Australian Government
Clean Energy Regulator

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Quarterly Carbon Market Report

September Quarter 2019

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David Parker AM
Chair, Clean Energy Regulator

Chair's foreword

Carbon markets play a key role in Australia's efforts to reduce carbon emissions. To help support the effective operation of Australia's carbon markets, I am pleased to introduce our first integrated Quarterly Carbon Market report. This report consolidates information across the three national carbon markets that we administer.

These reports will provide a regular view of supply and demand each quarter and explore the key factors that influence the market in the near future. The reports will also provide information on trends and opportunities to inform market decisions.

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 we administer. 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 your own independent professional advice in light of your particular circumstances on the state of these 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 the Quarterly Carbon Market report, or the availability or non-availability of the Quarterly Carbon Market report.

Executive summary

Australia's carbon markets continue to grow and mature. The annual value (Quarter 4 2018 to Quarter 3 2019) of the three unit and certificate markets administered by the Clean Energy Regulator was $2.75 billion[1].

Total abatement volumes, as measured by the direct or implicit carbon value of Australian carbon credit units (ACCUs), large-scale generation certificates (LGCs) and small-scale technology certificates (STCs) is estimated to be a little over 50 million tonnes of carbon dioxide equivalent (tCO_2-e) for 2019 (Figure 1).

In Quarter 3 2019, these carbon markets accounted for over 13 million tCO_2-e of carbon abatement.

Regulatory demand and Commonwealth purchasing has to date been the dominant source of demand and the driver of emissions reduction across the schemes we administer. However, we are increasingly seeing demand for units and certificates growing from corporates and other levels of government beyond required regulatory compliance. We expect this latter area of demand to grow strongly going forward and, over time, deliver material additional emissions reduction.

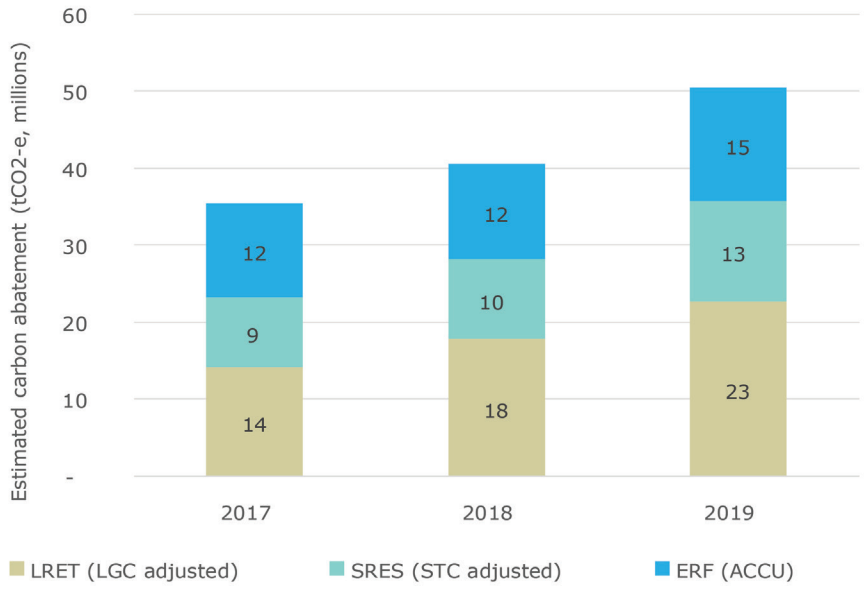
A step change for the carbon market

While the ACCU market is maturing and supply is growing to meet demand from the $2 billion already contracted under the Emissions Reduction Fund (ERF), a step change is coming through the implementation of the Climate Solutions Fund (CSF) that will provide new and expanded opportunities to participate in the ERF.

Market convergence

There is the beginning of a trend for two of the carbon markets to converge. This is being driven by voluntary action by large corporates and industrial facilities that are seeking to reduce and offset emissions from their operations. LGCs can be used to offset emissions that are indirectly due to electricity use (scope 2[3]). Demand for LGCs for this purpose is voluntary and is in addition to the mandated Large-scale Renewable Energy Target (LRET). Forward LGC prices are anticipated to continue to fall in the out years (post-2020) and over the medium term it could be expected that LGC and ACCU prices would converge to a "carbon equivalent value".

Figure 1: Estimated carbon abatement, 2017 to 2019[2]



1 The value of the markets is calculated by multiplying the average spot price from Q4 2018 to Q3 2019 by the number of certificates and units validated/issued over the same period.

2 Large-scale and small-scale generation data has been converted to tCO2-e of carbon abatement at the grid average carbon emissions intensity. Details of the calculations are set out on page 37 of this report.

3 Scope 2 emission of greenhouse gas, in relation to a facility, means the release of greenhouse gas into the atmosphere as a direct result of one or more activities that generate electricity, heating, cooling or steam that is consumed by the facility but that do not form part of the facility.

Market supply

Supply is increasing across all markets. There were 3.6 million ACCUs issued in Quarter 3 2019, a four per cent increase from Quarter 3 2018, and 14.7 million ACCUs are estimated to be issued in 2019, surpassing the previous high of 13.1 million ACCUs in 2016. With this increasing supply and a balance in accounts of over 5.4 million ACCUs, supply is expected to exceed demand over the next year unless we see a major increase in voluntary demand.

LGC supply was up 24 per cent from the same quarter last year with the validation of 6.7 million LGCs in Quarter 3 2019 compared to 5.4 million in Quarter 3 2018. This increase was due to a large number of new renewable power stations commencing generation. However, supply/demand balance in the market for 2019 is expected to be relatively tight depending on the amount of paid shortfall and 10 per cent carry forward mechanism used. The supply of LGCs has also been lower than expected due to recent changes in marginal loss factors (MLF), curtailment of renewable generation and delays in approvals for new power stations to export electricity to the grid.

Strong growth continues in the Small-scale Renewable Energy Scheme (SRES) with another record year in 2019 now certain. Some 2.2 gigawatts (GW) of capacity is expected to be installed in 2019 compared to 1.6 GW in 2018. This growth is expected to result in a material surplus of between six and eight million STCs against the small-scale technology percentage (STP).

Unit and certificate prices

All unit and certificate prices increased during Quarter 3 as shown in Table 1.

ACCU spot prices steadily increased from $15 at the start of Quarter 3 2019 to $16.10 at the end of Quarter 3 2019. The ACCU market continues to mature with increasing monthly volumes trading on the secondary market as forward prices emerge.

LGC spot prices continued to climb throughout Quarter 3 2019, from $42.50 to $48. Forward calendar 2020 trades had the sharpest increase across the quarter rising from $23.60 to $35.30 (a 50 per cent increase). This increase was likely due to the expectation that market tightness may carry into the 2020 LRET assessment year.

There was a slight increase in the STC spot price during Quarter 3 2019 with prices moving from $36.90 to $37.85. STC spot prices have remained relatively stable at an average price of $37.00 throughout 2019, despite the growing surplus of STCs.

Table 1: Price trend, Q3 2019

Certificate type	Spot price AUD (30 Sep 2019)[4]	Quarterly trend
ACCU	$16.10	+$1.10
LGC	$48	+$5.50
STC	$37.85	+$0.95

4 Data sourced from CommTrade Carbon and TFS Green.

Current policy processes

On 29 October 2019 the Government formed an expert panel to consult with industry and other stakeholders about the potential to incentivise further low-cost carbon abatement. The panel is led by the past president of the Business Council of Australia, Grant King, and joined by the Chair of the Clean Energy Regulator, David Parker along with Susie Smith, the Chief Executive of the Australian Industry Greenhouse Network and Professor Andrew Macintosh from the Australian National University. The panel will focus on the industrial, manufacturing and transport sectors. It will also look at ways to streamline the administration of the ERF, find new opportunities for emissions reductions under the CSF and leverage co-investment.

On 15 November 2019, the Government released a discussion paper advising of a future update to the Full Carbon Accounting model (FullCAM) used to calculate ACCUs for some modelled ERF vegetation projects. The update is expected to result in vegetation projects generating more credits across the scheme nationally over the lifetime of projects. The specific effects of the update for individual projects will vary depending on their particular characteristics. The Government is consulting on transitional arrangements to assist ERF project participants to move to using the FullCAM update. Compressed crediting is being considered as an option and could play an important role in bringing on new supply of projects and abatement.

1. Australian carbon credit units

- ACCU supply increased four per cent in Quarter 3 2019 compared to Quarter 3 2018 and 3.6 million ACCUs were issued.
- Activity in the secondary market increased with double the volume of ACCUs transacted in Quarter 3 2019 compared to Quarter 3 2018.
- 5.4 million ACCUs remained in the Australian National Registry of Emission Units (ANREU) at the end of Quarter 3; this represents 35 per cent of expected demand for the next four quarters (Quarter 4 2019 to Quarter 3 2020).
- Spot price trended up to $16.10, an increase of $1.10 from Quarter 2 2019. This upward trend has continued in early Quarter 4.
- The tenth ERF auction will be held on 25–26 March 2020.

1.1 Supply and demand balance

In Quarter 3 2019, supply of ACCUs increased by 3.6 million, up four per cent compared to Quarter 3 2018 (Table 2). Demand for ACCUs was stronger, with 4.3 million ACCUs delivered under ERF contracts and a further 132,669 ACCUs voluntarily surrendered by large corporates and industrial facilities. The balance held in the ANREU fell from 6.2 million in Quarter 2 2019 to 5.4 million in Quarter 3 2019[8].

Table 2: Balance of supply and demand at Quarter 3 2019 close[5]

Balance/supply of ACCUs from Quarter 2	+6,187,793
ACCUs issued Quarter 3	+3,620,761
Emissions Reduction Fund contract deliveries	-4,275,345
Safeguard surrender[6]	0
Voluntary surrender	-132,669
ACCU relinquishment[7]	-34,274
Net balance at the end of Quarter 3	+5,366,266

5 Supply of ACCUs refers to ACCUs issued and any balance from previous periods. Demand of ACCUs incorporates three sources including Commonwealth ERF contract deliveries, Safeguard mechanism surrender and state and private sector voluntary surrender.

6 Safeguard mechanism surrender does not include deemed surrender. A 'deemed surrender' occurs when ACCUs issued under an Emissions Redution Fund project at a Safeguard facility, in a particular year, are delivered to the Commonwealth under an Emissions Reduction Fund contract.

7 For more information see ACCU relinquishments

8 While the balance in accounts is rising, a proportion of these ACCUs may be held or banked for future needs (e.g. delivery under contract, future safeguard mechanism liability or voluntary cancellation).

Figure 2 shows that the net balance in the market has generally trended up, rising from just over two million ACCUs in Quarter 1 2018 to 5.4 million at the end of Quarter 3 2019 .

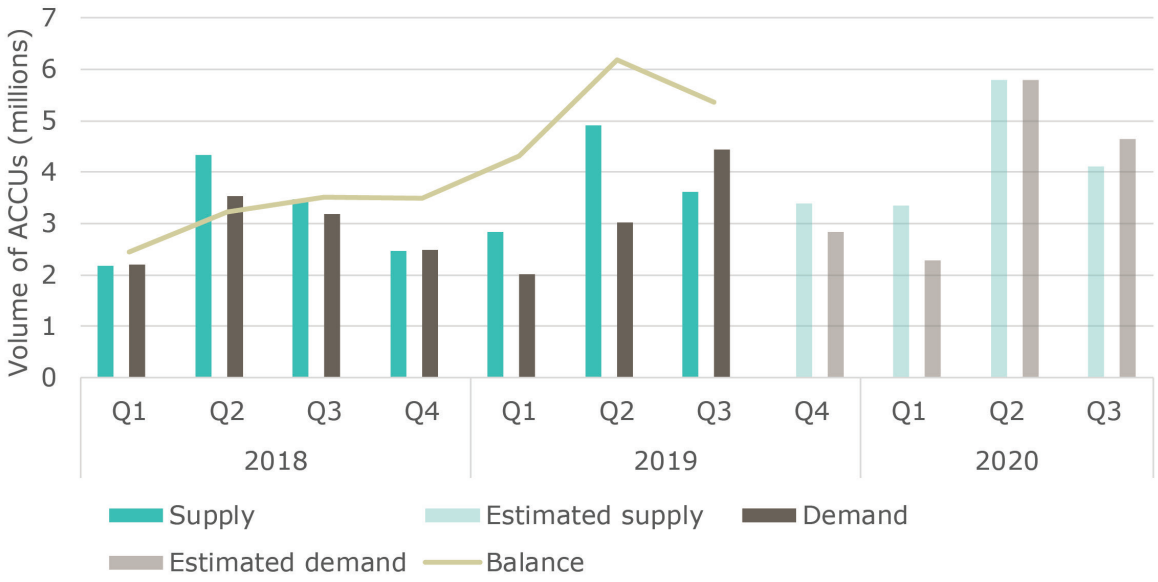
Supply is estimated to increase to an average of 4.1 million ACCUs issued per quarter during Quarter 4 2019 to Quarter 3 2020. With this increasing supply and a balance in accounts of over 5.4 million ACCUs, available units are expected to exceed demand over the next year unless we see a major increase in voluntary demand.

1.2 Factors impacting supply

Crediting

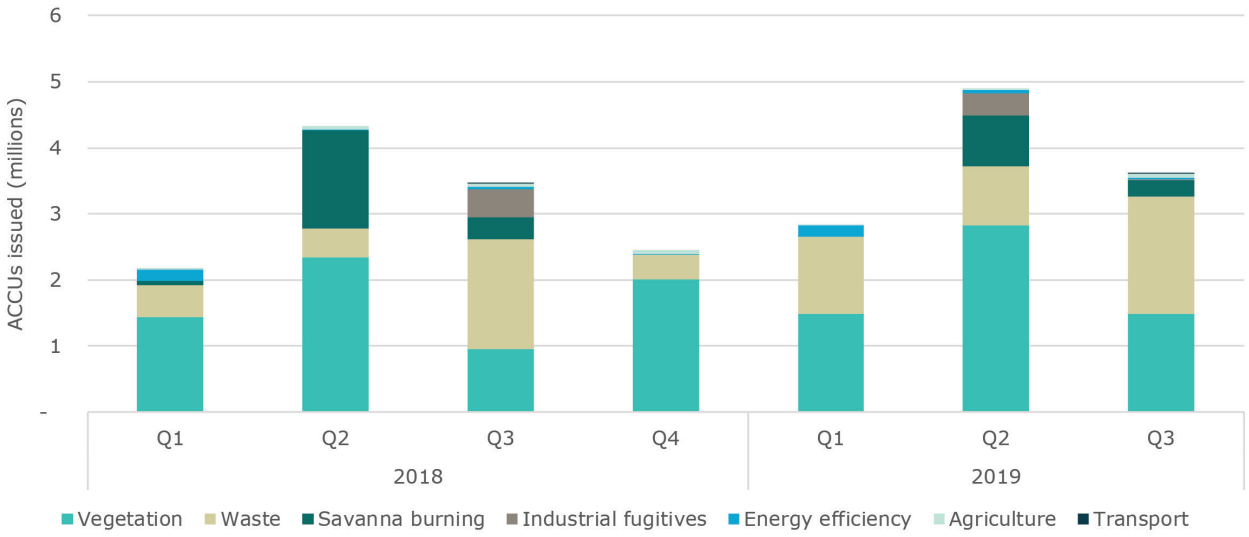
Waste, vegetation and savanna burning projects dominated the supply of ACCUs in Quarter 3 2019, with 49, 41 and seven per cent of ACCUs issued respectively, as shown in Figure 3. Since 2018, these types of projects have dominated ACCU supply with an average of 3.3 million ACCUs issued each quarter.

Figure 2: ACCU supply and demand balance, Q1 2018 to Q3 2020[9]



9 Estimated supply is calculated using both extrapolations from supply this year to date and Clean Energy Regulator estimates. Supply estimates from existing ERF projects are calculated by modelling project start dates, relevant land areas and abatement profiles for each registered project. As this is a projection, there are inherent uncertainties and assumptions that will change over time. Demand estimates consist of estimated ERF contract scheduled deliveries and voluntary demand estimates. ERF scheduled deliveries will change over time due to early deliveries, re-scheduled deliveries, contract lapses and terminations, and new contracts.

