Australian Government
Clean Energy Regulator

CLEAN ENERGY REGULATOR

Quarterly Carbon Market Report

December Quarter 2019

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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 December Quarter 2019 (October 2019 to December 2019) and provides information on supply and demand trends and opportunities to inform market decisions.

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 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 Quarterly Carbon Market report, or the availability or non-availability of Quarterly Carbon Market report.

Executive summary

Carbon abatement from schemes administered by the Clean Energy Regulator reached 50 million tonnes of carbon dioxide equivalent (CO2-e) in 2019 and is expected to ramp up to 59 million tonnes CO2-e in 2020 (see Figure 1).

Records were broken in supply across all carbon markets in 2019, and the same is expected in 2020.

In the Emissions Reduction Fund (ERF), 14.8 million Australian Carbon Credit Units (ACCUs) were issued, surpassing the 13.1 million ACCUs issued in 2016. Supply is expected to rise to over 16 million ACCUs in 2020.

Supply of large-scale generation certificates (LGCs) grew by almost a third compared to 2018, from 23.0 to 29.6 million certificates. Small-scale technology certificate (STC) supply also strengthened by over 20 per cent compared to 2018, from 29.9 to 35.8 million certificates.

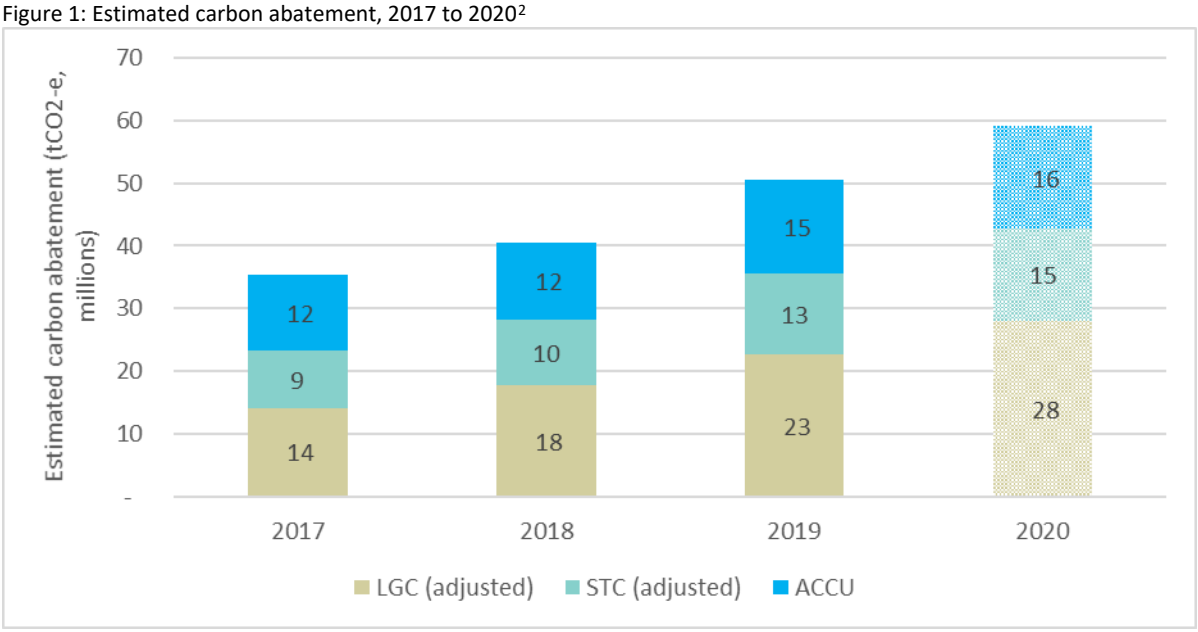
Investment in renewables remained strong

The Renewable Energy Target (RET) has not acted as a cap on renewable investment.

Across Australia 6.3 gigawatts (GW) of new renewable energy capacity was delivered, up 24 per cent from the previous record set in 2018. Household and commercial rooftop solar PV grew by 40 per cent from 1.7 GW in 2018 to 2.4 GW in 2019; and utility scale by 18 per cent from 3.3 GW to 3.9 GW[1]. A similar total capacity is expected to be delivered in 2020 - between 6.0 and 6.5 GW, although the mix will likely differ.

Total electricity generated or displaced from RET incentivised renewables was 44 terawatt hours (TWh) in 2019, up from 37 TWh in 2018.

Figure 1: Estimated carbon abatement, 2017 to 2020[2]



[1] Rooftop solar is all solar under 5 MW, utility scale solar is all solar above 5 MW.

[2] Large-scale and small-scale generation data has been converted to tCO2-e of carbon abatement at the grid average carbon emissions intensity. One ACCU is equivalent to one tonne of carbon dioxide abatement equivalent. Details of the calculations are set out in the accompanying workbook.

In 2019, 2 GW of new utility-scale renewable capacity reached financial close. While this was down on the record 4.4 GW in 2018, it was five times the average annual capacity of 0.4 GW that reached financial close in the first 15 years of the RET. The Clean Energy Regulator sees this as a strong result following the boom in investment in 2017 and 2018, after which the build signal from wholesale electricity prices and LGCs fell materially as supply increased. Other important context is the added cost and risks around grid connections and Marginal Loss Factors (MLFs).

It is expected that the 2020 Large-scale Renewable Energy Target (LRET) of 33,000 GW hours (GWh) will be met in 2020. The Clean Energy Regulator expects 35,000 to 37,000 GWh; this number has been revised down from previous estimates because of increasing lag time to connect new power stations plus increasing curtailment of generation owing to grid constraints. Total electricity generated or displaced by RET incentivised renewables should increase from 44 TWh to 56 TWh in 2020.

Australia's rapid transition to renewables is continuing despite increasing grid issues. It is estimated that 25 per cent of electricity in the National Electricity Market (NEM) was from renewables by the end of 2019. This aligns with the Department of Environment and Energy projections, released in December 2019 where Australia's electricity supply is projected to be 34 per cent renewable by June 2023[3].

Significant challenges have emerged in connecting and integrating some of the current pipeline of renewable projects into the grid in north-western Victoria. The damaged Heywood interconnector has also caused curtailment of generation from operating renewable power stations.

These grid constraints need to be overcome to leverage both the full generation potential of existing power stations, and those under construction, and also to ensure the forward pipeline of projects reaching financial close remain solid.

