarter 2 2020 to the end of Quarter 3 2020.

6. Emissions reduction

Emissions reduction from the schemes administered by the Clean Energy Regulator is estimated at 54 million tonnes of CO_2-e in 2020 (see Figure 30).

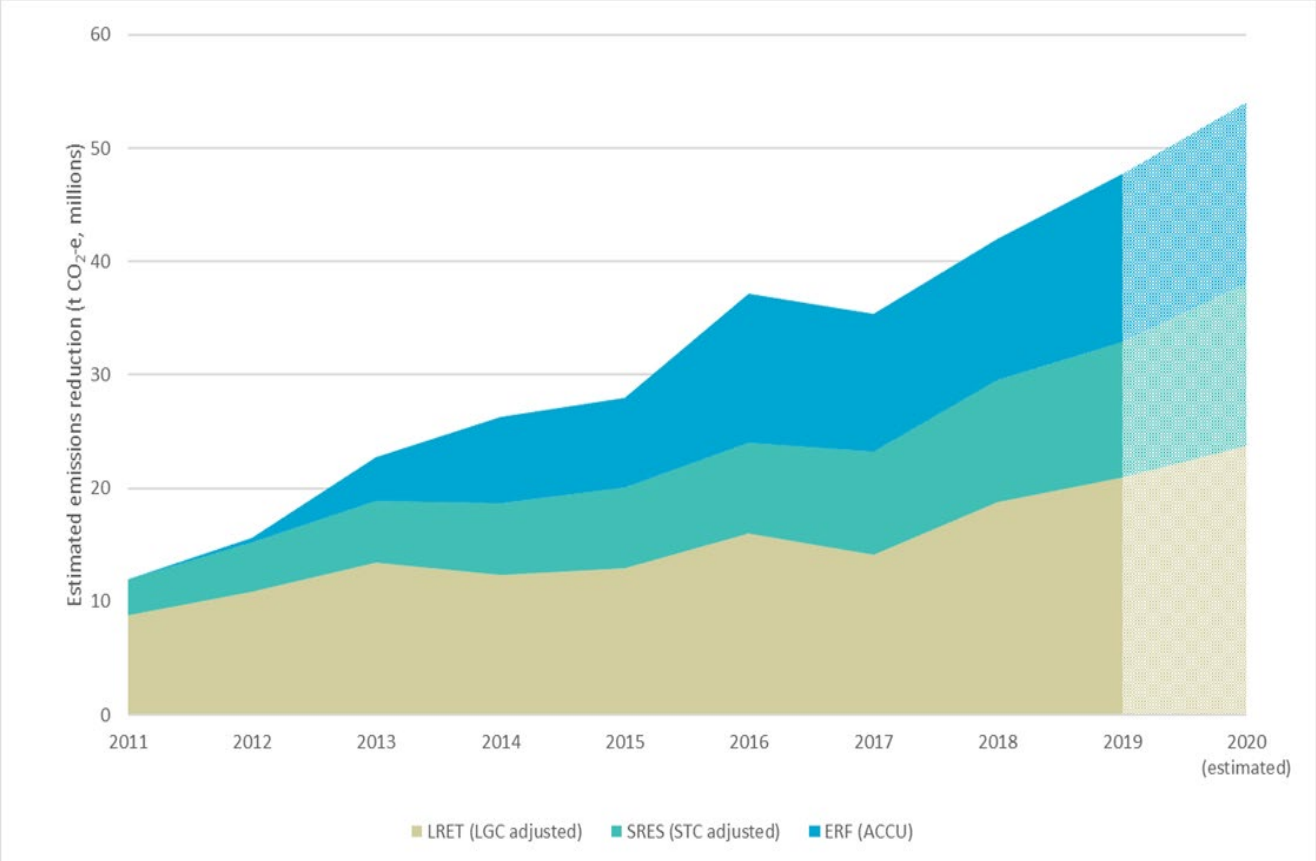
The estimated total is slightly lower than previously estimated in Quarter 2 2020 (54.5 million tonnes of CO_2-e) for this year. The reduction reflects the falling average emissions intensity factor.

Australia's emissions intensity is falling due to flat demand and the transformation in the generation mix to include increased renewable output. The emissions intensity factor used in the emissions reduction estimate fell by 1% from Quarter 2 to Quarter 3 2020.

The LRET is estimated to deliver 23.7 million tonnes of the 2020 total emissions reduction. About 14.3 million tonnes are expected to come from the SRES. Estimated emissions reduction from the LRET and SRES is now 0.4 million tonnes lower than previously estimated in Quarter 2.

The ERF is estimated to deliver ACCUs equivalent of 16 million tonnes of emissions reduction in 2020.[66]

Figure 30: Estimated emissions reduction from ERF and RET, 2011 to 2020



[66] ACCU supply is 69,445 tonnes lower than previously estimated in Quarter 2 due to the revisions to the forecast to account for actuals.

The Clean Energy Regulator's emissions reduction estimation methodology is considered conservative. The methodology uses an emissions intensity factor to derive estimated emission reduction.[67] The falling emissions intensity factor drives down the estimated abatement.

Based on the Department of Industry, Science Energy and Resources' greenhouse gas inventory data,[68] Australia's electricity sector emissions fell from 200 million tonnes of CO_2-e in 2011 to 181 million tonnes in 2018 (by 20 million tonnes). In comparison, using the conservative methodology in the Quarterly Carbon Market Report, emissions reduction from the RET (SRES and LRET) increased over the same period by 17.6 million tonnes. This estimate is lower than the reduction in the electricity sector emissions.

The continued fall in the emissions intensity of the grid implies that the gap between the emissions reduction estimated using the methodology in this report and the actual values is widening. The emissions reduction estimate will be updated in the December 2020 Quarterly Carbon Market Report to reflect the latest inventory.

[67] The methodology uses AEMO's emissions data for the NEM, available from their Carbon Dioxide Equivalent Intensity Index to derive estimated emission reduction. The grid emissions intensity factor fell from 0.726 tCO_2-e/MWh in the June 2020 Quarterly Carbon Market Report, to 0.719 tCO_2-e/MWh as in the September quarter update.

[68] Department of Industry, Science, Energy and Resources, National Greenhouse Gas Inventory, September 2019.

Glossary

Term	Acronym
Australian carbon credit unit	ACCU
Australian Energy Market Operator	AEMO
Australian Energy Regulator	AER
Australian National Registry of Emissions Units	ANREU
Australian Renewable Energy Agency	ARENA
Certified emission reduction unit	CER
Climate Solutions Fund	CSF
Emissions Reduction Fund	ERF
Energy saving unit	ESC
EU allowance unit	EUA
Integrated Systems Plan	ISP
Gigawatt	GW
Large-scale generation certificate	LGC
Large-scale Renewable Energy Target	LRET
Land Restoration Fund	LRF
Marginal loss factor	MLF
Megawatt	MW
National Electricity Market	NEM
National Greenhouse and Energy Reporting Act 2007	NGER
New Zealand unit	NZU
Power purchase agreement	PPA
Renewable Energy Certificate Registry	REC Registry
Renewable Energy Target	RET
Renewable power percentage	RPP
Small-scale Renewable Energy Scheme	SRES
Small-scale technology certificate	STC
Small-scale technology percentage	STP
Verified carbon unit	VCU
Victorian energy efficiency certificate	VEEC
Verified emission reduction unit	VER

cleanenergyregulator.gov.au