Figure 3: ACCUs issued per method type, Q1 2018 to Q3 2019



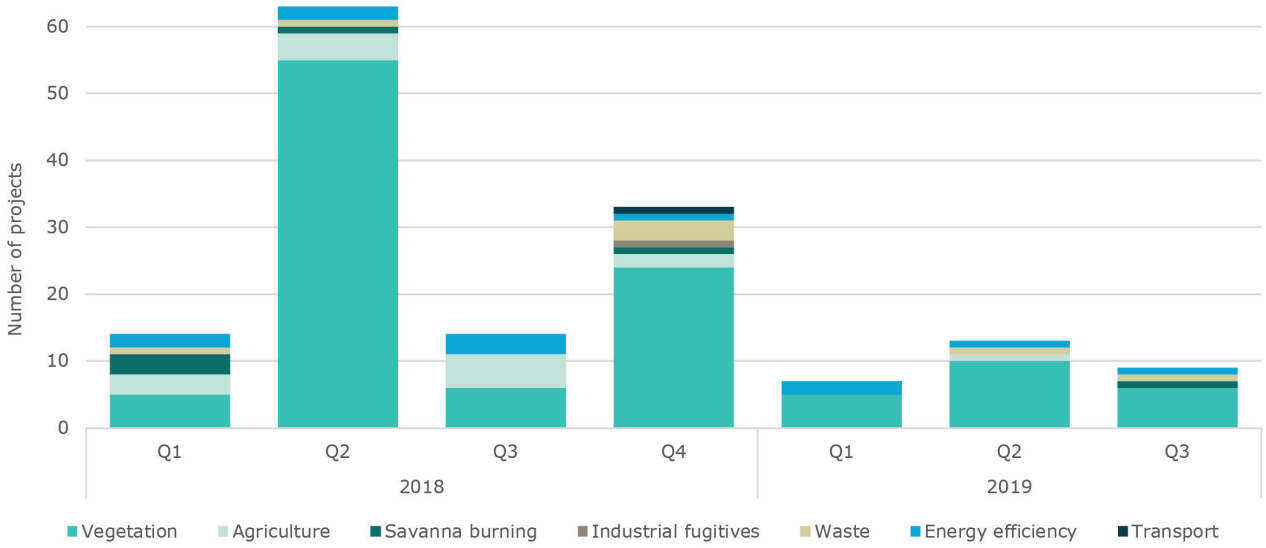
Of the 786 registered projects, 461 are currently generating ACCUs and 325[10] are yet to be credited. On average, projects take one to two years to transition from registration to crediting. Projects may generate ACCUs for seven to 25 years, depending on the method. 10 projects were issued credits for the first time in Quarter 3 2019: five were vegetation, three were savanna burning and two were landfill gas.

On 15 November 2019, the Government released a discussion paper advising of a future update to the FullCAM used to calculate ACCUs for some modelled ERF vegetation projects. The revised model incorporates the latest CSIRO research and extensive new information about vegetation growth. It is expected to result in vegetation projects generating credits in greater quantities across the scheme nationally over the lifetime of projects. The nature of the changes is expected to increase abatement estimates for some projects and reduce estimates for others, compared to the current version of FullCAM.

The Government is consulting on transitional arrangements for the implementation of the FullCAM update. ERF projects will not be required to use the FullCAM update for estimating abatement until 2020, after the modelled vegetation transitional arrangements are finalised. Compressed crediting is being considered as a transitional option and could play an important role in bringing on new supply of projects and abatement.

10 In order 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.

Figure 4: New registered projects per method type, Q1 2018 to Q3 2019[11]



Projects

Nine new projects were registered in Quarter 3 2019. Six of these projects were vegetation projects.

The first industrial equipment upgrade project was registered in Quarter 3 2019. This project is expected to operate nationwide, undertaking industrial equipment upgrades to a range of activities across a broad range of facilities.

While project registrations do occur throughout the year, there is generally an increase in registrations leading up to auctions. Figure 4 shows over 60 project registrations occurred in Quarter 2 2018, before auction seven and over 30 projects were registered before auction eight in Quarter 4 the same year. The increase in project registrations before auction nine was relatively muted, perhaps reflecting policy uncertainty in the lead up to the federal election.

Regional trends

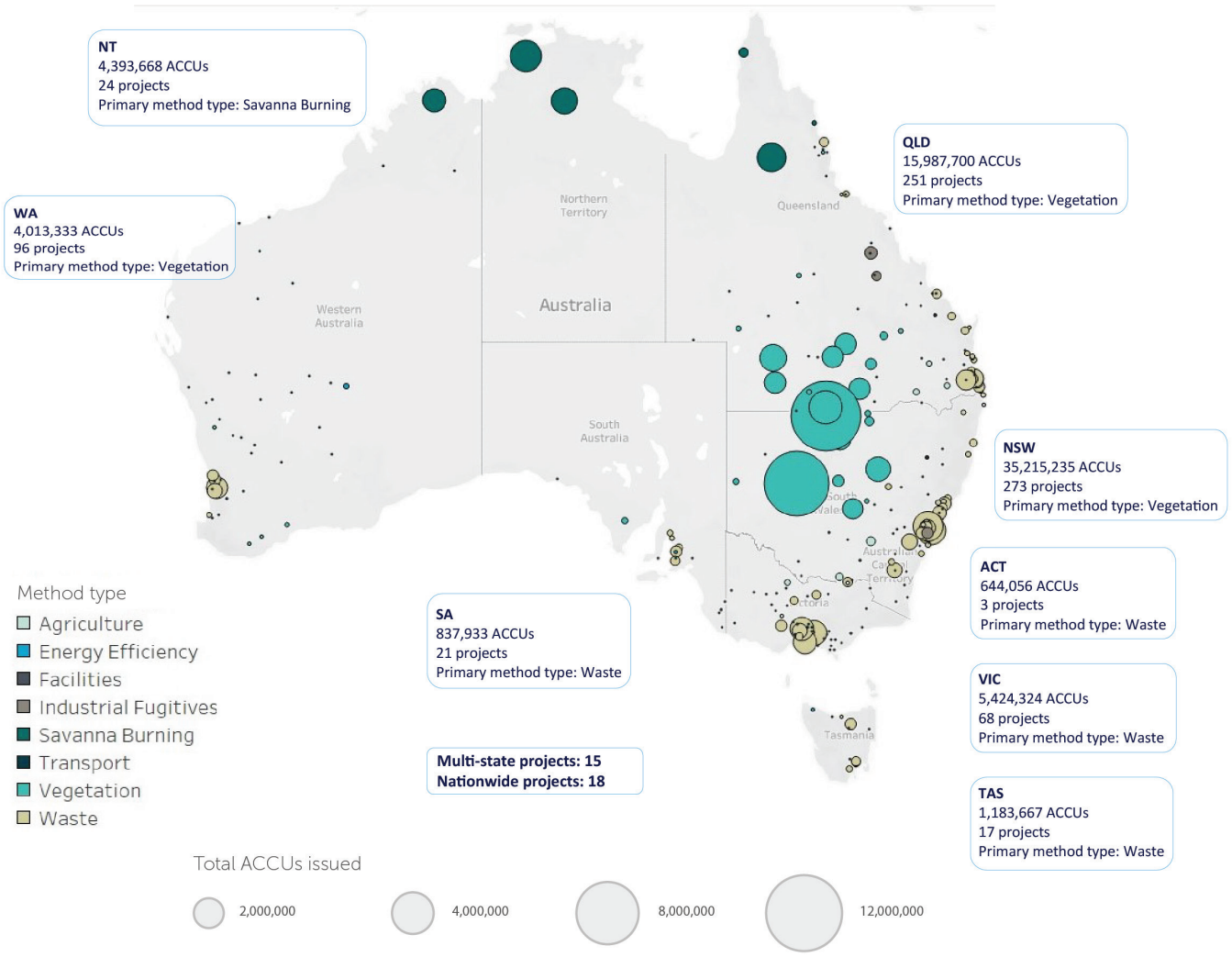
The six new vegetation projects registered in Quarter 3 2019 are split between Queensland and Western Australia.

The eastern states host the majority of projects and generate the most ACCUs (Figure 5). New South Wales has the most projects with 273, and has generated over 35 million ACCUs since the scheme began, which is more than half of total ACCUs issued. More recently, Western Australia has increased its share of project registrations with 56 projects (37 per cent) of the 153 projects registered since 2018.

Waste projects are the primary method type in the Australian Capital Territory, Tasmania, Victoria and South Australia, with most projects located around urban centres. In the Northern Territory, savanna burning is the primary project method in use.

11 Auction seven took place during 6-7 June 2018; Auction eight took place during 10-11 December 2018; Auction nine took place during 24-25 July 2019.

Figure 5: Total number of ACCUs issued per method type by location



Climate Solutions Fund

On 25 February 2019 the Australian Government announced the $2 billion Climate Solutions Fund (CSF), which builds on the success of the ERF. The CSF marks a new phase and aims to deliver a step change to the offsets market in Australia by boosting the supply of carbon units. Implementation of the CSF also incorporates a program of work, including co-design with industry that will help drive down transaction costs while maintaining integrity and investment under the ERF.

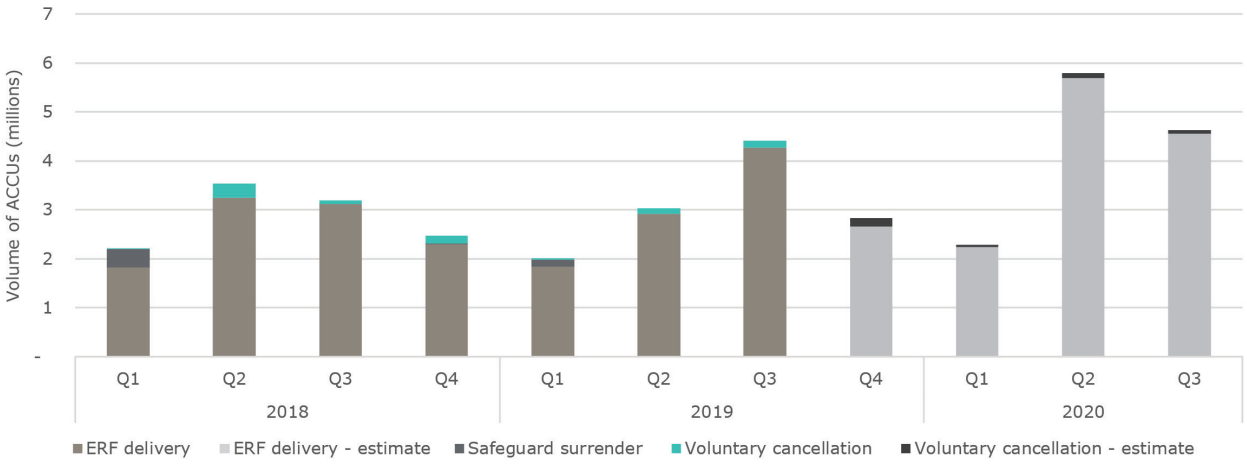
Details are available on the Climate Solutions Fund website.

1.3 Factors impacting demand

Total demand of 4.4 million ACCUs in Quarter 3 2019 was higher than any quarter in the last two years and second overall to Quarter 4 2016, which totalled 4.5 million ACCUs. ERF contract deliveries were the largest source of increased demand (see Figure 6).

Demand from ERF contracts is expected to moderate from Quarter 4 2019 to Quarter 1 2020 and then rise again in Quarter 2 and Quarter 3 2020 in line with previous quarterly trends (Figure 6). Demand under the Safeguard Mechanism is expected to be realised in Quarter 1 2020, and is expected to be broadly similar to previous years.

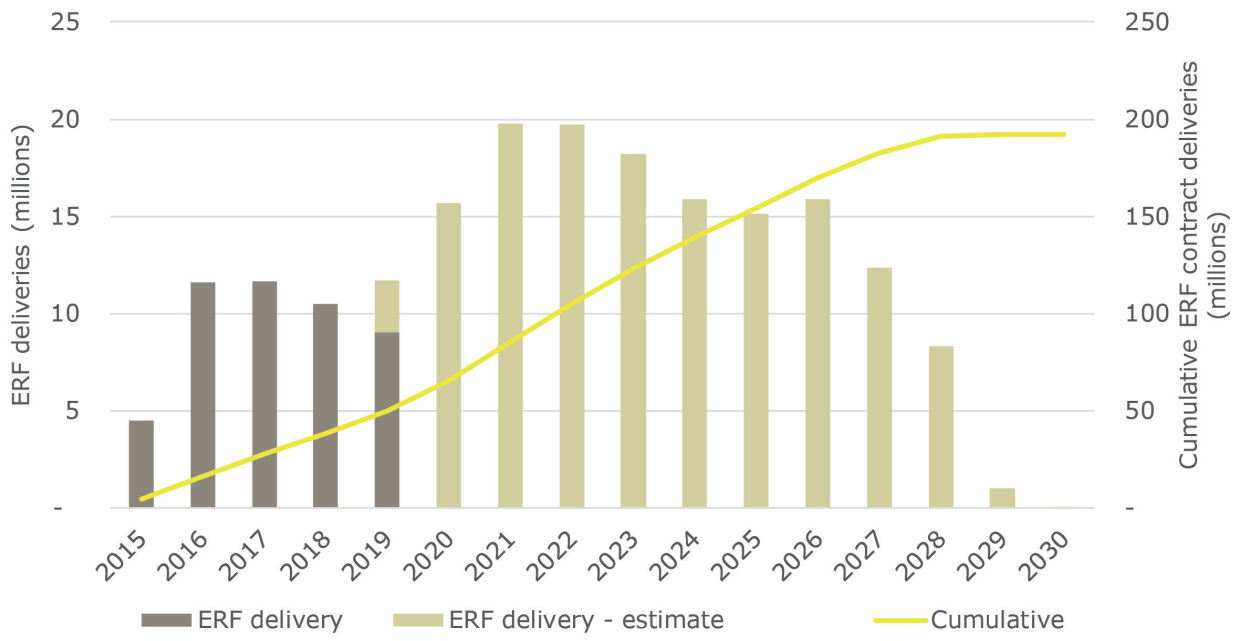
Figure 6: Actual and estimated demand for ACCUs, Q1 2018 to Q3 2020



Commonwealth demand

The ERF has contracted over 192 million ACCUs with 47 million ACCUs now delivered. Scheduled demand from ERF contracts is rising over the medium term, with the 10.5 million ACCUs delivered in 2018 increasing to over 19 million ACCUs in 2021 and 2022 (Figure 7). After 2022, excluding any new contracts from forthcoming auctions, there is a downward trend in ERF contract deliveries with the current portfolio of contracts ending in 2030. However, this will increase as the Government contracts $2.23 billion from the new CSF and remaining funds from the ERF.

Figure 7: Commonwealth delivery for current portfolio of contracts, 2015 to 2030



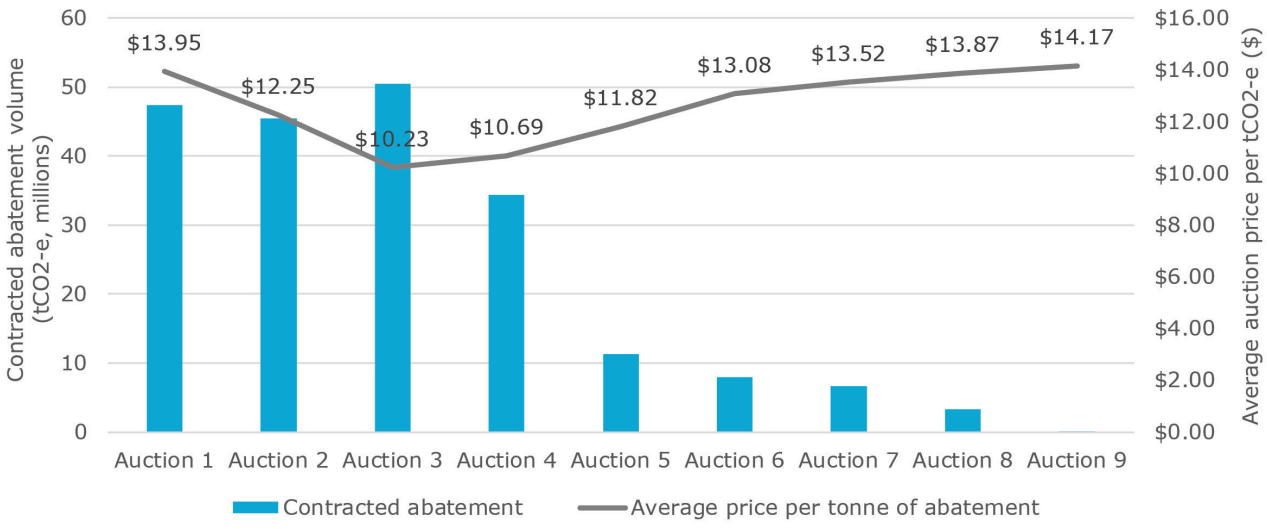
Emissions Reduction Fund auctions

The ninth ERF auction ran over the election period of 2019, with the associated uncertainty appearing to contribute to constrained project development and auction registration (Figure 8).

We have a statutory duty to purchase abatement at the lowest cost. In practice, this means we will buy up the long run supply curve and the price is likely to rise somewhat over time as it did at auction nine. However, it is not the role of the agency to buy up the short run supply curve, when it appears that abatement supply is temporarily suppressed. Hence, we purchased 59,000 tonnes of carbon abatement for approximately $840,000. Abatement was purchased at the slightly increased average price of $14.17.