Australian Energy Market Operator (AEMO) released the 2020 draft Integrated System Plan which shows the potential for connecting up to 13 GW[4] of capacity in the NEM until the next grid upgrades and infrastructure work is completed. It also identifies priority transmission projects and renewable energy zones, which the Clean Energy Regulator welcomes.

There is evidence of the market finding some workarounds to increasing grid constraints and declining MLFs. Some utility-scale project developers are still finding relatively strong parts of the grid to build new projects. Some are also adding batteries. Growth is also seen in off-grid renewables systems on resources projects, as well as 5 – 30 megawatts (MW) solar PV in locations close to large load sources. Rooftop solar continues to grow strongly across the household and commercial sectors.

The Clean Energy Regulator believes a second wave of renewables investment can be unlocked if the necessary grid work can be progressed quickly, and changes are made at a distribution level to enable high levels of annual rooftop solar capacity additions to continue.

[3] This projection uses up to date Clean Energy Regulator and AEMO estimates.
[4] Page 10, AEMO 2020 Integrated System Plan.

Climate Solutions Fund (CSF) offers new flexibility to grow total ACCU supply

Abatement in the ERF is recognised at the point of crediting. New sources of demand including from state governments and businesses are emerging that are likely to pull forward new supply. The Clean Energy Regulator has taken steps to lower the risk of project development with a new optional delivery contract available.

This option gives sellers the right, but not an obligation, to sell ACCUs to the Commonwealth at a set price within a set time. It provides a guaranteed floor price with the flexibility for sellers to sell some or all of their ACCUs elsewhere if it is profitable to do so. Additionally, it removes the obligation to deliver if the project does not go ahead. The Clean Energy Regulator expects this option will accelerate project registration and crediting as it enables project developers to better manage investment risk while also providing a long-term Commonwealth government contract as security.

Interest in corporate sustainability accelerating

Business appetite for verified action that can meet corporate commitments and address climate risks is increasing. Announcements from national financial institutions, such as the Reserve Bank of Australia and the Australian Prudential Regulation Authority, recommending businesses adequately address and disclose climate change related risks to investors are a key driver. Shareholders, supply chain partners and the public are also wanting independent reporting of corporate achievements in this space.

As businesses explore options to address climate risks, an increased use of renewable energy and LGCs to offset emissions is being observed. For example, some desalination plants, are now investigating alternative emissions reduction and offsetting arrangements to ACCUs, such as investing in renewable energy projects linked to their facilities or purchasing and surrendering LGCs. Also, Climate Active participants for the first time in Quarter 4 2019 voluntarily surrendered LGCs to meet carbon neutrality commitments.

To assist business and corporates in understanding options to reduce their emissions and to achieve carbon neutrality, the Carbon Market Institute and the Clean Energy Regulator will collaborate to run a series of workshops nationally over March and April 2020. The focus of these workshops will be on how businesses can participate in Australia's carbon markets to meet corporate climate and sustainability goals.

Recent bushfires

Australia's 2019-20 bushfires, while having a devastating impact across communities in rural and regional Australia, have not had a material impact on the Clean Energy Regulator's schemes to date. Initial assessment shows that the areas burnt do not significantly overlap with projects registered under the ERF. The Clean Energy Regulator does not expect the supply of ACCUs in 2020 to be substantially reduced as a result of bushfires.

Bushfire smoke reduced the generation from solar PV in affected areas. For example, a solar monitoring company has found output from rooftop solar panel systems in Sydney and Canberra were significantly impacted on recent heavy bushfire smoke haze days. However, the overall impact was not material with record generation from renewable energy in Quarter 4 2019.

The Clean Energy Regulator proactively shares information with relevant state and territory fire authorities to assist them meeting their responsibilities. Under the RET, locations of renewable installations are shared with fire authorities so that fire authorities know where solar PV installations are when attending incidents. For the ERF, the locations of ERF projects are shared with fire authorities ahead of each fire season to assist rural fire services with planning ahead of each bushfire season. The Clean Energy Regulator will work with any participants affected by fire once the threat has passed.

Unit and certificate prices

The LGC price fell in the lead up to the surrender deadline of 14 February 2020. This suggests material shortfall charge should be expected for the 2019 assessment year, as some liable entities continue to arbitrage lower forward prices[5].

In contrast, the ACCU price trended up primarily due to increasing voluntary demand.

STC price moderated marginally during the quarter.

Table 1: Price trend, Q4 2019

Certificate type	Spot price AUD (31 December 2019)[6]	Quarterly trend
ACCU	$17.25	+$1.15
LGC	$39.00	-$9.00
STC	$37.40	-$0.45

[5] Clarification on tax treatment of shortfall refunds announcement.
[6] Data sourced from CommTrade Carbon and TFS Green.

1. Australian carbon credit units

- 2019 was a record year with 14.8 million ACCUs issued, surpassing the previous highest issuance of 13.1 million ACCUs in 2016. Supply is expected to rise to over 16 million in 2020.
- Modest increase in the project portfolio in 2019 with 39 new projects registered taking total registered projects to 793.
- New optional delivery contracts offer more flexibility and a guaranteed floor price.
- Next ERF auction will be held on 25–26 March 2020.
- Spot prices trended up to $17.25, an increase of $1.15 from Quarter 3 2019.
- No material impact to ERF projects from Australia's bushfires in Quarter 4 2019.

1.1. Supply and demand balance

The balance of ACCUs held in the Australian National Registry of Emissions Units (ANREU) increased from 5.4 million in Quarter 3 2019 to 6.1 million in Quarter 4 2019[7] (Table 2).

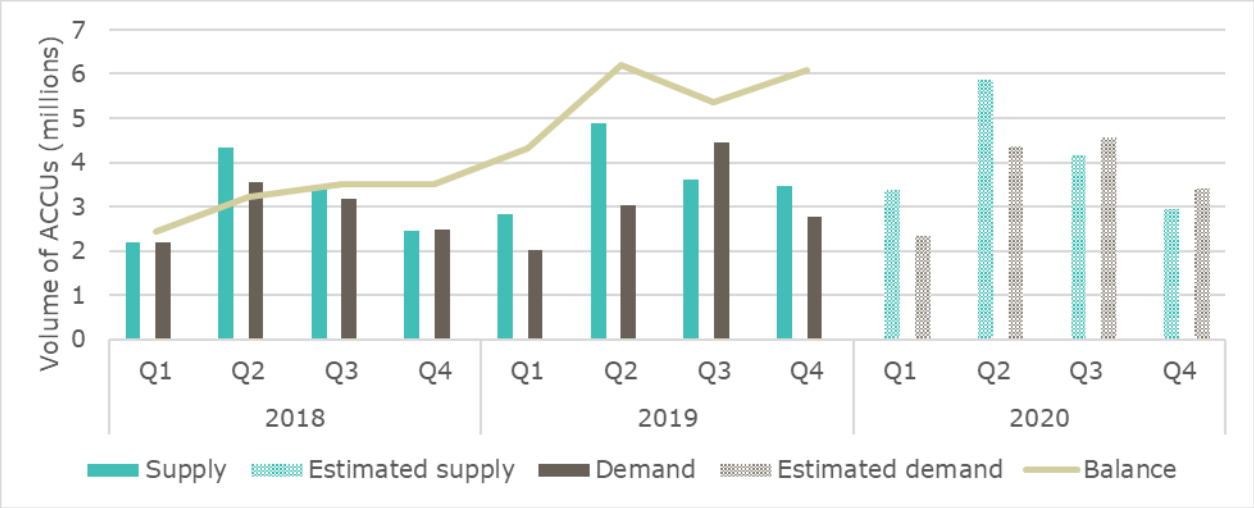
Supply of ACCUs increased by 3.5 million, up 41 per cent compared to Quarter 4 2018. Demand for ACCUs was 12 per cent higher than Quarter 4 2018.

Table 2: Balance of supply and demand at Quarter 4 2019 close[8]

Balance/supply of ACCUs from Quarter 3	+5,366,266
ACCUs issued Quarter 4	+3,475,000
Emissions Reduction Fund contract deliveries	-2,566,313
Safeguard surrender[9]	-2,637[10]
Voluntary surrender	-194,144
ACCU relinquishment[11]	0
Net balance at the end of Quarter 4	+6,078,172

[7] 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).
[8] 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.
[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] The 2,637 ACCUs surrendered is comprised of 1,737 ACCUs surrendered by entities for the 2018-19 compliance year and 900 ACCUs surrendered by an entity due to a resubmission of its 2017-18 NGER data resulting in an increase in emissions for that year.
[11] For more information see ACCU relinquishments.

Figure 2: ACCU supply and demand balance, Q1 2018 to Q4 2020



Supply is estimated to increase to 16.4 million ACCUs in 2020. With this increasing supply and a balance in accounts of over six million ACCUs, units in the ANREU Registry are expected to exceed current estimations of demand for 2020 (see Figure 2).

1.2. Factors impacting supply

Crediting

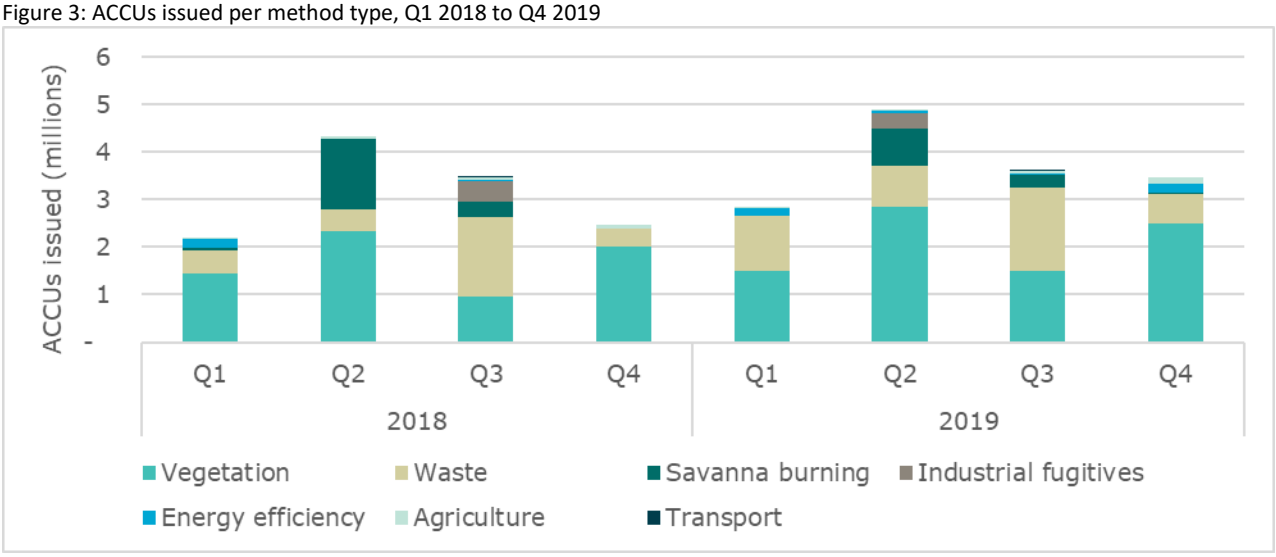
A record 14.8 million ACCUs were issued to ERF projects in 2019, surpassing the previous highest issuance of 13.1 million in 2016. Annual issuances to ERF projects under vegetation, agriculture, energy efficiency, and waste methods all increased. ACCUs issued to land fill gas projects had the largest increase, rising 68 per cent from 2.9 million in 2018 to 4.4 million in 2019 as landfills extracted and destroyed additional methane from their facilities (Figure 3). A tranche of 47 projects, from mostly vegetation and waste methods began to be credited, adding an additional 1.6 million ACCUs.

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. Over 22 million total ACCUs of future supply could be available from the 43 current conditionally registered Human-Induced Regeneration of a Permanent Even-Aged Native Forest projects in Western Australia over the 25 years of project life, with the potential for new projects to now come on line.

Of the 793 registered projects, 469 are currently generating ACCUs and 324[12] are yet to be credited.

[12] 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 3: ACCUs issued per method type, Q1 2018 to Q4 2019



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2019-20 Bushfires

To date Australia's bushfires have not had a material impact on ERF projects. Initial assessment of detailed geospatial data shows that the areas burnt do not significantly overlap with projects under the ERF (Figure 4). The overlap is limited to 11 vegetation projects that have been issued with less than 120,000 ACCUs and it is likely that much of the vegetation will regenerate. The supply of ACCUs or deliveries under Commonwealth contracts is not expected to be materially affected by the bushfires.

In September and December 2019, the Clean Energy Regulator communicated with all land-based project proponents to prioritise safety first in the event of a fire occurring on their project and that notifications of significant natural disturbance events, such as bushfire, can be made to the agency in due course once the immediate threat has passed.