The tenth ERF auction will be held on 25–26 March 2020. In addition to the $237 million remaining ERF funds, the new CSF funding of $2 billion is available for forward contracting at this auction. The additional CSF funding provides a strong signal to the market that there is ongoing demand for abatement, which is expected to drive new project registrations and increase auction participation over time. A benchmark price will not be set, which means all eligible auction bids will be considered.

Figure 8: ERF auction results



Safeguard mechanism surrender

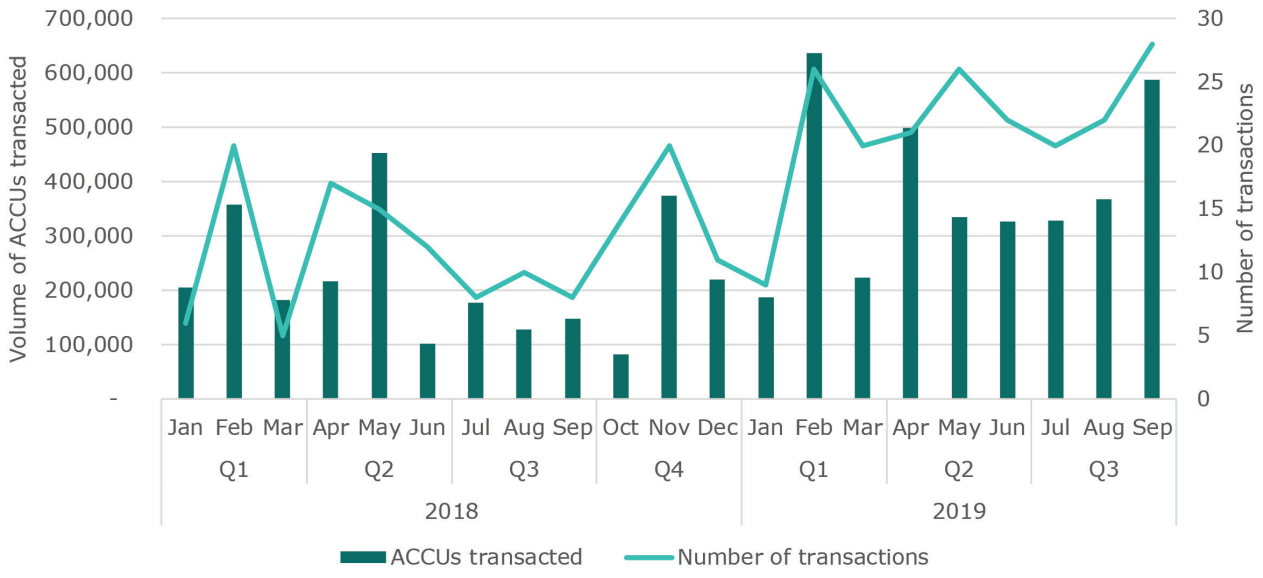
Safeguard entities are currently in the 2018-19 compliance year. With reports submitted by the end of October 2019, safeguard entities are aware of their emissions positions and have a number of options to keep their emissions below their baseline by 28 February 2020. Depending on the circumstances of individual entities, these options could include applications for multi-year monitoring periods, calculated baselines, emissions intensity variations and surrendering ACCUs. While we expect ACCU demand for this year to be broadly similar to previous years, we are aware that some entities are securing a portfolio of ACCUs to ensure they can meet any future liabilities[12].

Voluntary surrender

Voluntary demand for ACCUs continued to grow strongly in Quarter 3 2019. A total of 132,669 ACCUs were voluntarily surrendered, almost double the ACCUs surrendered in Quarter 3 2018 and around half of the 282,000 ACCUs surrendered in 2019. While the large demand from desalination plants that occurred in 2018 is unlikely to be repeated in 2019, voluntary surrender volumes for 2019 are expected to be broadly similar to last year[13] where over 527,000 ACCUs were surrendered in 2018.

Further analysis on the voluntary market is discussed in the *Voluntary, state and territory government markets* chapter.

Figure 9: ACCU market transactions (excluding ERF transactions), Q1 2018 to Q3 2019[14]



12 For further information on the safeguard demand data, please refer to the 2016–17 safeguard facility emissions table and 2017–18 safeguard facility emissions table on our website.

13 For more information and analysis on the voluntary market please refer to the voluntary cancellations table.

14 Data as at 30 September 2019. Please note the market transaction data in this graph has been revised from the data published in the ACCU Market Update in October 2019.

1.4 Market liquidity

The ACCU market is maturing. Volumes of ACCUs traded on the secondary market continue to increase. Over Quarter 3 2019, 1.2 million ACCUs were traded through 70 transactions (Figure 9). Compared to Quarter 3 2018, both transaction numbers and transacted volumes between parties have more than doubled.

Driving this increasing activity is the emerging portfolio demand from the private sector including acquisition of ACCUs for potential future surrender requirements under the Safeguard Mechanism and meeting voluntary environmental, social and corporate sustainability commitments.

1.5 Spot price

Over Quarter 3 2019, ACCU spot prices steadily increased from $15.00 in the beginning of July to $16.10 in the final week of September (Figure 10).

Over the previous two years, driven by increased activity, the bid and offer prices began to converge, indicating a more liquid and maturing market. Various sources are now reporting forward bids and offers and contract prices, with one account of a forward trade taking place. At the last ERF auction the average price increased by $0.30 to $14.17. Since then the spot price has stayed on average 11 per cent above the auction nine average price.

A divergence between spot and auction prices is to be expected due to duration differences and the absence of counter party risk with a longer term government contract.

Figure 10: ACCU spot prices, Q3 2019[15]

15 Sourced from CommTrade.

1.6 Key dates

Date	Event	Significance
31 October 2019	National Greenhouse and Energy Reporting (NGER) and Safeguard application deadline	Deadline for NGER reporters and Safeguard entities to submit: » 2018–19 applications for variation of baseline determination for reduction in emissions intensity » 2018–19 exemption declaration applications, and 2018–19 NGER reports.
1 February 2020	Safeguard multi-year monitoring period deadline	Deadline for Safeguard entities to submit multi-year monitoring period declaration applications starting 2018–19.
28 February 2020	ACCU surrender deadline	Deadline for safeguard entities to surrender ACCUs under the Safeguard Mechanism if required.
25–26 March 2020	Tenth ERF Auction	The auction guidelines and details about the auction process is available on Participating in an auction.
15 April 2020	Extended safeguard application deadline	Provided a multi-year monitoring period is in place, deadline for safeguard entities to submit: » 2018–19 calculated baseline applications » 2018–19 applications for a production adjusted baseline

2. Large-scale generation certificates

» The LGC supply/demand balance may be tight this year depending on the amount of paid shortfall and the 10 per cent carry forward mechanism.

» LGC spot prices increased 13 per cent to $48 over Quarter 3 2019.

» Total accredited new capacity for 2019 at the end of Quarter 3 was 2.8 GW, compared to 2.9 GW at the end of Quarter 3 2018.

- We expect to accredit just over 4 GW by the end of 2019 compared to 3.5 GW accredited in 2018.

2.1 Supply and demand balance

An estimated 35.3 million LGCs are expected to be available for the 2019 assessment year. This consists of 28.2 million LGCs expected to be validated this year and 7.1 million LGCs carried over from previous years. Legislated demand for 2019 is set at 32.1 million LGCs. Liable entities eligible for shortfall charge refunds may increase demand by an additional 2.6 million LGCs this year and some certificates are held by parties who do not intend to sell. Hence, we expect supply and demand to be relatively tightly balanced for the 2019 assessment year depending on the amount of paid shortfall and the 10 per cent carry forward mechanism.

Table 3 shows the LGC balance if no shortfall is taken for the 2019 assessment year. Shortfall enables liable entities to time shift demand and arbitrage between current prices and lower forward prices. The use of shortfall depends on commercial decisions by large entities. We expect that shortfall options will be exercised by some liable entities.

Table 3: Expected LGC supply and demand balance for 2019 assessment year

	Supply	Demand
LGC balance 14 February 2019	+7.1 million	
Expected LGC supply (available for 2019 surrender)	+28.2 million	
Legislated demand		-32.1 million
ACT government scheme[16]		-2.1 million
GreenPower[17]		-0.5 million
Shortfall charge refunds[18]		-2.6 million
Total balance (before any shortfall options taken)		**-2.0 million**

16 This is the expected accumulation of LGCs (by end 2019) held by the ACT government that is not expected to be available for surrender.

17 GreenPower volume is based on surrenders that have already occurred in the 2019 year, no further surrenders are expected before 14 February 2020.

18 This is the amount of paid shortfall from previous assessment years that entities may surrender to receive a refund, to date 1.5 million LGCs from a total 2.6 million have been surrendered in 2019. Forward prices are lower than current prices so there remains an incentive to take further paid shortfall for the 2019 assessment year.

A large amount of new capacity is being accredited and is likely to reach full generation by around mid-2020. We expect LGC supply of 35 to 37 million LGCs in 2020 against a legislated demand of 33 million LGCs. Supply is expected to continue to increase in 2021 to more than 40 million LGCs. Accordingly, a surplus will start to emerge from the 2021 assessment year onwards. The level of that surplus will depend on delivery of the investment pipeline, the date generators are allowed to export to the grid and any increase in voluntary demand as LGC prices reduce.

2.2 Factors impacting supply

LGC supply

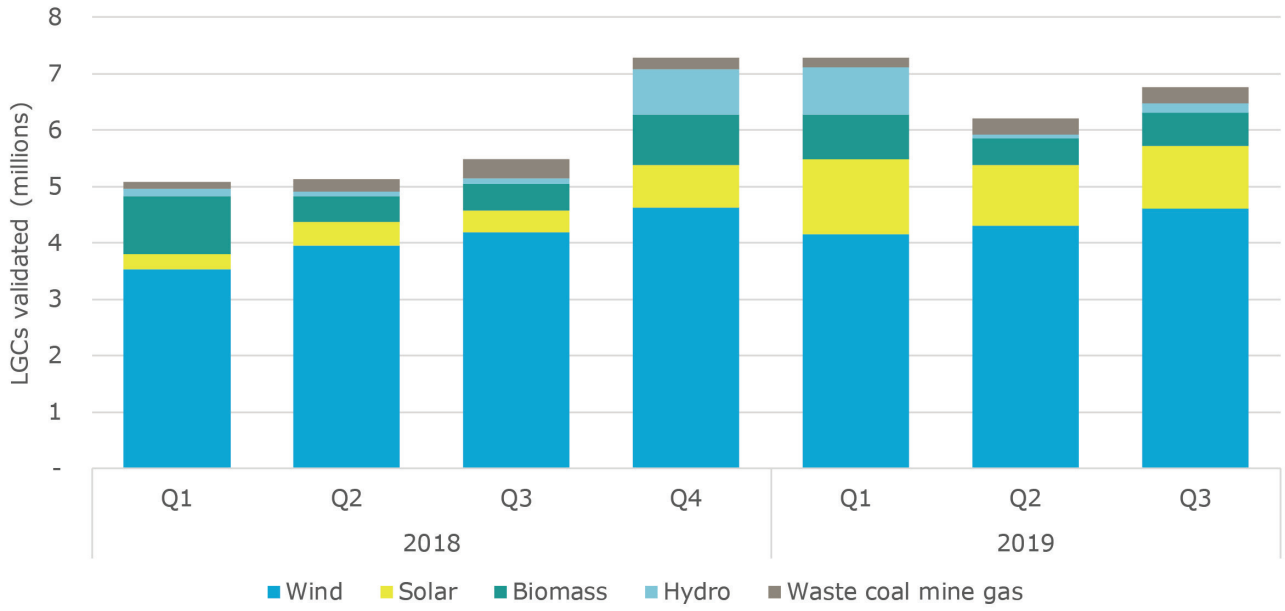
At the close of Quarter 3, there were 20.9 million LGCs registered in the Renewable Energy Certificate (REC) Registry. Accredited capacity remains high, with the total capacity of accredited power stations in 2019 at 2.8 GW so far. We expect to accredit up to 1.5 GW in Quarter 4. The accreditation of power stations does not align with full generation. It can take a number of months for wind and solar farms to begin full generation which changes the expected supply of LGCs.

LGCs validated in Quarter 3 2019 were higher than Quarter 3 2018 (Figure 11). We also expect the number of validated LGCs for Quarter 4 2019 to be higher than Quarter 4 2018 despite a lower than anticipated level of LGCs from hydroelectric power stations, that generate above baseline in 2019, due to lower dam levels and generation so far this year.

The Australian Energy Market Operator (AEMO) finalised amendments to MLFs at the end of June 2019. These changes affected approximately 20 per cent of the utility-scale power stations tracked through our pipeline of projects and resulted in reduced MLFs for these generators. These changes are expected to reduce the total LGC supply by 0.77 million in 2019 and 1 million in 2020.

New power station build is progressing well, however, some projects are facing connection delays and staged connection. These projects often receive a temporary notifiable exemption from AEMO that enables the project to connect a maximum of five megawatts (MW) for pre-commissioning work. Whilst these projects are eligible for LGCs under the notifiable exemption, the supply is reduced.

Figure 11: LGCs validated by technology type, Q1 2018 to Q3 2019



Accreditation

For Quarter 3 2019, 101 new power stations were accredited totalling over 1 GW of capacity (Figure 12).

Across Australia, the majority of new accredited capacity in Quarter 3 2019 came from wind farms (757 MW). Solar has dominated accredited capacity over the past 12 months.

We estimate that just over 4 GW of new capacity will be accredited in 2019, up from 3.5 GW last year.

Queensland had the most new capacity accredited, and the majority of this capacity came from the 453 MW Coopers Gap Wind Farm. This wind farm, located in Boyneside QLD, is expected to generate 1500 gigawatt hours (GWh) per annum at full generation (Figure 13). Accredited capacity is increasing in Queensland, New South Wales and Tasmania, all recording their largest quarter for 2019 so far.

The accreditation of the Cattle Hill Wind Farm, owned by Goldwind and partners, in Tasmania took us past the necessary capacity to guarantee that the LRET target of 33,000 GWh of additional renewable energy will be met in 2020.