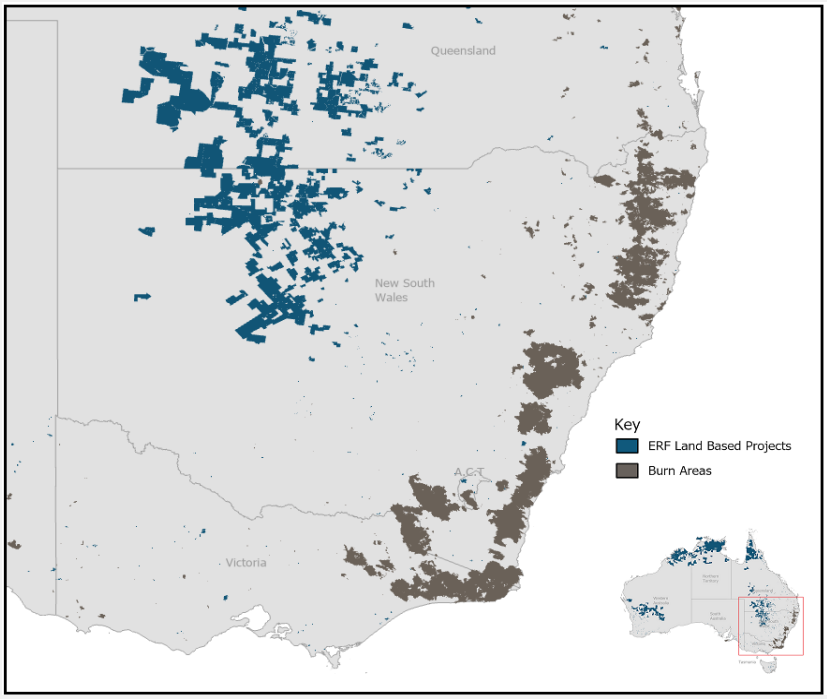


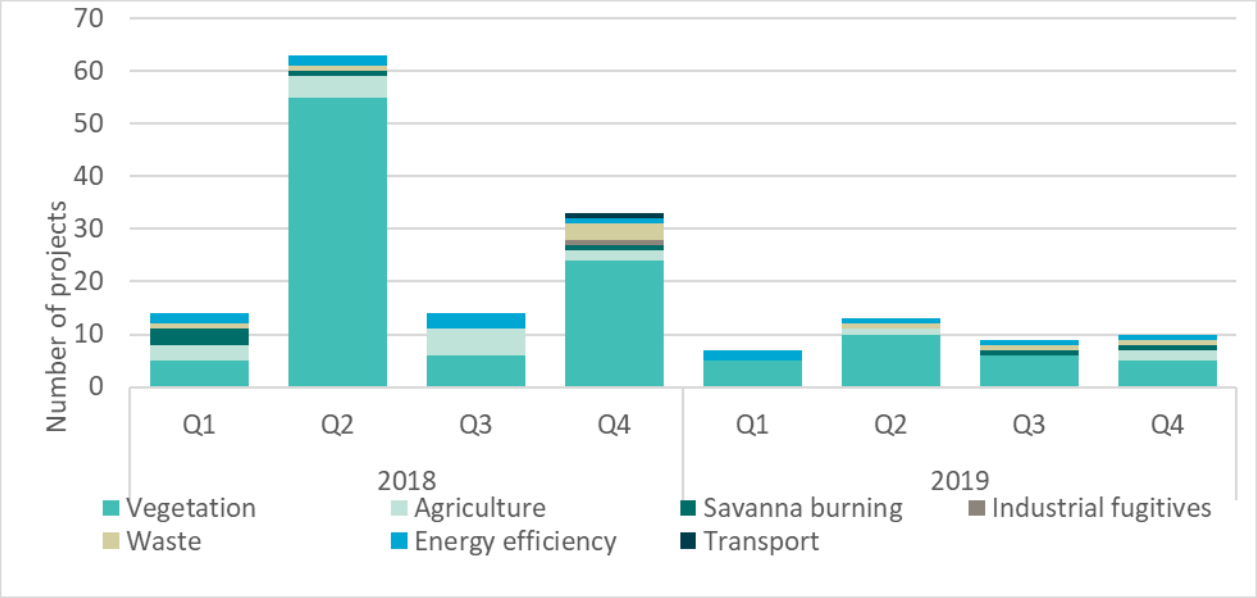
Figure 4: ERF land-based projects and bushfire burn region (NSW and VIC)

Projects

Ten new projects were registered in Quarter 4 2019, with half of the new projects registered under vegetation methods as shown in Figure 5.

This brings total registration in 2019 to 39 projects, a 69 per cent reduction from the 125 that were registered in 2018. The Clean Energy Regulator is working on initiatives under the CSF to support the initiation of new projects[13].

Figure 5: New registered projects per method type, Q1 2018 to Q4 2019



Climate Solutions Fund outreach and simple guides

The Clean Energy Regulator is attending field days and agricultural shows in regional Australia to raise awareness of the CSF with farmers and local stakeholders.

In late 2019, the Clean Energy Regulator attended two events in New South Wales—the Australian National Field Days in Borenore, and the Renewables in Agriculture Conference in Wagga Wagga.

In 2020, the outreach is expanding to more events across more states. In March 2020 the Clean Energy Regulator will have booths at the Talkin' Soil Health conference in York, Western Australia and at the Farm World field days in Lardner Park, Victoria. Details of these and future outreach events will be available on the CSF website.

The Clean Energy Regulator is developing simple factsheets and guides to assist participants to understand and run CSF projects. The first guide for soil carbon projects was launched on 21 February 2020 and is now available with various method factsheets on the CSF website. The first carbon credits for a soil carbon project were issued in 2019 with more issuances expected from the 45 projects registered under this method.

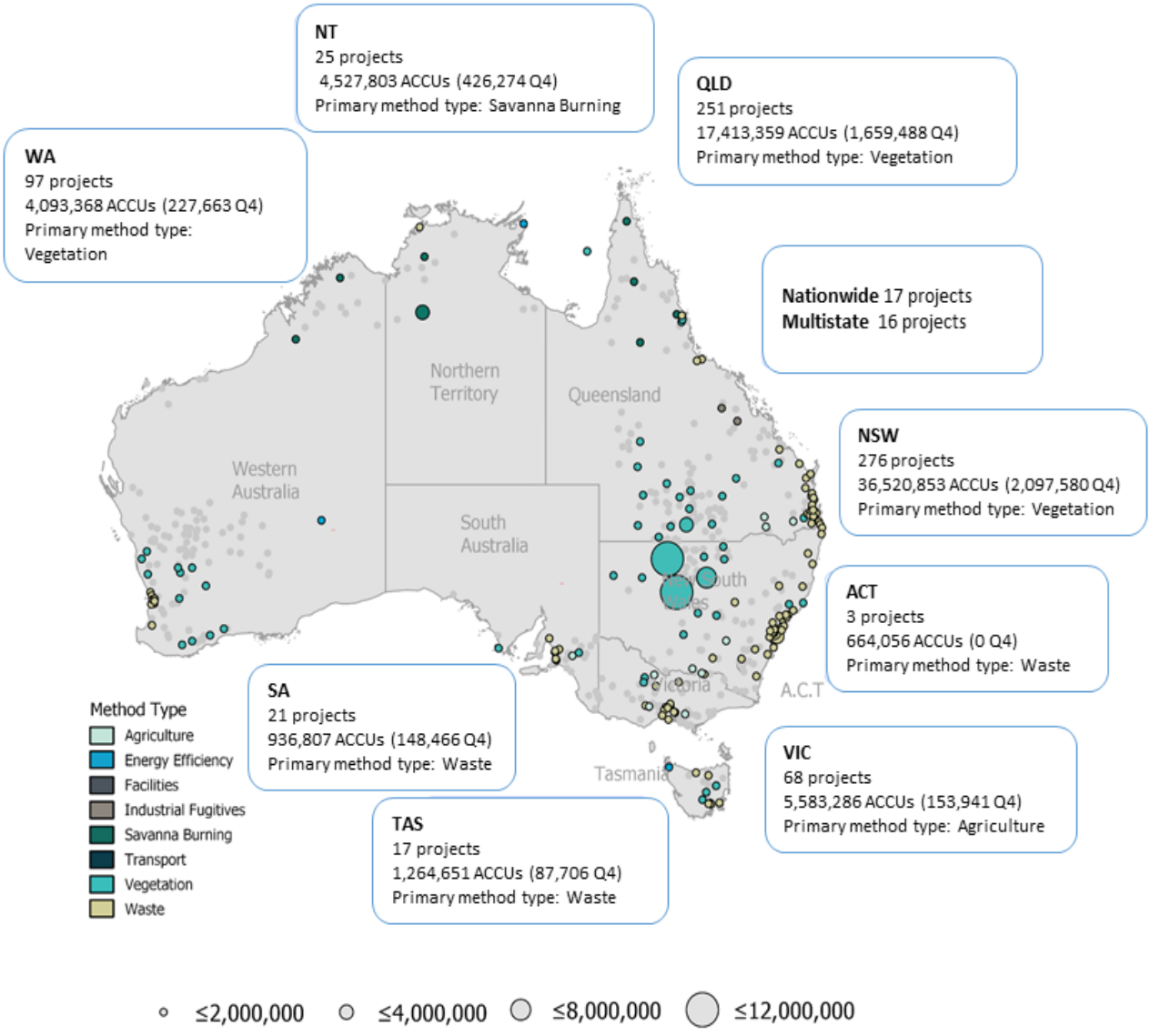
[13] Please see CSF website for further details.

The pace of project registration is expected to pick up in 2020 through the anticipated registration of new projects facilitated by the ERF auction on the 25–26 March, the Western Australian government announcement to allow offset projects on pastoral lands, the new optional delivery contract, and the Queensland government tender.

Clarity has been provided on transition arrangements for the Human Induced Regeneration (HIR) and Native Forest from Managed Regrowth (NFMR) projects, following announcement of transitional arrangements for the Full Carbon Accounting Model used to calculate ACCUs for many land-based methods on 20 December 2019[14]. These methods are the most frequently used methods under the ERF with a total of 303 registered projects representing 38 per cent of the portfolio.

A snapshot of the ERF project portfolio across Australia for Quarter 4 is shown in Figure 6.

Figure 6: Total number of ACCUs issued per method type by location, Q4 2019 and scheme to-date



[14] The transitional arrangements were published by the Department of Energy and the Environment on 20 December 2019.

1.3. Factors impacting demand

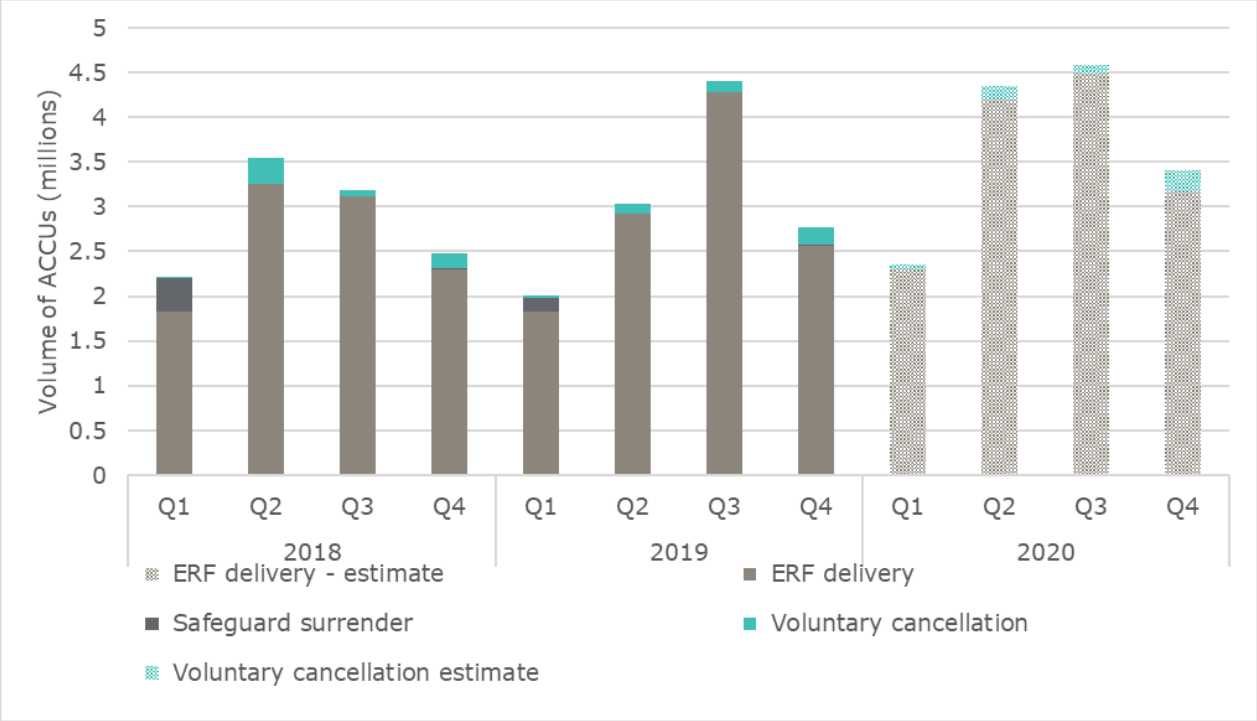
Total demand of 2.8 million ACCUs in Quarter 4 2019 was 0.3 million higher than the same quarter in 2018 (2.5 million ACCUs; see Figure 7).