Figure 12: Capacity of new accredited power stations by state, Q3 2019

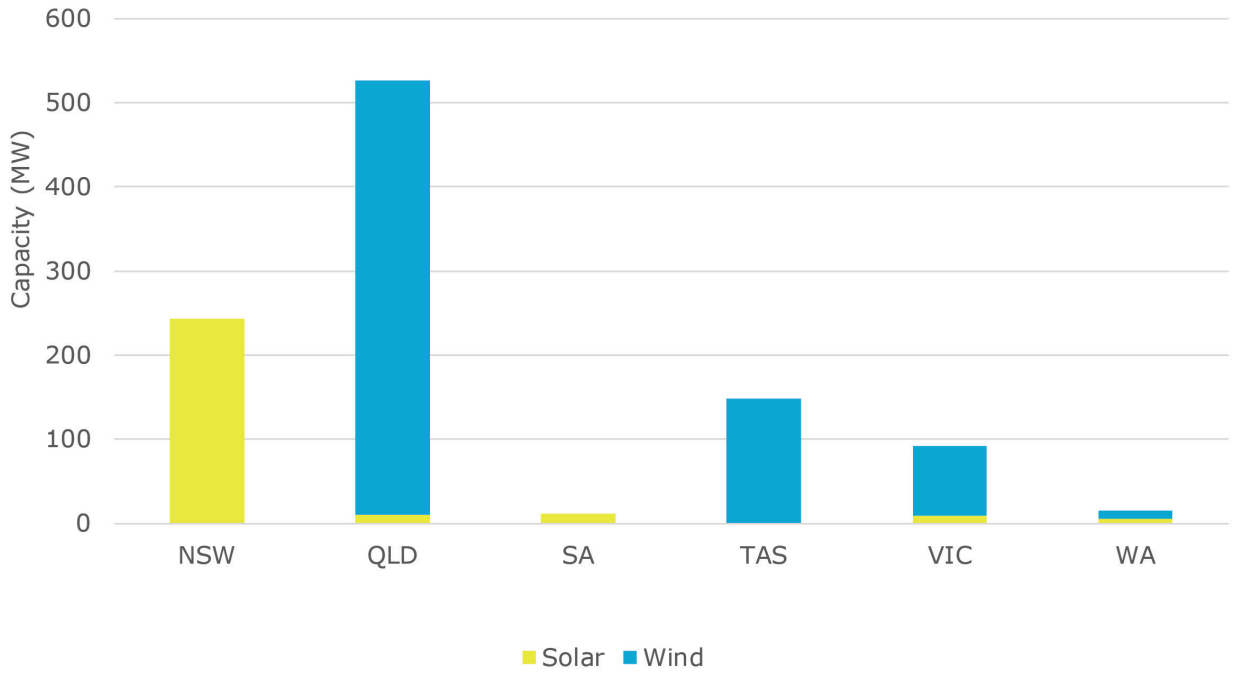
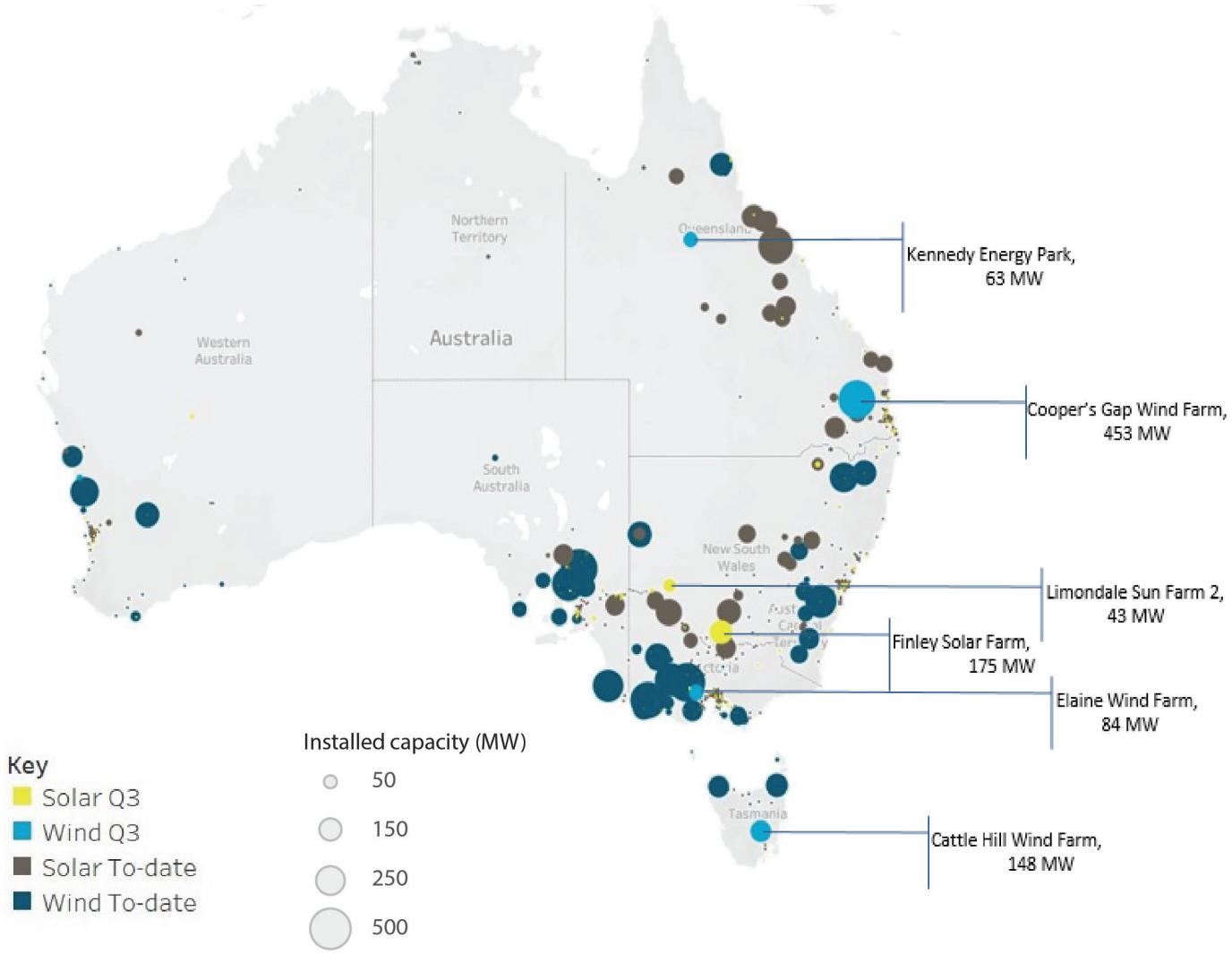


Figure 13: Wind and solar power stations accredited capacity (MW) by location, Q3 2019 and scheme to-date



Committed projects

Figure 14 shows how the capacity reaching final investment decision (committed projects) can vary significantly from quarter to quarter. During Quarter 2 2018 there was enough capacity committed since the start of 2016 to achieve the 2020 target. Most commentators expected that announcements of committed projects would then slow significantly; however, that has not unfolded. Power purchase agreements (PPAs), merchant projects and state processes have continued to support announcements.

168 MW was committed[19] in Quarter 3 2019. The rate of new committed projects has moderated since Quarter 4 2018, which saw a record 1.5 GW of capacity committed. However, Quarter 4 is traditionally the highest quarter for financial close announcements and we expect an upswing in capacity announced in Quarter 4 2019 compared to Quarter 3 2019.

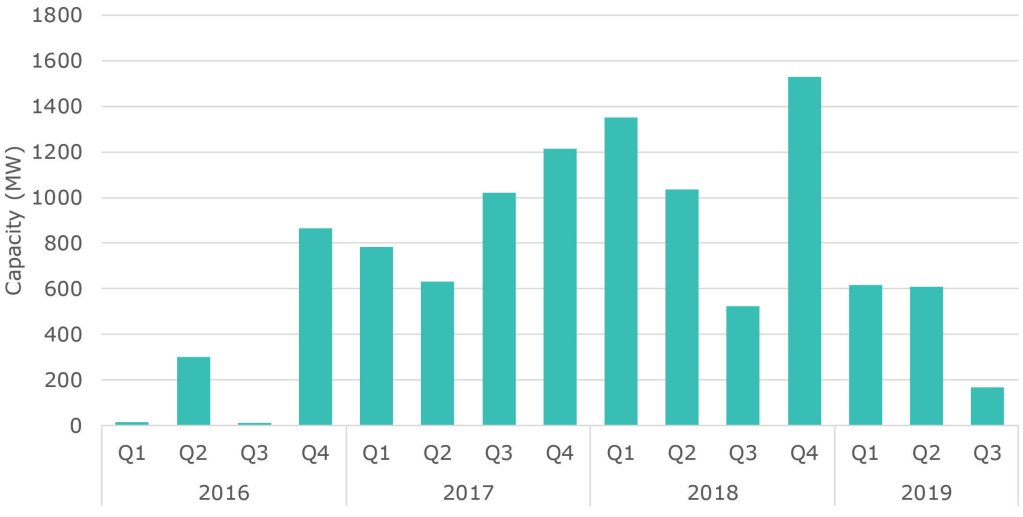
We are tracking 1.5 GW of projects with PPAs between strong counter parties that we expect to reach financial close and start construction over the next three quarters. In addition, over the same period we expect material capacity to reach final investment decision from international developers with access to significant equity.

Power purchase agreements

Of the current 13 GW[20] pipeline, 9 GW of the capacity is contracted through publically disclosed PPAs[21] (Figure 15). Our data indicates only 18 per cent of projects tracked on the pipeline have been supported by a PPA with the three largest Australian electricity retailers. Other retailers, state governments and corporates continue to invest in renewables through PPAs.

Corporate PPAs constitute over 15 per cent of the total pipeline. This is an emerging sector that should continue to grow based on strengthening demand from businesses for lower emissions electricity at a lower price.

Figure 14: Capacity committed per quarter, Q1 2016 to Q3 2019



19 Committed projects refer to large-scale energy projects that have received all development approvals and reached final investment decision according to the commercial understanding of the term. Beyond this committed pipeline, market intelligence suggests possible projects with development approval or in planning stages are estimated to be around 58 GW.

20 Of the 13 GW pipeline that we track, 7.3 GW is accredited, 4.4 GW is committed and 1.5 GW is probable.

21 PPA data is sourced from publically disclosed information that is typically released prior to construction. There is no legal requirement to disclose PPAs and many more may be entered into after construction has commenced.

Figure 15: Capacity (GW) of PPAs by category (2016 to 2019)

2.3 Factors impacting demand

Legislated demand for 2019 is 32.1 million LGCs, with a potential additional 2.6 million LGCs being surrendered on or before 14 February 2020 for shortfall charge refunds.

Voluntary demand

There is continued demand for LGCs from GreenPower, states and territories and corporates. In Quarter 3 2019, there were 627,839 LGCs voluntarily surrendered, primarily for GreenPower. Although LGC demand from GreenPower has fallen since 2017 as LGC prices rose, it is expected that surrenders for reasons other than the LRET statutory demand will increase in 2020 and beyond as LGC prices are expected to decline.

Further analysis of voluntary markets is included in Voluntary, state and territory government markets chapter.

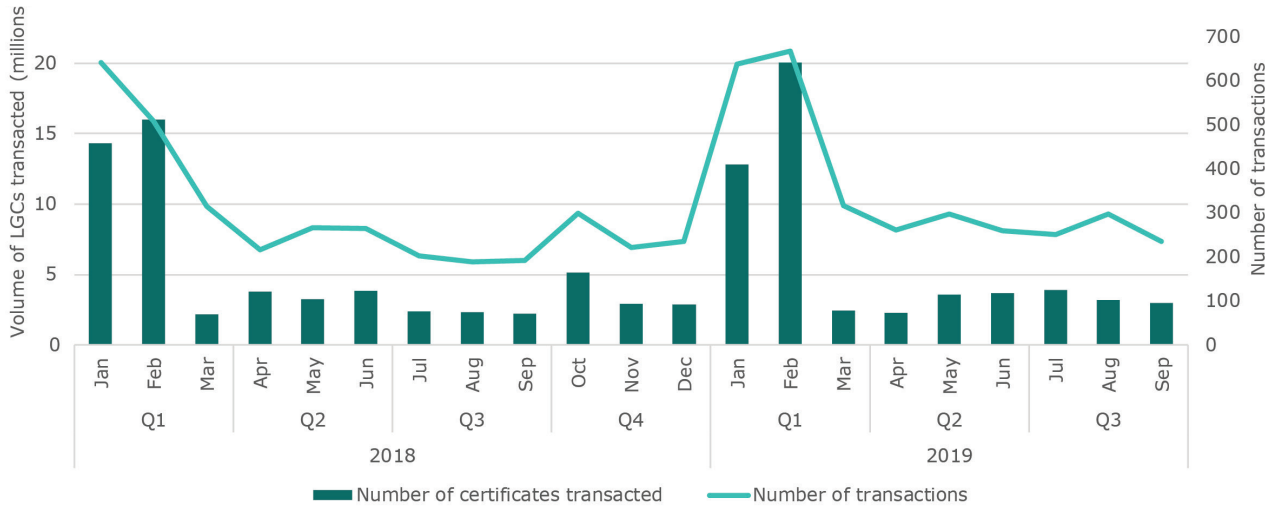
2.4 Market liquidity

Over Quarter 3 2019, 10.1 million LGCs were traded through 783 transactions with an average transaction size of 12,900 LGCs. Transactions during this quarter were less frequent than Quarter 2 2019 but of higher volumes as liable entities obtain LGCs in readiness to meet their obligations for the 2019 assessment year.

As a well-established market, LGC transactions follow seasonal patterns, with the most trading activity occurring in January and February before the surrender deadline. However, the volume traded in Quarter 3 2019 was nearly double the volume traded in Quarter 3 2018 (Figure 16).

Trading is expected to increase over the next two quarters as liable entities seek to finalise their surrender positions.

Figure 16: LGC market transactions, Q1 2018 to Q3 2019



Currently, 60 per cent of total available LGCs are held by 10 entities. Of this 60 per cent, Origin and AGL hold over 20 per cent (Figure 17). The remaining 8.7 million LGCs (40 per cent) are held by over 800 entities or individuals.

2.5 Spot price

The LGC spot price has continued to rise over the course of Quarter 3 2019. Prices dropped to a low of $31 in Quarter 1 2019 before climbing to $48 at the end of Quarter 3 2019, as shown in Figure 18. The increase in spot price is likely due to the relatively tight supply and demand balance for the 2019 assessment year. How tight the market becomes will depend on the level of shortfall taken to arbitrage between current LGC prices and expected lower forward prices.

Figure 17: Market concentration of top 10 holders of LGCs (millions), end Q3 2019

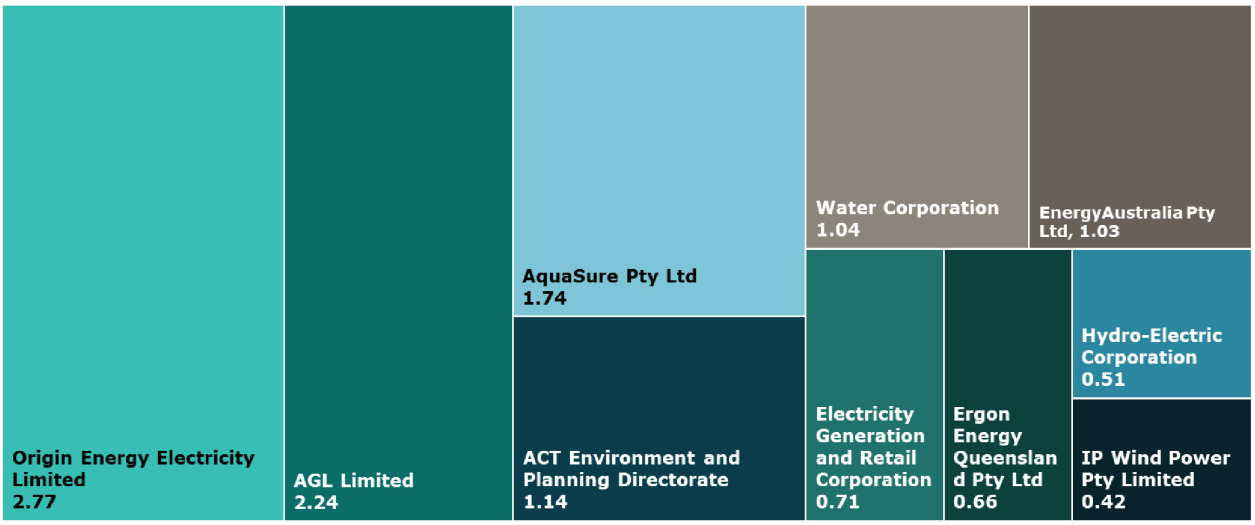
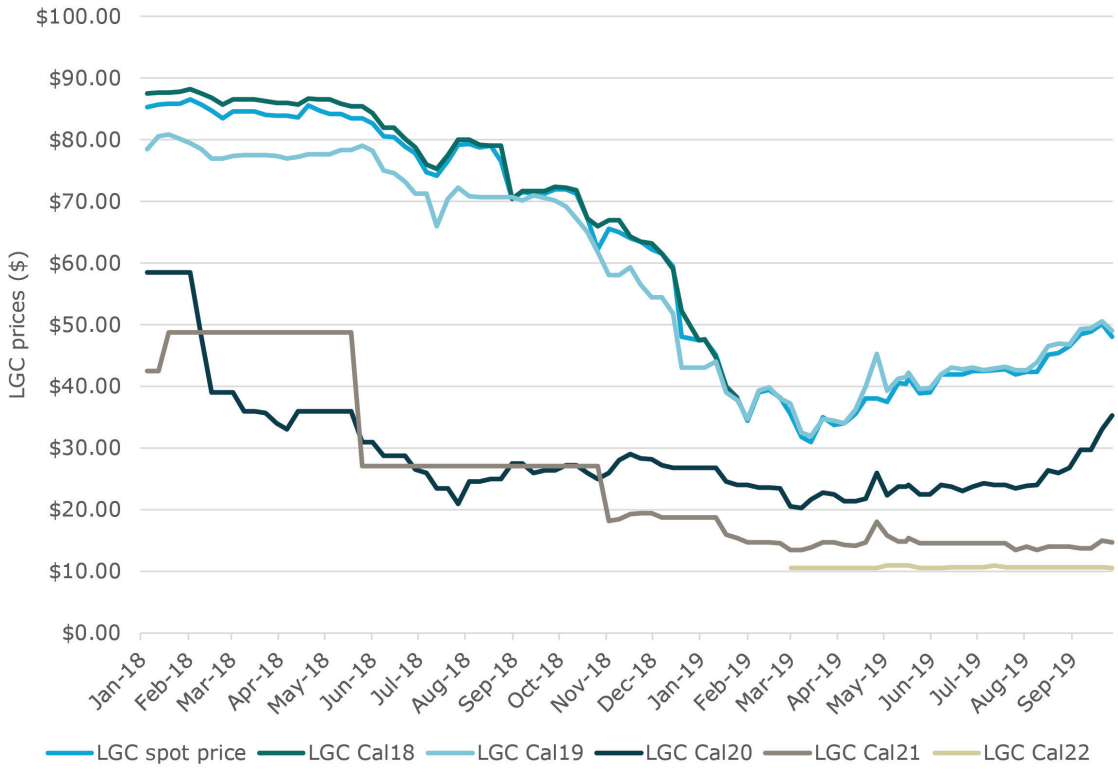


Figure 18: LGC spot and forward prices, 2018 to 2019[22]



Calendar 2019 (Cal19) prices show similar trends, increasing from $31.90 in mid-March to $48.50 at end Quarter 3 2019. Calendar 2020 (Cal20) prices also increased from $26.15 in mid-August to $35.30 at the end of September, signalling market expectations that the supply/demand balance will be tighter than expected. Calendar 2021 (Cal21) and Calendar 2022 (Cal22) prices have remained relatively stable throughout this period, finishing at $14.90 and $10.50 respectively.