Demand from state and territory governments is growing, with the Queensland Government announcing its first investment round for the Land Restoration Fund (LRF), which aims to invest A$100 million in new Queensland based carbon offset projects in 2020. Projects are required to be registered under the ERF in order to secure a contract under the LRF and must be new. Participants can have contracts with both the Commonwealth and the Queensland Government for the same project.

One of the main objectives of the LRF is to invest in projects that will provide social, economic and environmental co-benefits in addition to delivering carbon abatement through ACCUs. To help investors understand and value co-benefits, the Queensland Government has developed a co-benefit framework.

In its recent announcement, the Western Australian Government stated that 15 million ACCUs from Western Australian projects are likely to be purchased by large emitters to meet emissions targets. This further highlights the growing demand for ACCUs beyond Commonwealth contracts. Also in the quarter, the Western Australian Environmental Protection Authority (EPA) released its draft emissions guideline, requiring companies to show how they can "reasonably and practicably avoid, reduce, and offset" emissions in line with the state's net zero emissions by 2050 target. The EPA's final guideline will be released in March 2020.

Figure 7: Actual and estimated demand for ACCUs, Q1 2018 to Q4 2020



Commonwealth demand

In 2019, 11.6 million ACCUs were delivered under contract to the Commonwealth, up 10 per cent from the 2018 volume of 10.5 million ACCUs. Scheduled deliveries are estimated to significantly increase over the next two years rising up to 14.1 million in 2020 and 19.9 million in 2021 (see Figure 8).

Emissions Reduction Fund auctions

The tenth ERF auction will be held on 25–26 March 2020.

The agency is piloting a new approach to purchasing by introducing a new optional delivery contract. The contract aims to bring forward additional ACCU supply by providing a 'right', but not an 'obligation', to deliver ACCUs under an agreed contract. That is, sellers can choose whether to deliver abatement to the Commonwealth at a contracted price or sell some or all of their ACCUs elsewhere. It is expected that the optional delivery contract will help the voluntary carbon market to further evolve and mature, and that bids will reflect the value of the more flexible contract offering. More information on the optional delivery contract can be accessed from the Clean Energy Regulator website.

Auction rules have also been enhanced to allow for greater participation. From the tenth ERF auction, a benchmark price will no longer be set for the auction, which means all eligible auction bids will be considered.

Safeguard Mechanism Surrender

Safeguard entities are exercising options to keep their emissions below their baseline by 28 February 2020, including sourcing and surrendering ACCUs. A total of 1,737 ACCUs have been surrendered against the 2018–19 compliance year as at 31 December 2019. Overall demand for the 2018–19 compliance year is expected to be below that of previous compliance years. With a current balance in accounts of over 6.1 million ACCUs, safeguard entities should be able to access sufficient ACCUs to meet their liability if they choose to manage their emissions in this way.

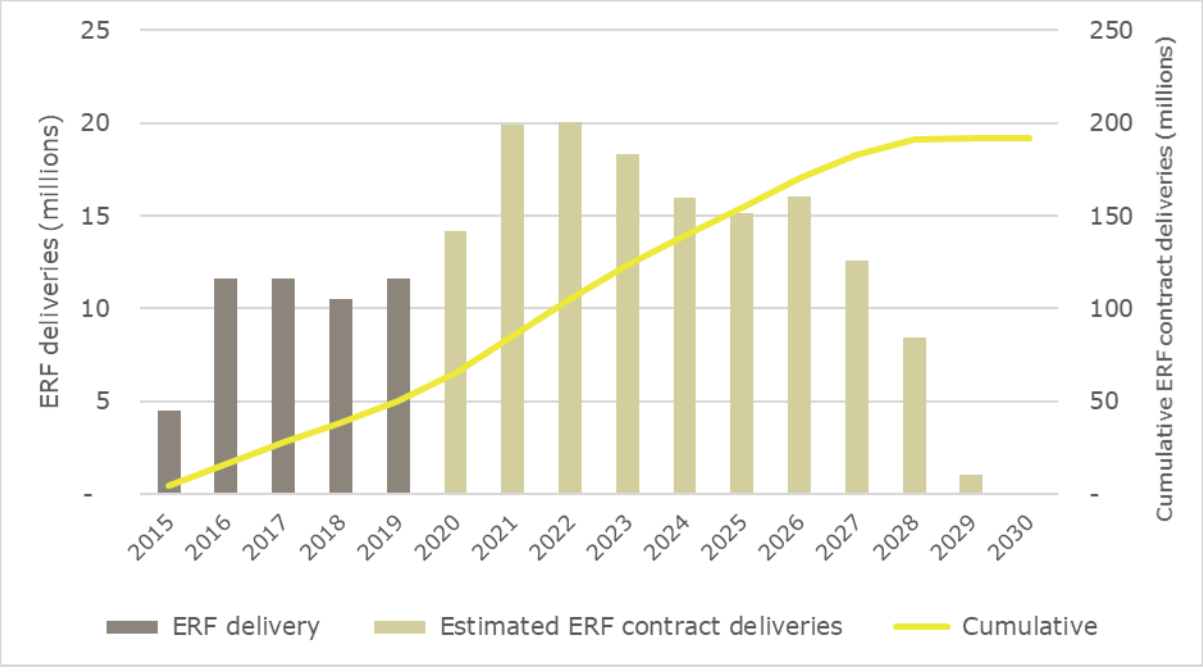
Voluntary Surrender

Abstracting from surrenders by desalination plants, more ACCUs were surrendered in 2019 than in 2018.