The large price differential (around $20) between Cal20s ($35.30) and Cal21s ($14.90) is of interest, given liable entities can continue to arbitrage using shortfall and the three year rule. Whether this difference is maintained, or Cal20 and Cal21 prices converge, will be a watch point in future reports.

2.6 Key dates

Date	Event	Significance
14 February 2020	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 2020	The Renewable Power Percentage (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.

22 Source TFS Green

3. Small-scale technology certificates

- Average small-scale solar PV system size and installations increased by five and 23 per cent respectively compared to Quarter 3 2018 increasing supply of STCs.
- The 2019 STP will be exceeded and a surplus of between six and eight million STCs is likely to emerge after Q4 surrender in February 2020.
- Reported battery plus solar PV installations are growing quickly but still only account for two per cent of all PV installations in 2019. There may be additional non-reported installations.
- In 2019 we estimate 2.2 GW of small-scale solar PV capacity will be installed nationally.
- The STC spot price remained steady ending Quarter 3 2019 at $37.85.

3.1 Supply and demand balance

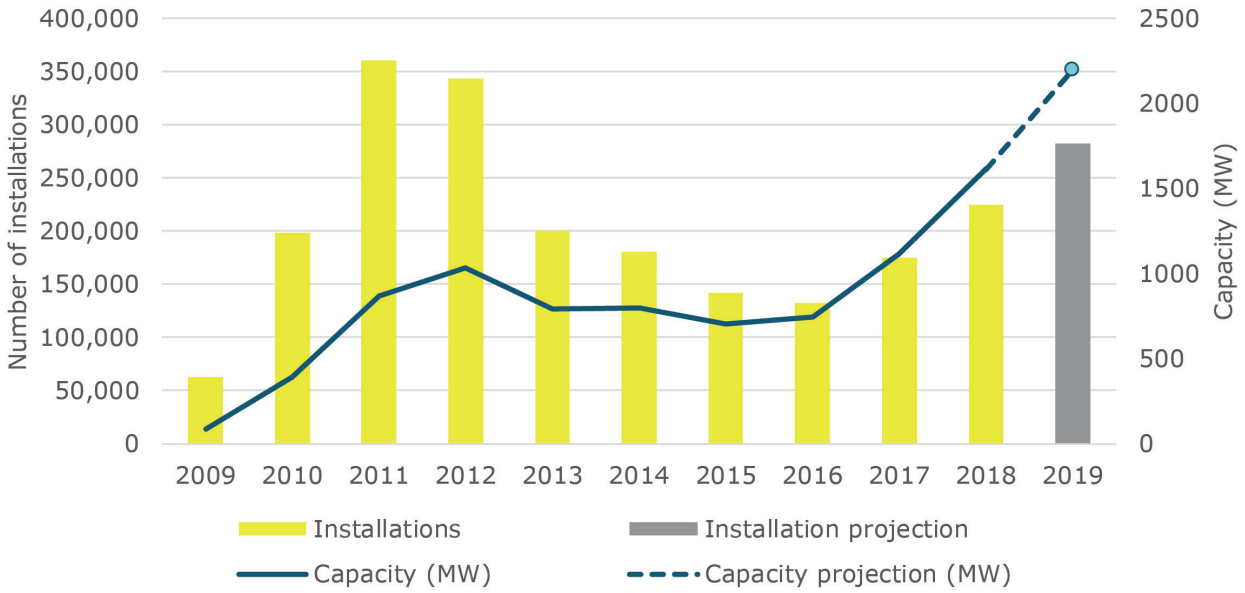
At the close of Quarter 3 2019, over 10.3 million STCs were registered in the market, with 348,000 STCs pending clearing house sale. The balance after Quarter 3 surrender on 28 October 2019 was 3.9 million STCs. Approximately 5.6 million STCs are required to be surrendered for Quarter 4 on 14 February 2020.

The average weekly STC creation rate at the end of Quarter 3 2019 was 700,000, which is 23 per cent above the rate required by the STP[23]. If this rate of STC creation continues, a surplus between six and eight million STCs is likely to emerge.

Total installed small-scale solar PV capacity for the quarter was 541 MW, a 34 per cent increase compared to the same quarter last year. The average kilowatt (kW) capacity of small-scale solar PV systems also increased by five per cent from 7.2kW in Quarter 3 2018 to 7.5kW in Quarter 3 2019. The increasing size of small-scale solar PV systems is contributing to higher STC creation rates.

In total, 9.6 GW of capacity has been installed under the SRES since its inception, with 99.9 per cent of capacity coming from small-scale solar PV and the remaining from small-scale wind and hydro[24]. In 2019, we estimate 2.2 GW of small-scale solar PV capacity will be installed nationally (Figure 19)[25].

Figure 19: Small-scale solar PV installations and capacity, 2009 to 2019



23 The SRES aims to balance supply and demand by requiring STCs created to be surrendered over time. To do this the STP is set each year to require liable entities to surrender to the agency 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. For more information see the small-scale technology percentage page on our website.

24 For this reason capacity in this chapter relates only to small-scale solar PV.

25 For further information on capacity and installation trends by state (including postcode data), see postcode data for small-scale installations on our website.

Solar PV and solar water heaters are capable of generating and displacing approximately 15,900 GWh of electricity per year (Figure 20). Of this 15,900 GWh, 76 per cent is from electricity generated by small-scale solar PV and the rest is displaced through solar water heaters and air source heat pumps.

3.2 Factors impacting supply

Solar PV and installations

Solar PV capacity and installations are growing strongly (Figure 19), leading to increased supply of STCs in the market. Installations have increased 24 per cent and capacity by 34 per cent compared to Quarter 3 2018. Notably, even though the degree of stimulus from the SRES is declining over time, payback periods are staying around the same. On that basis it seems likely installations of small-scale solar PV will continue at similar levels, subject to distribution systems connection constraints.

Although solar PV installations make up the bulk of installations, solar water heaters are at steady and significant installation levels. Air source heat pumps, however, have had an average annual growth of 14 per cent since 2017 (compared to less than one per cent for solar water heaters).

Total SRES installations have increased by seven per cent between Quarter 2 and Quarter 3 2019. We expect installation numbers to continue to increase, especially in Quarter 4 2019 when marketing campaigns from solar retailers highlighting the one year decline in the deeming period for solar PV are run (Figure 21).

Figure 20: Estimated solar PV and solar water heater generation and displacement, 2011 to 2019

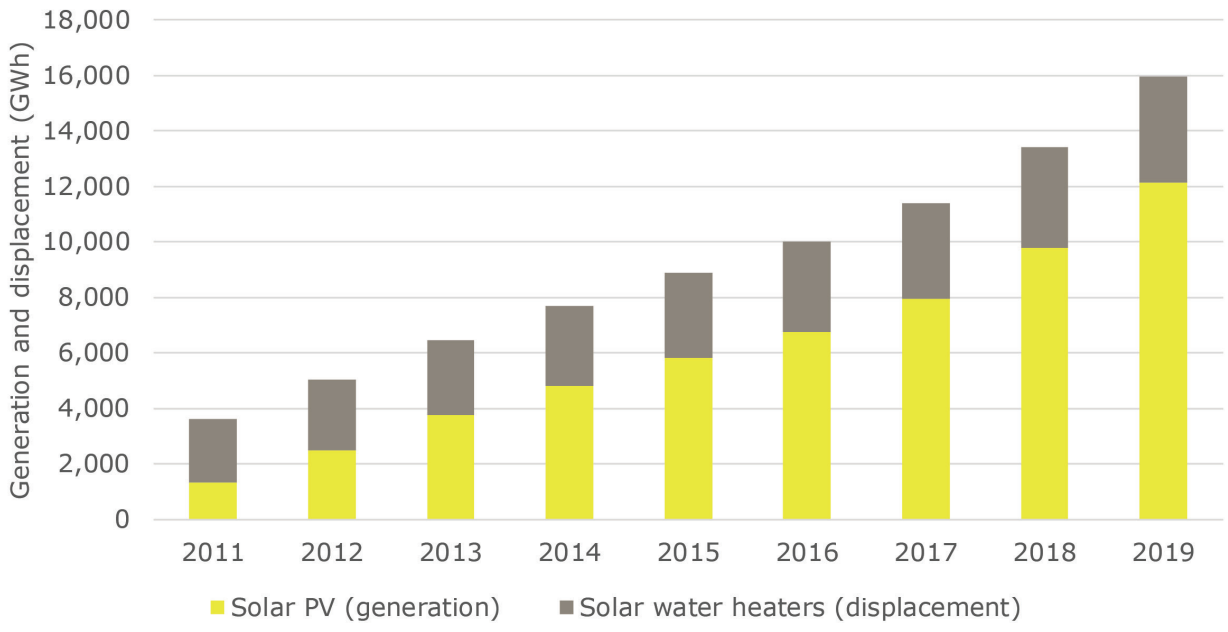
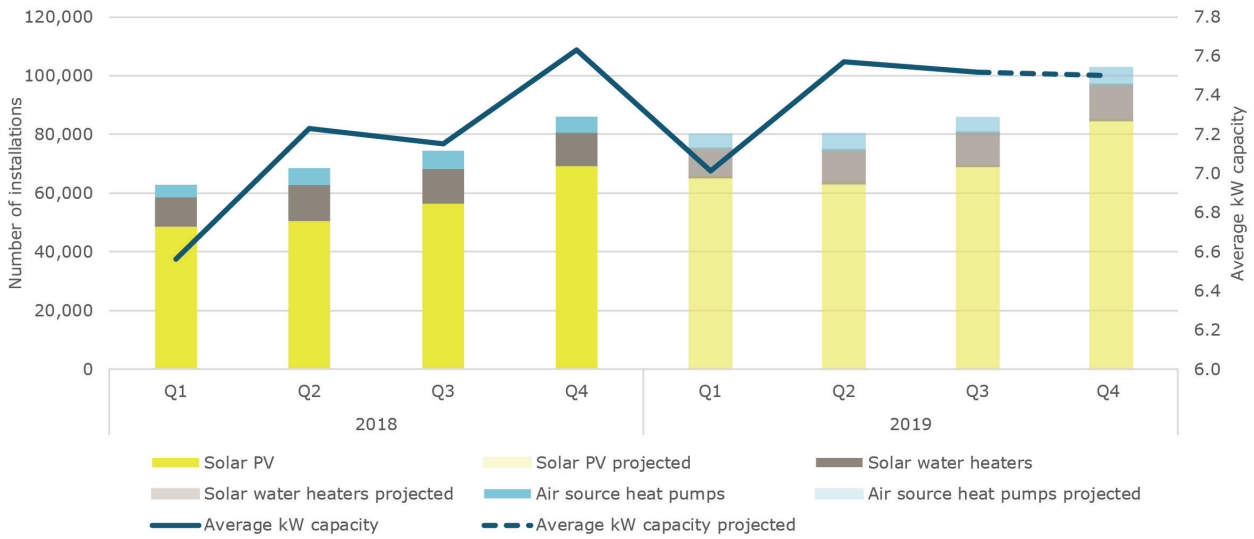


Figure 21: SRES installations and average kW capacity, Q1 2018 to Q4 2019



The majority of installations over Quarter 3 2019 were in Queensland (19,837), New South Wales (19,677) and Victoria (14,559). Shorter payback periods, electricity prices and strong consumer sentiment are contributing to national solar PV growth. Table 4 outlines estimated capacity installed by state for Quarter 3 2019.

System size

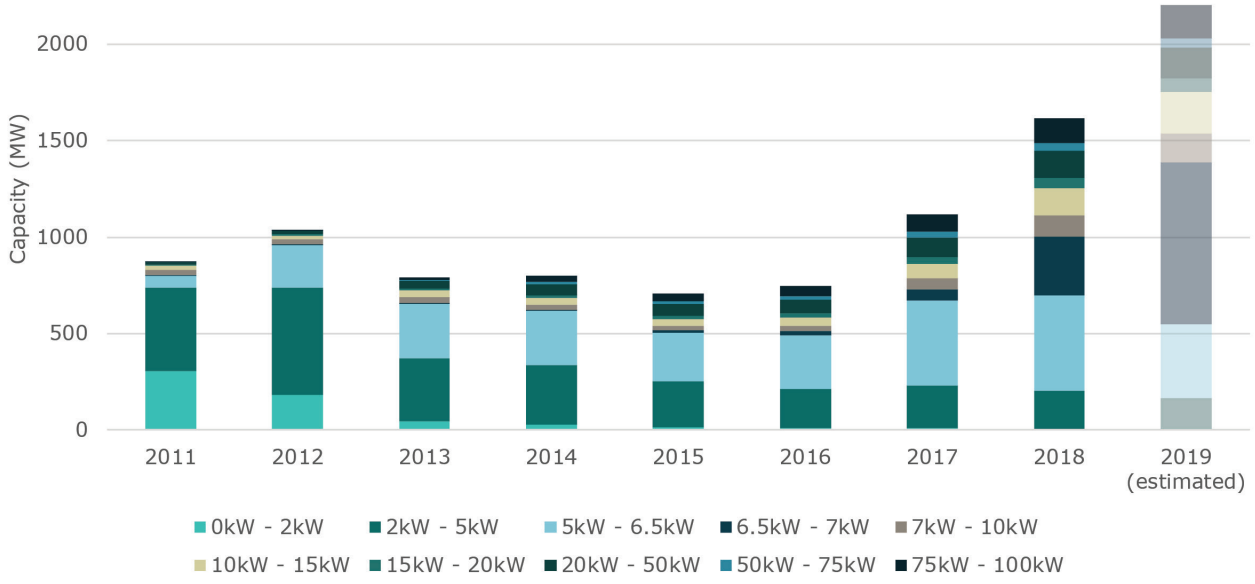
On average, small-scale solar PV system sizes have continued to increase (Figure 22), driven by a quadrupling of installations sized between 6.5-7kW. Systems in this size category represent 39 per cent of systems installed this year. Falling solar PV costs have made larger system sizes accessible to consumers and 6.5-7kW systems have now become the standard installation size. Average system size for all small-scale solar PV installations remains at a high of 7.5kW for the quarter.

Table 4: Estimated capacity by state, Quarter 3 2019

	Estimated capacity (MW)
ACT	7
NSW	154
NT	7
QLD	148
SA	61
TAS	6
VIC	98
WA	61
Total	**541***

*Totals may not sum due to rounding

Figure 22: Small-scale solar PV capacity composition, 2011 to 2019



Battery storage

Since 2014 we have collected voluntarily disclosed data on small-scale solar PV systems installed with battery storage, as such there may be additional non-reported battery installations not represented in our data. Our data shows consumers are gradually choosing to install battery storage with solar PV with early adopters and state based incentives driving the current uptake. Annual recorded concurrent installations of batteries with solar PV increased from 1278 in Quarter 3 2018 to 1765 in Quarter 3 2019, a 38 per cent increase. If current rates of battery installations continue, it is estimated over 6900 concurrent battery systems will be installed in 2019. This would represent two per cent of the expected PV installations for the year.

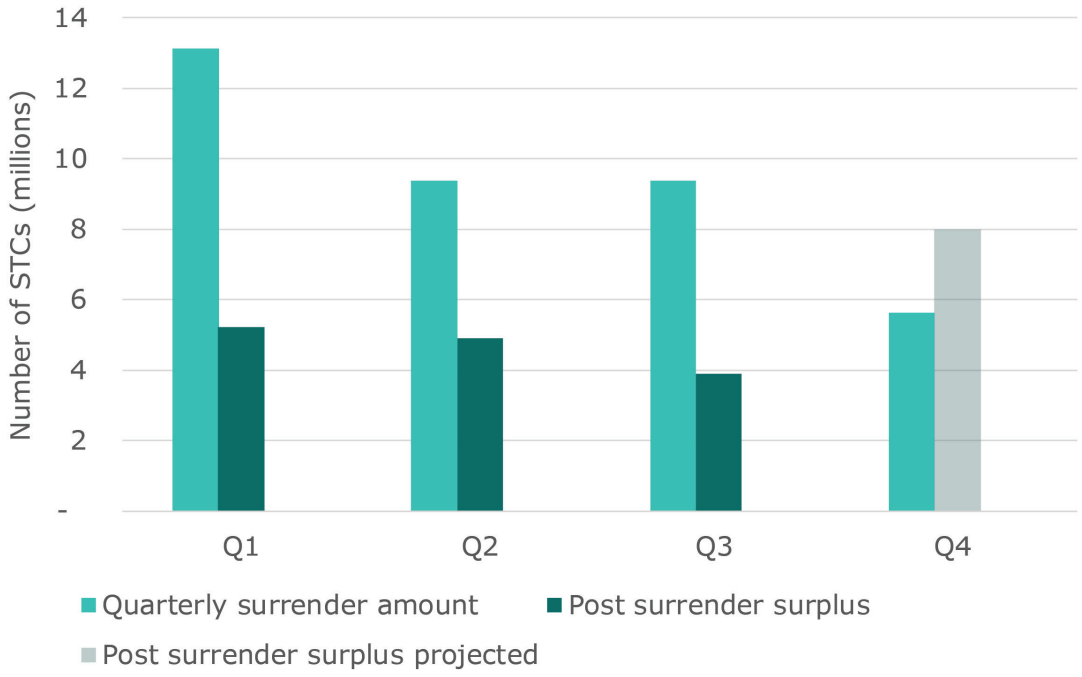
3.3 Factors impacting demand

Quarterly surrender

Liable entities are required to surrender approximately 37.5 million STCs in 2019 to meet their SRES obligations. The Quarter 3 2019 surrender requirement was approximately 9.3 million STCs (25 per cent). The post-surrender surplus was 3.9 million STCs (Figure 23).