Voluntary surrender volumes for 2020 are currently estimated to be 550,000 ACCUs.

More information on the voluntary carbon market is available in Section 4.

Figure 8: Commonwealth delivery for current portfolio of contracts, 2015 to 2030



1.4. Market trading

Over Quarter 4 2019, 0.8 million ACCUs were traded through 64 transactions with an average parcel size of 12,500 ACCUs (Figure 9). On average 357,000 ACCUs were traded each month in 2019, up 62 per cent on the volumes in 2018.

1.5. Spot price

In Quarter 4 2019, the ACCU spot price rose to a record $17.25, an increase of $1.15 from the close of the previous quarter (Figure 10). This increase may reflect voluntary demand for Climate Active participants who may pay a premium for ACCUs with associated co-benefits.

Since the last auction, the spot price has stayed on average 16 per cent above the auction nine average price[15].

Figure 9: ACCU market transactions (excluding ERF transactions), Q1 2018 to Q4 2019

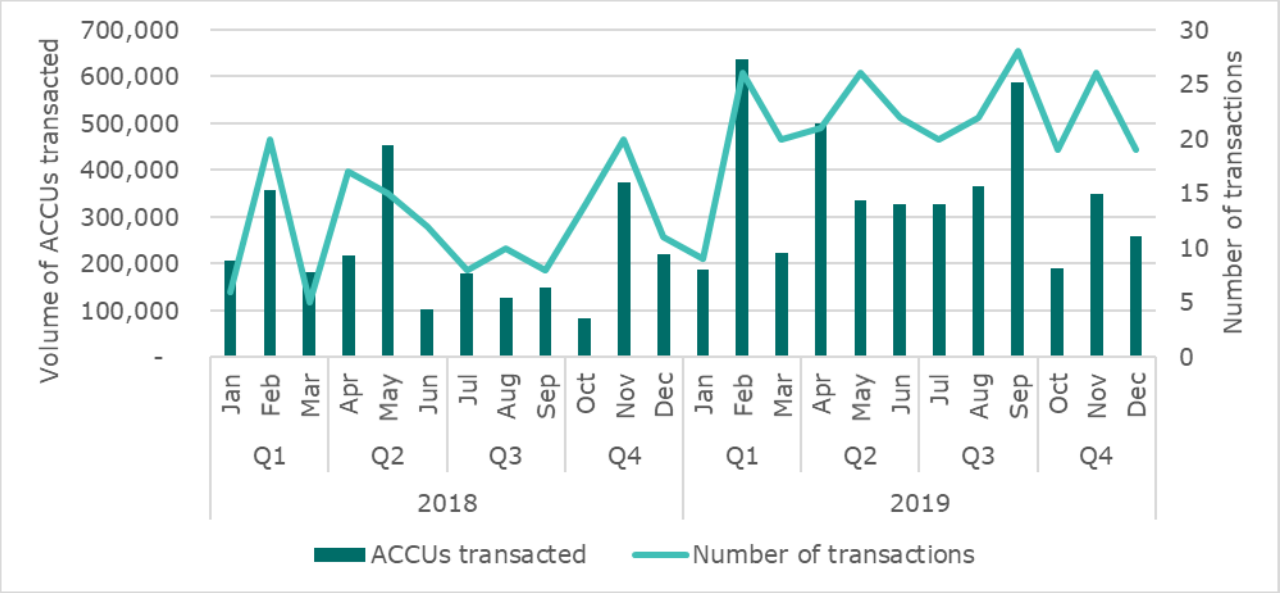
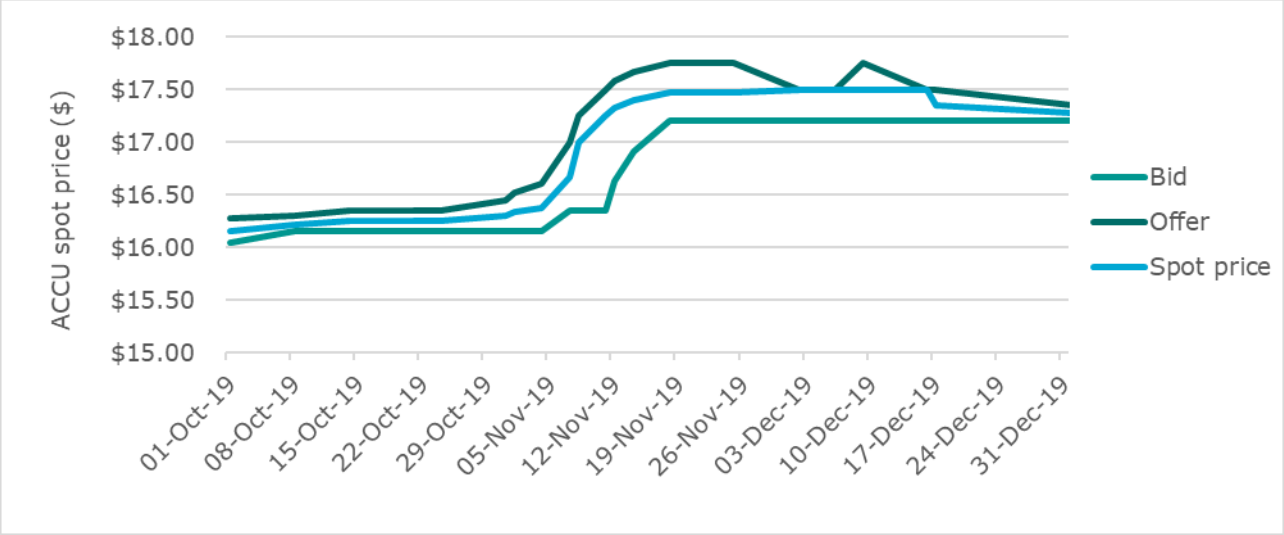


Figure 10: ACCU spot prices, Q4 2019[16]



[15] This is calculated by comparing the auction 9 average price with the average of the spot prices from auction 9 to Quarter 4 2019.
[16] Sourced from CommTrade.

1.6. Key dates

Date	Event	Significance
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.
25–26 March 2020	Tenth ERF Auction	The auction guidelines and details about the auction process is available on Participating in an auction webpage on the Clean energy Regulator website.
March and April 2020	**Participating in Australia's carbon markets to meet corporate climate goals: National Seminar Series & Webinar 2020**	The 2020 webinar and seminar series, led by the Carbon Market Institute and the Clean Energy Regulator, will be held in Melbourne, Sydney, Brisbane, Perth, and Adelaide. The series will provide foundational information about Australia's carbon markets and focus on opportunities for voluntary participation in these markets.