Based on high creation rates, we expect there will be a surplus of six and eight million STCs post Quarter 4 surrender on 14 February 2020.

Figure 23: Estimated surplus after quarterly surrender, 2019



3.4 Market liquidity

Over Quarter 3 2019, 26.9 million STCs were traded on the open market via 3400 transactions with an average transaction size of 7900 STCs (Figure 24). Over the course of Quarter 3 2019, the total number of transactions per month were 1100 on average. This is up from an average of 809 transactions per month in Quarter 3 2018. Only 0.26 per cent of STCs in Quarter 3 2019 were traded through the STC clearing house. The STC clearing house is unlikely to be used for any material purchases until at least Quarter 3 2020[26].

Currently, the top 10 holders of STCs hold 79 per cent of the STCs in the market (Figure 25).

26 See our October STC market update for more information on the clearing house surplus.

Figure 24: STC market transactions, Q1 2018 to Q3 2019

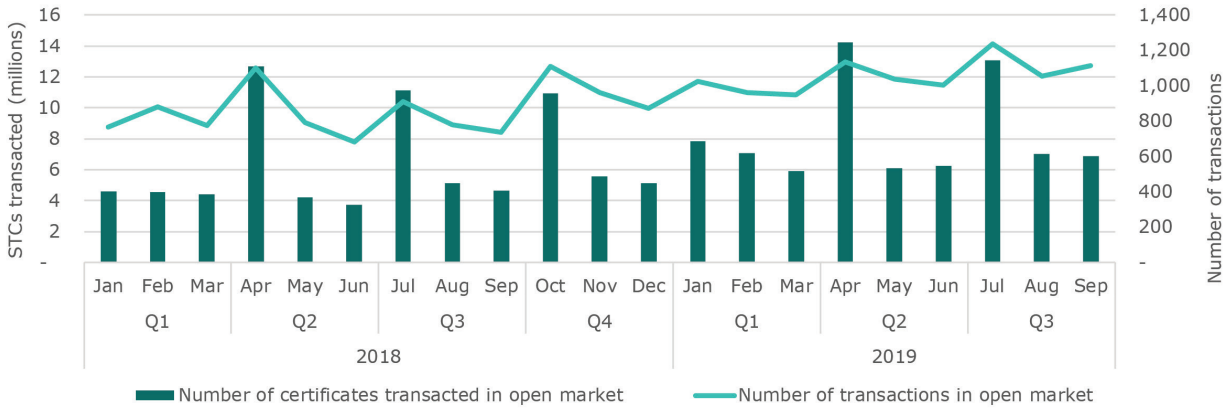
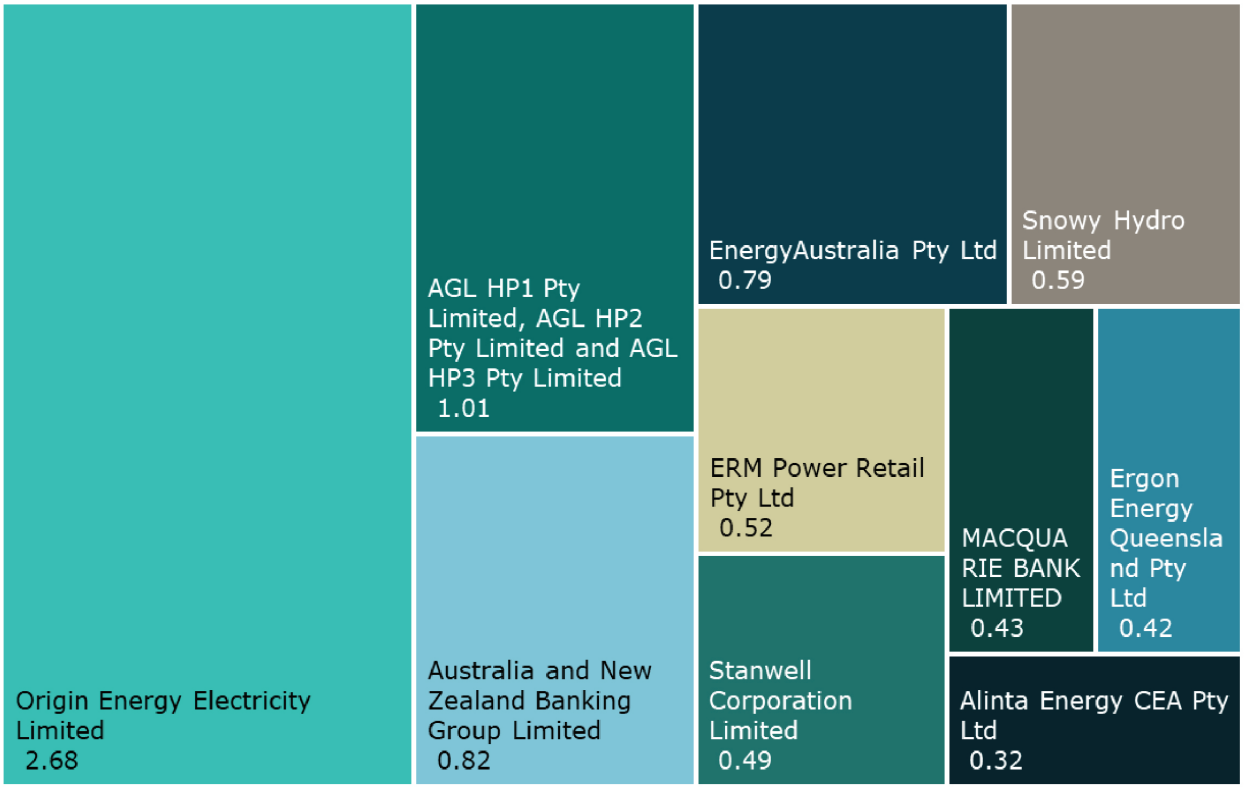


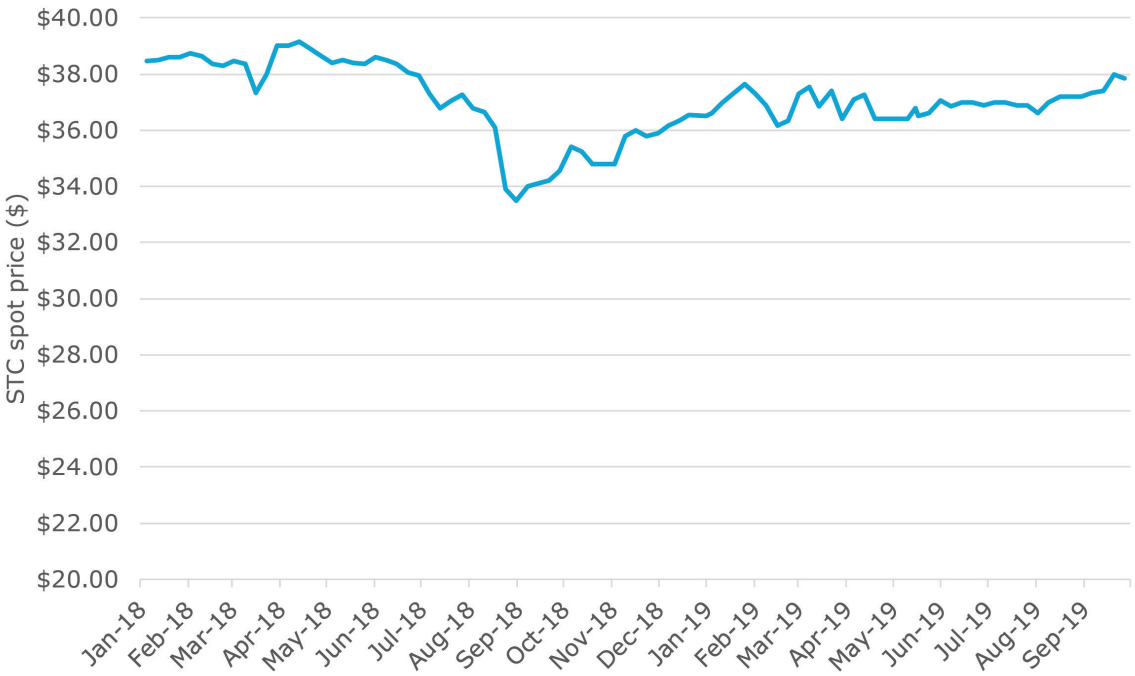
Figure 25: Market concentration of top 10 holders of STCs (millions), end Q3 2019



3.5 Spot price

Spot prices remained broadly steady over the course of Quarter 3 2019, with a low of $36.50 at the beginning of August and a high of $38 in mid-September (Figure 26). As of the end of Quarter 3 2019, spot prices had softened slightly to $37.85.

Figure 26: STC spot prices, 2018 to 2019



3.6 Key dates

Date	Event	Significance
15 February – 28 April	Quarter 1 surrender period	A liable entity must surrender 35 per cent of liability for the year in the REC Registry for this quarter.
30 March	STP calculations set 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.
29 April – 28 July	Quarter 2 surrender period	A liable entity must surrender 25 per cent of liability for the year in the REC Registry for this quarter.
15 April	Required surrender amount calculated	The Clean Energy Regulator provides each liable entity with an estimate of required surrender amounts for quarters one to three for the SRES
29 July – 28 October	Quarter 3 surrender period	A liable entity must surrender 25 per cent of liability for the year in the REC Registry for this quarter.
29 October – 14 February	Quarter 4 surrender period	A liable entity must surrender 15 per cent 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	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.

4. Market spotlight: The rise of the commercial and industrial mid-scale solar PV market

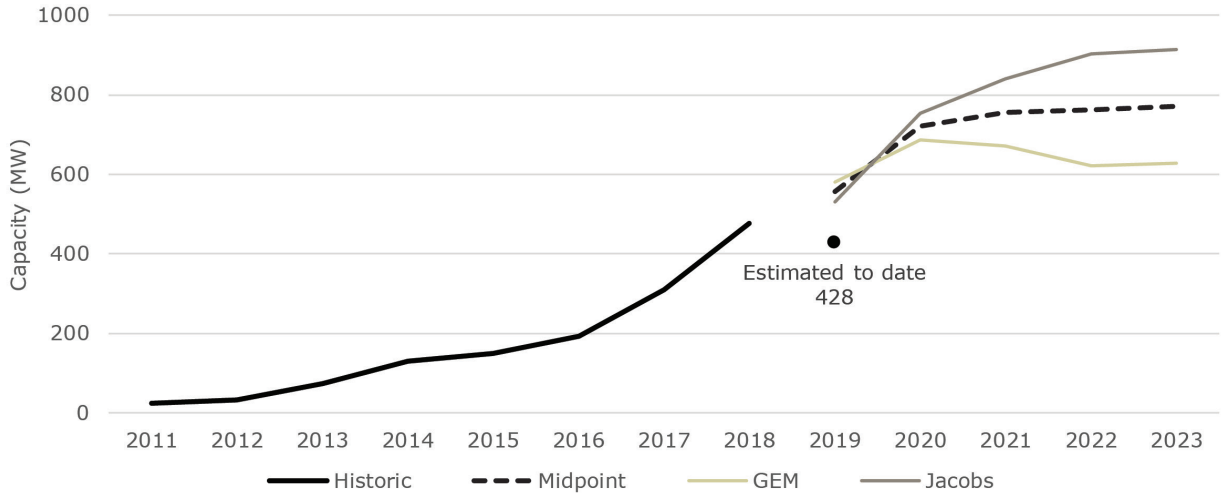
A view into the rapidly emerging mid-scale solar PV market.

Mid-scale rooftop solar PV systems (15kW-5 MW), installed by commercial and industrial participants have surged in recent years[27]. In 2018, there were 10,206 systems installed with a total capacity of 477 MW. This is a 44 per cent increase in systems, and a 54 per cent increase in capacity compared with 2017. For 2019, capacity of installations at the end of Quarter 3 totalled 428 MW. We expect approximately 600 MW to be installed in 2019.

We recently engaged Green Energy Markets and Jacobs Group Australia to examine this trend and estimate activity out to 2023. This modelling suggests growth in the sector is likely to continue over the short term (Figure 27). These reports are now available on our website.

For larger systems (100kW-5 MW), analysis indicates health, agriculture, retail, manufacturing and offices are rapidly emerging market segments for businesses looking to generate their own electricity.

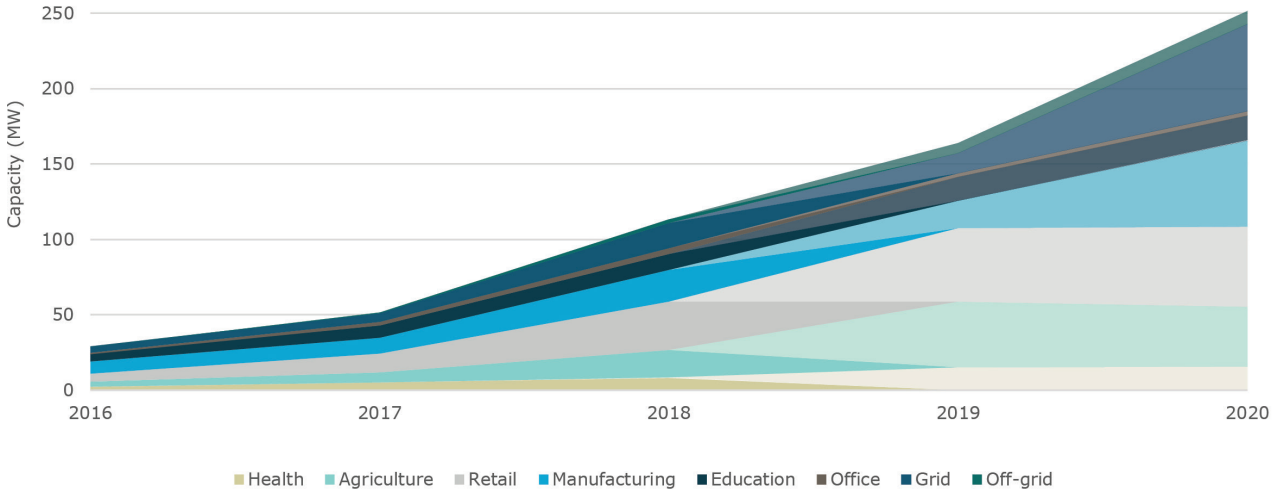
Figure 27: Mid-scale solar PV (15kW–5MW) capacity additions and expected growth, 2011 to 2023[28]



27 We define mid-scale solar as systems with a capacity between 15kW to 5MW. 15kW to 100kW systems are eligible under the SRES and 100kW-5 MW systems are eligible under the LRET.

28 Based on Clean Energy Regulator data and Green Energy Markets' and Jacobs Group Australia's modelling results for the Clean Energy Regulator.

Figure 28: Mid-scale solar PV (100kW-5 MW) actuals and estimates by market segment, 2016 to 2020[29]



The agriculture and retail sectors have rapidly increased uptake of mid-scale solar PV systems, with annual uptake increasing fivefold from 2016 to 2018. The increase in agriculture sector uptake is largely driven by the use of solar electricity for irrigation requirements and temperature control for indoor animals (such as poultry).

The retail sector, including shopping centres, supermarkets and airports, operates seven days a week providing a relatively stable daily load, meaning there is a good match between demand for electricity and PV generation profiles. The remaining sectors tripled their annual installation rate over the same period. High energy prices, low technology costs and increasing environmental awareness are key drivers for the expected increase in uptake across most market segments from 2019 onwards.

29 Sourced from Green Energy Market's and Jacob Group Australia's modelling results. Clean Energy Regulator data used to August 2019. Mid-scale solar uptake by market segments is estimated by applying GEM's percentage distribution of sectors to the mid-point uptake for both modellers.

5. Market spotlight: Carbon abatement

Since 2011, the RET and ERF schemes have had a substantial impact on reducing carbon emissions in Australia. Total abatement volumes, measured by the carbon value of ACCUs, LGCs and STCs, has risen from 12 million tCO_2-e in 2011, to over 50 million tCO_2-e for 2019 (Figure 29). For 2019, this is estimated to include 22.7 million tCO_2-e from the LRET, 12.9 million tCO_2-e from the SRES and 14.7 million tCO_2-e from the ERF.

Regulatory demand and Commonwealth purchasing has to date been the dominant source of demand and the driver of emissions reduction across the schemes we administer. However, we are increasingly seeing demand for units and certificates growing from corporates and other levels of government beyond required regulatory compliance. We expect this latter area of demand to grow strongly going forward and, over time, deliver material additional emissions reduction.

Recognising the growing diversity of demand, the carbon abatement estimate in Figure 29 is estimated based on all ACCUs at the time they are issued as well as emissions reduction from all the RET eligible generation from renewables, regardless of the source of demand for the units and certificates. The estimate therefore includes ACCUs that are not contracted to the Commonwealth. This abatement helps to meet Australia's international targets, beyond that under contract to the Commonwealth. The estimate excludes so called 'baseline' renewables generation already in place prior to the commencement of the RET.

Abatement estimation methodology

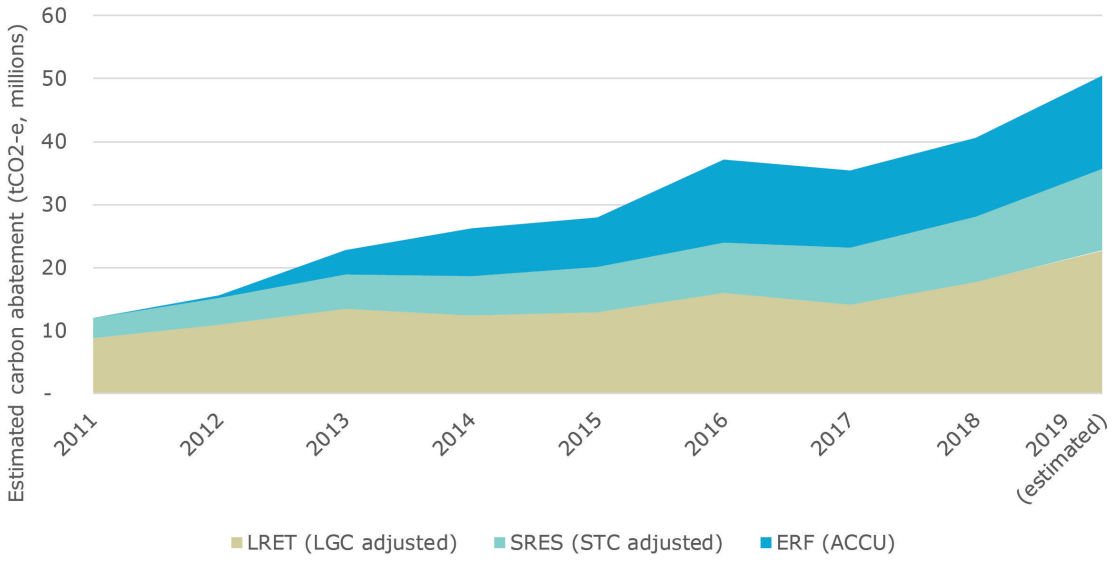
LGCs and STCs are equivalent to one megawatt hour of renewable electricity produced. One ACCU is equivalent to one tonne of carbon dioxide abatement equivalent. To determine abatement across the RET and ERF, ACCUs issued for the period have been added to the abatement from large and small-scale renewable electricity generation under the RET[30].

To convert renewable generation into a carbon abatement equivalent, it is multiplied by the emissions intensity factor of the Australian electricity network[31].

Renewable energy generation predominately displaces thermal generation with higher emission intensities. Accordingly, greater penetration of renewables leads to a lower emissions intensity of the electricity grid.

The conversion of renewable electricity generation to a carbon value using this emissions intensity factor is considered a conservative estimate. The alternative approach would use the weighted average emissions intensity of the coal and gas generation displaced by renewables, including self-generation of rooftop solar, which would be higher.

Figure 29: Estimated carbon abatement from ERF and RET, 2011 to 2019



30 Only the estimated generation and displacement for the year in which a small-scale renewable energy system is installed is accounted for in abatement estimation methodology. In this way generation and displacement from forward deemed small-scale renewable energy systems are not included.

31 Department of Environment and Energy's March 2019 Update of Australia's National Greenhouse Gas Inventory.

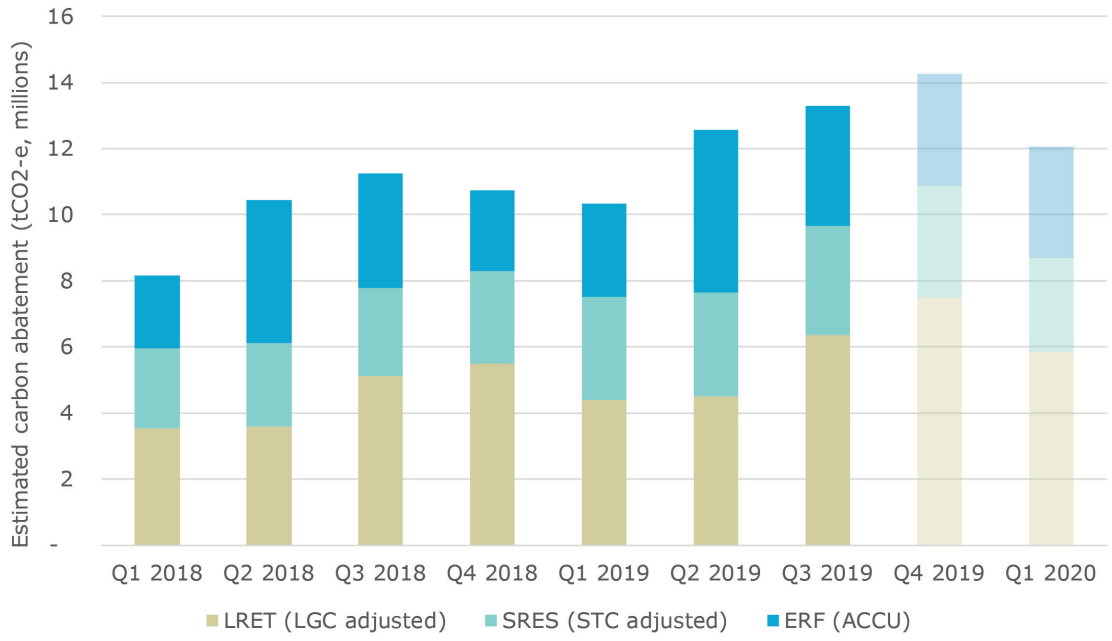
Over Quarter 3 2019, it is estimated that there will be a total abatement of 13.3 million tCO_2-e from the carbon markets we administer (Figure 30). This is an 18 per cent increase from Quarter 3 2018.

Looking ahead, total abatement is set to increase to above 14 million tCO_2-e in Quarter 4 2019, and then fall to 12 million tCO_2-e in Quarter 1 2020. This is due to a combination of seasonal variation in generation from large and small-scale renewables and the commercial decision to structure contract abatement delivery in the ERF outside of the first quarter.

Across sectors for Quarter 3 2019, emissions reductions were highest in the electricity (8.9 million tCO_2-e), waste (1.8 million tCO_2-e) and vegetation sectors (1.5 million tCO_2-e). Energy efficiency, mainly through installations of solar water heaters under the SRES and through energy efficiency projects under the ERF, accounted for 0.7 million tCO_2-e. Emissions abated from the transport sector and industrial fugitive emissions were lower, accounting for 9,489 tCO_2-e and 13,861 tCO_2-e respectively (Figure 31).

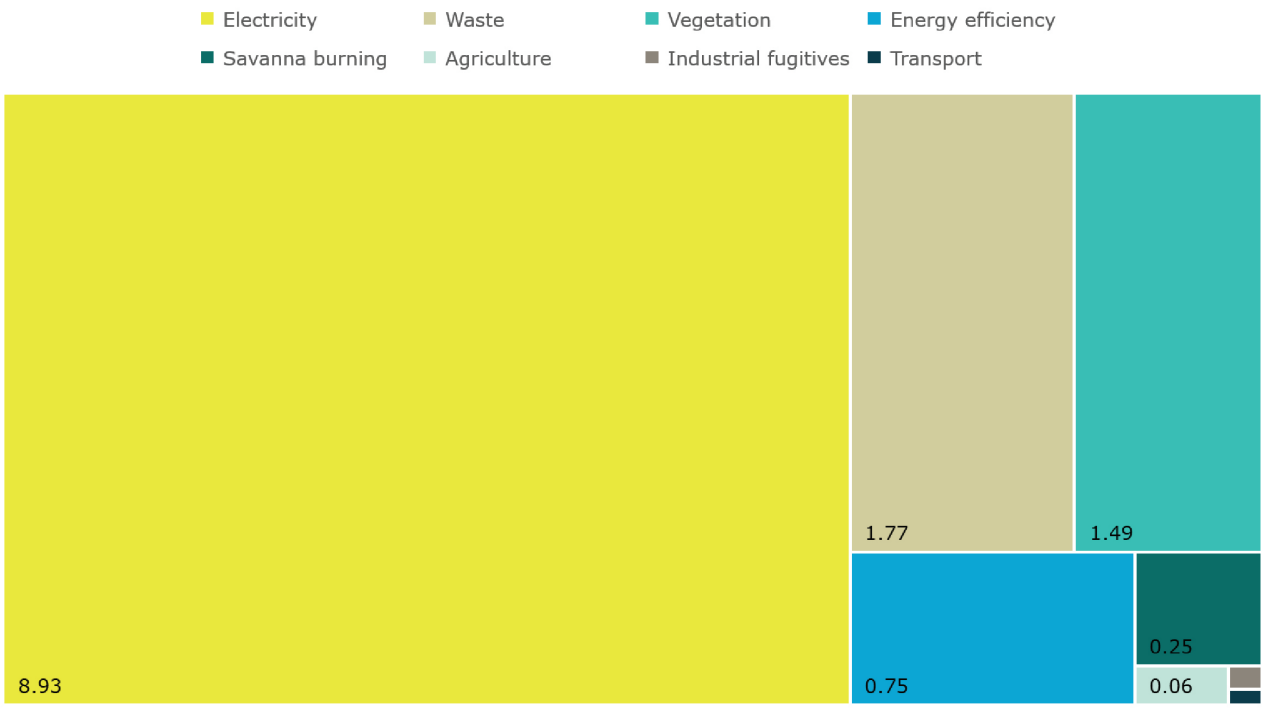
These trends are consistent with recent findings that the National Electricity Market (NEM) emissions and emissions intensity for Quarter 3 2019 reached their lowest level on record[32], with an average emissions intensity of 0.7 tonnes of carbon dioxide equivalent per megawatt hour (tCO_2-e/MWh). This is 10 per cent lower than Quarter 3 2018 and 22 per cent lower than Q3 2011. This fall in emissions intensity is a clear indication of the increased abatement from additional renewable energy generation in the electricity sector.

Figure 30: Estimated carbon abatement from ERF and RET, Q1 2018 to Q1 2020



32 Australian Energy Market Operator, Quarterly Energy Dynamics – Q3 2019, November 2019, p.12 available at https://www.aemo.com.au/Media-Centre/AEMO-publishes-Quarter-Energy-Dynamics---Q3-2019.

Figure 31: Estimated carbon abatement by sector from ERF and RET, (Quarter 3 2019)



6. Market spotlight: Voluntary, state and territory government markets

Many large and small businesses are adopting strategies to address climate change related risks and to reduce emissions. This means that businesses are going beyond their compliance obligation into ambition. This is in part driven by shareholder concerns, supply chain pressures, and climate risk disclosures. The rise of an investor preference for Environmental, Social and Governance (ESG) investments is driving voluntary action by corporations to reduce or offset emissions.

An example of this trend is Climate Action 100+, an investor led initiative that accounts for two-thirds of annual global industrial emissions where companies commit to improving their climate performance and transparent disclosure of emissions.

Domestically, many Australian companies are also setting ambitious targets, for example Qantas Group's recent announcement that they will reach net zero carbon emissions by 2050, in a major expansion of the airline's commitment to a more sustainable aviation industry. Likewise, many state and territory governments in Australia also have commitments and policies to reduce and offset emissions for specific activities within their jurisdiction.

Existing Government policy frameworks facilitate this ambition by providing a sound verification framework to facilitate companies demonstrating voluntary commitments to reduce and offset emissions. Consequently, the voluntary and state and territory government market share of the total carbon offset market has increased in recent years from 10 per cent in 2016 to 12 per cent in 2018 (Figure 32) and can be expected to grow further.

Queensland Government Land Restoration Fund

The Queensland Government's $500 million Land Restoration Fund aims to expand carbon farming in the state by supporting land-sector projects that deliver clear environmental, social and economic co-benefits or support research and development for new carbon farming methods. 12 projects have been announced in the pilot phase of the program.

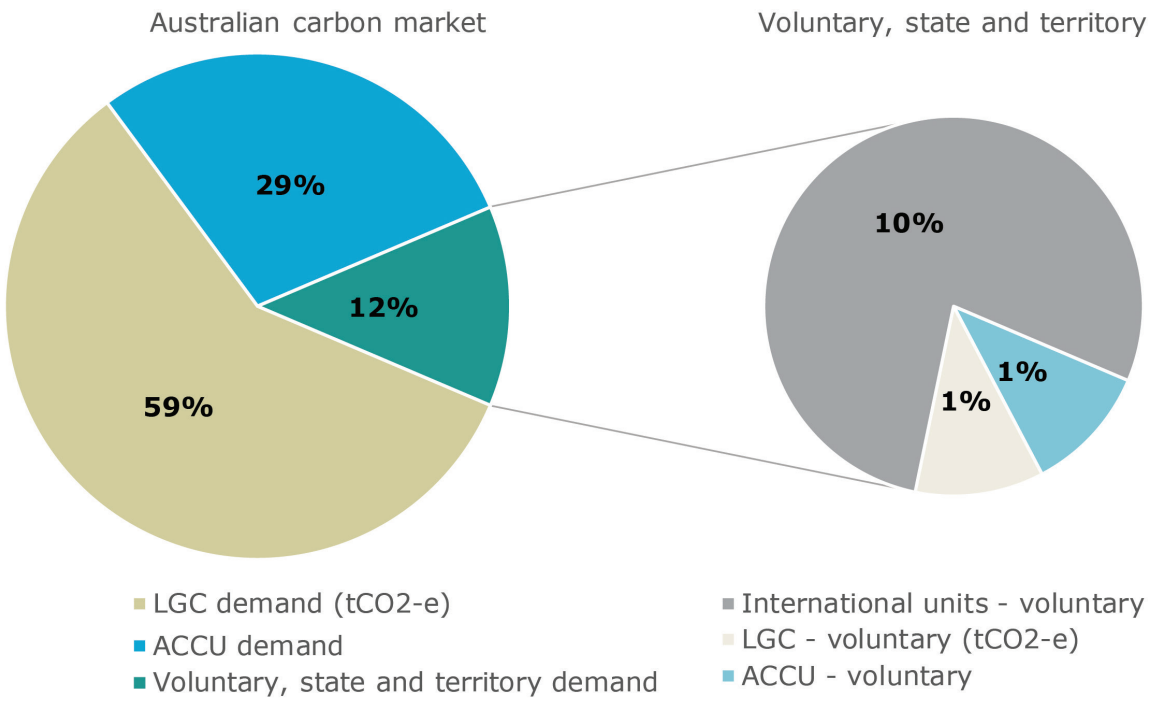
It is expected the Queensland Government may proceed with further purchasing processes.

In 2018, an estimated 4.9 million tonnes of carbon abatement was surrendered by voluntary and state and territory market participants with 0.5 million ACCUs, 0.6 million LGCs (CO_2-e)[33] and 3.8 million international units[34] surrendered. International units made up over 77 per cent of all voluntary demand with 2.2 million certified emission reduction units (CERs) and 1.6 million voluntary emission reductions (VERS) and verified carbon units (VCUs) surrendered in 2018.

33 LGC data discussed on carbon value or compared market has been converted to CO_2-e.

34 International units are a combination of certified emissions reduction units (CERs) through the Clean Development Mechanism, voluntary emission reductions (VERS) through Gold Standard and verified carbon units (VCUs) through Verra.

Figure 32: Australian carbon offset market composition, 2018[35]



Prices

There is a wide price spread between carbon units used for the Australian voluntary and state and territory market from below $1 for CERs and $60.75 for carbon equivalent converted LGCs. Drivers of these price differences are due to:

- the location of the project generating the unit (e.g. overseas or Australian origin);
- co-benefits associated with each project (e.g. many projects have additional positive benefits associated with carbon abatement, in terms of economic, environmental, social and cultural aspects).
- the demand markets that each unit can access (e.g. ACCUs are the only unit for delivery under Commonwealth contracts under the ERF).

LGCs currently trade at a higher price than other commodities used for voluntary surrender due to the statutory demand required under the LRET and its associated market dynamics, as explained in section 2.4. LGC prices are expected to fall substantially in future as supply exceeds the amount required to meet the statutory target. However, prices are not likely to go to zero as excess certificates can and are likely to be used to meet voluntary commitments. It seems reasonably likely the voluntary market could eventually find an equilibrium between ACCU and LGC prices to converge at what would be the carbon equivalent price.

35 The voluntary and state and territory carbon market is defined as ACCUs, LGCs and international units. Additional voluntary demand for international offsets may exist but are not included in this data set as these units may be cancelled in international registries and used for voluntary action of which we are not aware. Data for the voluntary, state and territory demand is sourced from the Clean Energy Regulator and from the Department of the Environment and Energy.

This is because LGCs have an inherent displaced carbon value and purchasers seeking to offset emissions would value them for this purpose.

If ACCU prices remain at current levels ($16.10) over the next three years, we expect carbon equivalent converted LGC and ACCU prices to converge by early 2022 (Figure 33)[36]. As the LGC price declines, entities may look to secure a portfolio of LGCs to reduce their scope 2 emissions to meet future carbon neutrality (such as the Climate Active Carbon Neutral Standard[37]) or carbon reduction obligations.

It is difficult to predict timing of the convergence of ACCU and LGC prices in terms of carbon equivalence. While forward LGC prices are known and regularly trade, Figure 33 does not show a changing ACCU price, as there is little forward price information available.

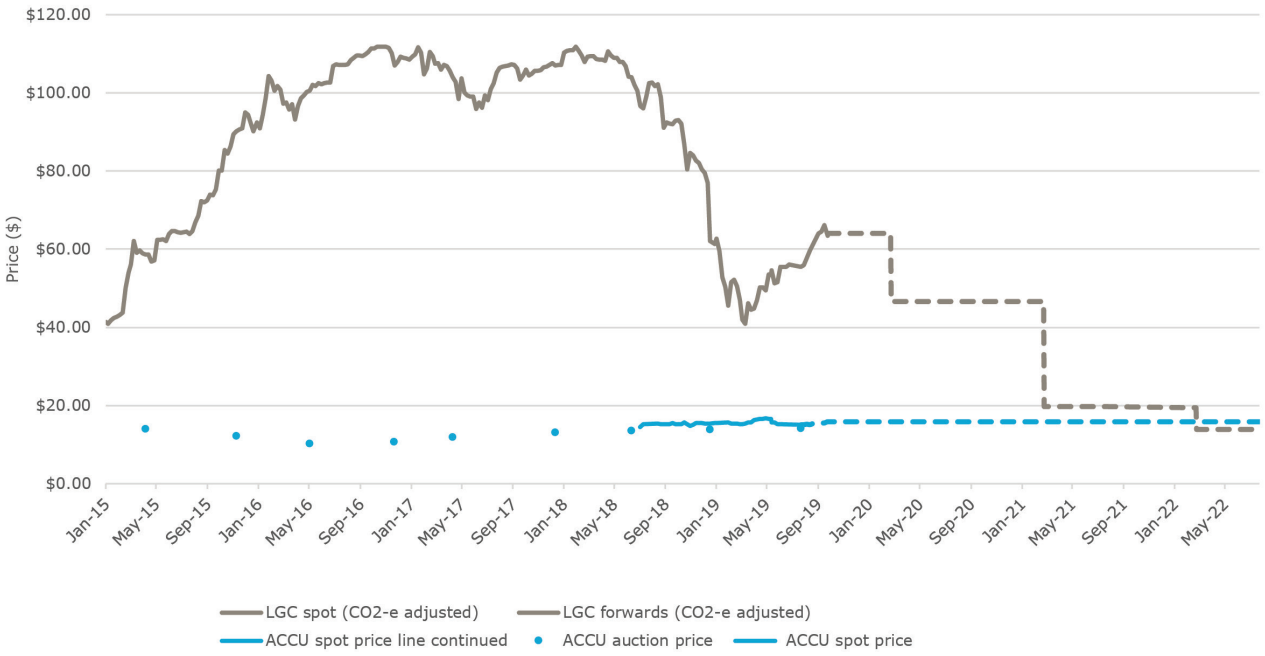
The use of LGCs to offset scope 2 electricity emissions is increasing and markets are likely to continue to innovate in this area.

LGCs

LGC voluntary demand represented 11 per cent of the overall voluntary market in 2018.

In Quarter 3 2019, 627,839 LGCs were surrendered voluntarily, with the majority of demand coming from GreenPower (Figure 34). However, decreasing GreenPower demand over the last two years, likely due to high LGC spot prices in 2017 and 2018, resulted in an 18 per cent decline in voluntary LGC surrender from 2018 to 2019.

Figure 33: ACCU and LGC price convergence, 2015 to 2022[38]

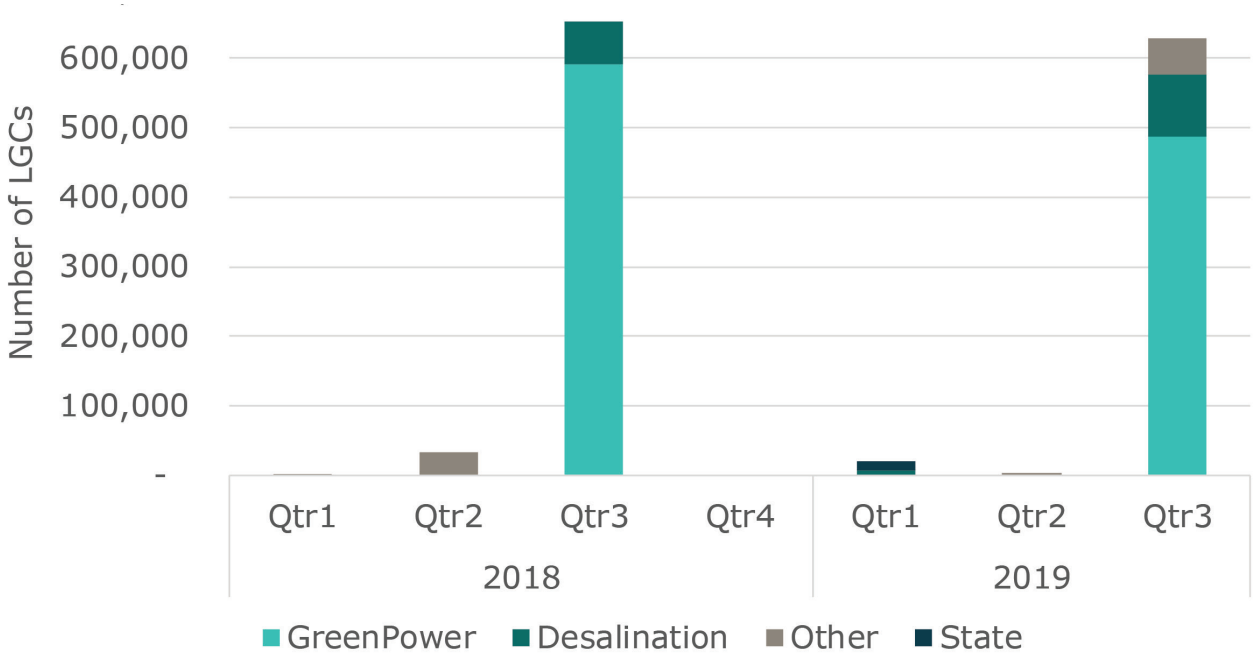


36 This convergence may occur slightly earlier or later depending on the actual future LGC and ACCU prices. For example, if ACCU prices rise and LGC prices fall further over this time period, the convergence will occur earlier.

37 Climate Active Carbon Neutral Standard was formerly known as the National Carbon Offset Scheme (NCOS).

38 Data sourced from TFS Green and CommTrade Carbon.

Figure 34: Voluntary, state and territory government demand for LGCs, Q1 2018 to Q3 2019



Other sources of voluntary demand are growing with surrenders doubling over the past two years, from 28,000 in 2017 to 55,424 in 2019. Future avenues for voluntary demand may emerge through Climate Active Carbon Neutral Standard surrenders which offset the scope 2 emissions from electricity of the entity/service/program/ building by certifying through renewable generation to meet carbon neutrality.

Quarter 1 2019 saw the inaugural surrender of LGCs under a state program, with over 12,000 LGCs surrendered for the Melbourne Solar Trams Project. Additionally, the ACT Government's 100 per cent Renewable Energy Target may result in the voluntary surrender of 2.1 million LGCs by February 2020. Similarly, voluntary surrenders from the Victorian renewable energy target projects are expected to begin in 2020.

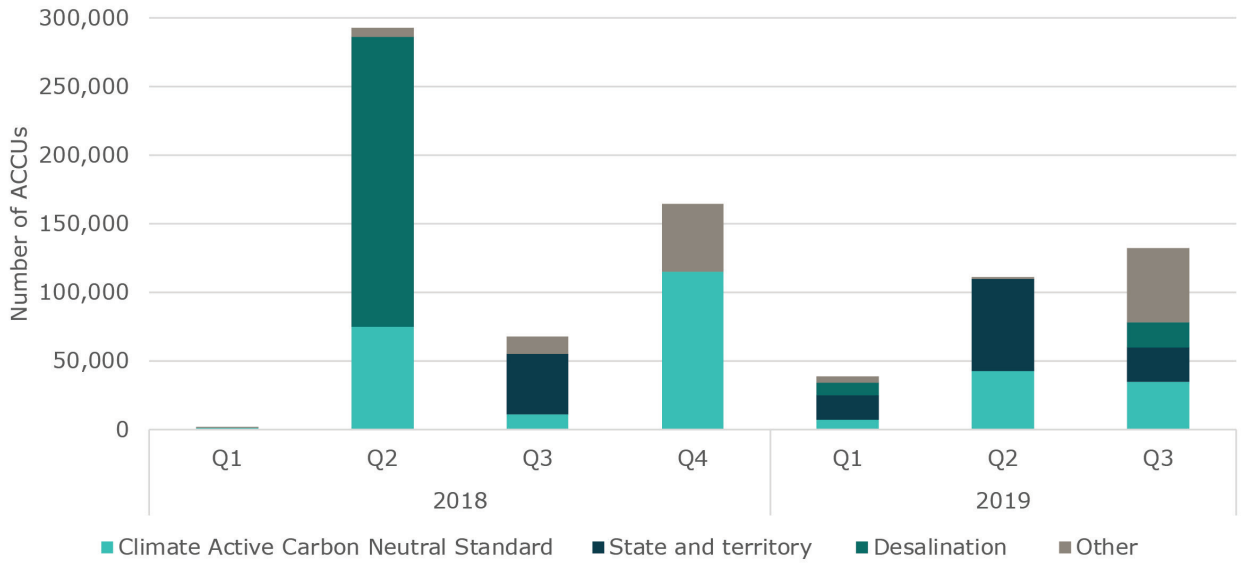
ACCUs

ACCU voluntary and state and territory demand is increasing and represented 11 per cent of the voluntary market in 2018. Over 211,000 ACCUs were surrendered by desalination plants, and over 43,000 ACCUs by government fleets in 2018. Demand from Climate Active Carbon Neutral Standard almost quadrupled from 2017 to 2018, with over 200,000 ACCUs surrendered (Figure 35).

While the large demand from desalination plants in 2018 is unlikely to be repeated in 2019, overall demand is still expected to be at similar levels due to continued increases from other demand sources[39].

39 For more information and analysis on the voluntary market please refer to the voluntary cancellations table on our website.

Figure 35: Voluntary, state and territory government ACCU demand by source, Q1 2018 to Q3 2019[40]



Since 2014, over one million ACCUs have been voluntarily surrendered with the majority from savanna burning (57 per cent) and vegetation (41 per cent) methods. Quarter 3 2019 saw the second largest surrender of ACCUs by vegetation methods to date, 50 per cent this quarter (Figure 36).

Voluntary buyers often value and are prepared to pay a premium for the broader benefits associated with the underlying projects. For example, savanna burning projects often support employment in indigenous and rural communities, and vegetation projects may have complementary biodiversity and/or water quality benefits. This is evidenced by Figure 36 which shows voluntary surrenders are mostly derived from vegetation and savanna burning projects with very few ACCUs surrendered from waste projects.

Other Units

CERs were the most sought after voluntary carbon unit in 2018 with 2.2 million units surrendered, over 45 per cent of the market share. This is due to CERs being the lowest cost unit as shown in Table 5. However, it is likely actual prices paid by many voluntary market participants may be above this price as not all CERs are eligible for use when making a carbon neutral claim against Climate Active Carbon Neutral Standard[41]. Negotiations about the use of these units for the Paris Agreement period are expected to conclude within the next year. This will provide greater clarity to the voluntary market on the availability and price of these units in the near term.

Other units such as VERs through the Gold Standard[42] and VCUs through Verra[43] are also valued units in the voluntary market. Market intelligence suggests that the majority of units are likely selling at prices ranging from less than $1 to $10[44].

40 Data sourced from the Clean Energy Regulator and from the Department of the Environment and Energy.

41 See Guidance: Offsets – Eligible offsets for the Climate Active Carbon Neutral Standard for more information.

42 https://www.goldstandard.org/.

43 https://verra.org/.

44 Price information for VCUs is gathered from market intelligence and is not currently publically available.

Figure 36: Voluntary, state and territory government ACCU demand by method type, Q1 2018 to Q3 2019

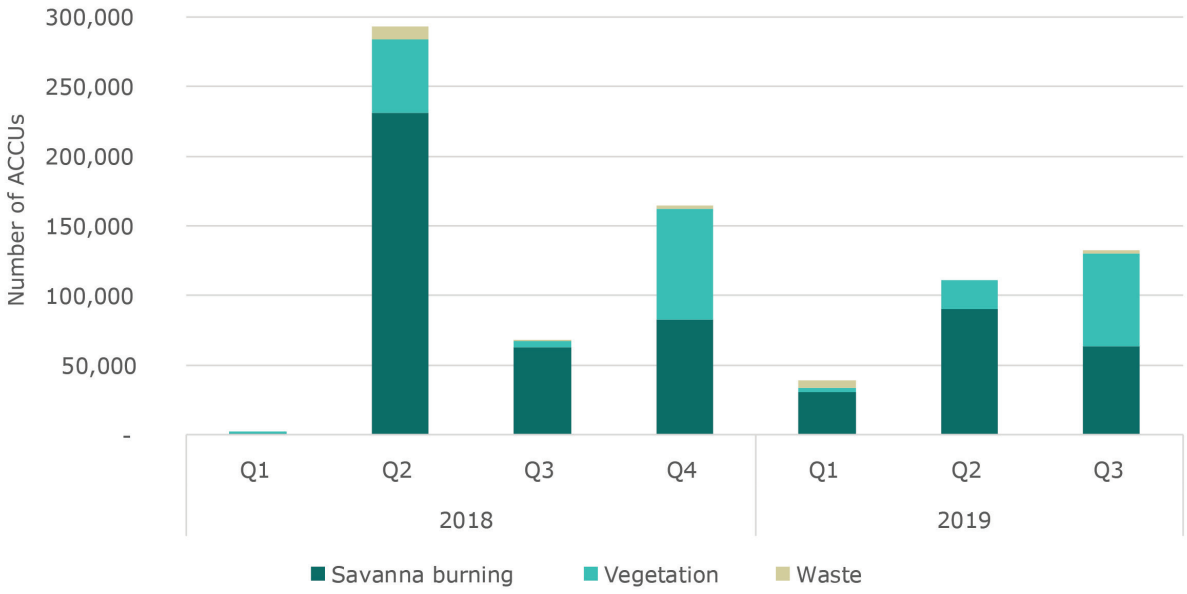


Table 5: Domestic and international carbon market spot price

Product	Spot price AUD (30 September 2019)[45]	Quarterly trend	Change in Price
ACCU	$16.10	Up	+$1.10
LGC (CO_2-e)	$60.75	Up	+$5.50
ESC	$22.15	Up	+$1.25
VEEC	$22.50	Up	+$0.10
CER	$0.34	Up	+$0.04
EUA	$36.87	Down	-$10.27
NZU	$23.16	Down	-$0.49

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

45 Data sourced from OMF, CommTrade Carbon, TFS Green, Thomson Reuters and Korea Exchange.

Glossary

Term	Acronym
Australian carbon credit unit	ACCU
Australian National Registry of Emissions Units	ANREU
Certified emission reduction unit	CER
Climate Solutions Fund	CSF
Emissions Reduction Fund	ERF
Energy saving unit certificate	ESC
EU allowance unit	EUA
Large-scale generation certificate	LGC
Large-scale Renewable Energy Target	LRET
Marginal loss factor	MLF
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

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