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

19–20 May 2020	**Seventh Australasian Emissions Reduction Summit**	This annual event, hosted by the Carbon Market Institute, will showcase world-leading knowledge sharing, commercial interactions and capacity building, helping delegates to manage climate risk and opportunities.

31 October 2020	National Greenhouse and Energy Reporting (NGER) and Safeguard application deadline	Deadline for NGER reporters and Safeguard entities to submit:
		  • 2019–20 applications for variation of baseline determination for reduction in emissions intensity
		  • 2019–20 exemption declaration applications, and 2018–19 NGER reports.

2. Large-scale generation certificates

- The LGC price fell in the lead up to the surrender deadline of 14 February 2020. This suggests material shortfall should be expected for the 2019 assessment year, as some liable entities continue to arbitrage lower forward prices.
- 2019 was another landmark year for renewables in Australia with 4.1 GW of new capacity accredited under the LRET, a 17 per cent increase on the 3.5 GW of accredited capacity for 2018.
- An additional 28 TWh of eligible large-scale generation was delivered in 2019, compared to 23 TWh in 2018.
- LGC spot prices moderated to $39 at the end of Quarter 4 2019 in response to the announced changes to the law to clarify that no tax is payable on the refund of LGC shortfall charges.
- The 2020 target has not acted as a cap on investment with a further 2 GW of new projects reaching financial close in 2019.

2.1. Supply and demand balance

An estimated record 35.3 million LGCs were available for the 2019 assessment year, at the end of Q4 2019. Liable entities eligible for shortfall charge refunds may increase demand by an additional 2.6 million LGCs this year and some certificates may be held by parties who do not intend to sell. Table 3 shows the LGC balance if no shortfall is taken for the 2019 assessment year.

After the surrender deadline of 14 February 2020, 25 million LGCs were surrendered against liability for the 2019 assessment year. Over nine million LGCs remained in the REC Registry after surrender on 14 February. Detailed results will be provided through the Clean Energy Regulator's annual publication of surrender results and Quarter 1 2020 report.

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[17]		-2.5 million
GreenPower		-0.5 million
Shortfall charge refunds[18]		-2.6 million
Total balance (before any shortfall options taken)		**-2.4 million**

[17] This is the expected accumulation of LGCs (by end 2019) held by the ACT Government that is not expected to be available for surrender.
[18] This is the amount of paid shortfall from previous assessment years that entities may surrender to receive a refund, to date 2.3 million LGCs from a total 2.6 million have been surrendered in 2019. Forward prices are lower than current prices so there remain an incentive to take further paid shortfall 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. The announcement by the Government in the Mid-Year Economic and Fiscal Outlook that it will amend the law retrospectively to clarify that no tax is payable on the refund of LGC shortfall charges is likely to encourage greater use of the shortfall provisions for the 2019 assessment year and into the future.

Supply of LGCs is expected to continue to increase in 2020 to 35 million LGCs.[19]

Factors impacting supply include the likelihood that new renewable projects reach financial close and are connected to the grid, the date generation is delivered to the grid, any curtailment of generation, changing marginal loss factors and generation from hydropower. The increasing demand from the statutory target is the key factor affecting demand. There is the growing interest from corporations to use renewable energy or to offset their emissions by voluntarily surrendering LGCs, the current impact on demand is relatively small but likely to grow in the future.

2.2. Factors impacting supply

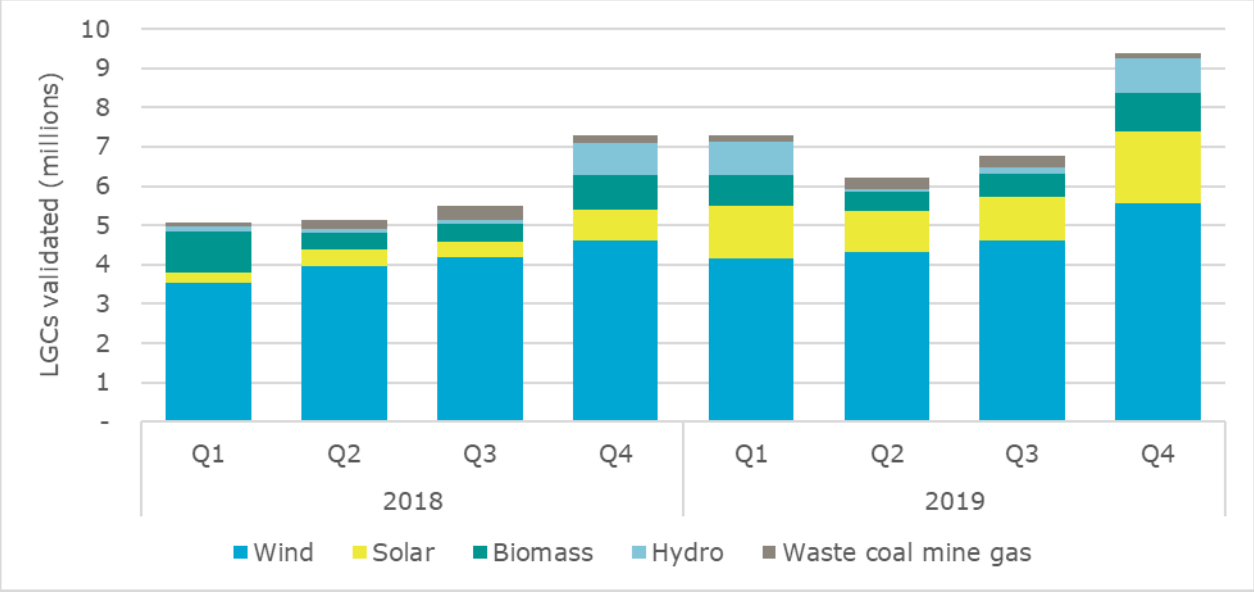
LGC supply

Quarter 4 2019 set a record for LGC supply with 9.3 million certificates validated (see Figure 11), resulting in a total supply of 29.6 million LGCs in 2019.

Accreditation

In Quarter 4 2019, 122 new power stations were accredited totalling over 1.3 GW of capacity (see Figure 12). Total capacity accredited in 2019 was 4.1 GW, an increase of 14 per cent from 2018. Early signs suggest that 2020 will see similarly high levels of new renewable capacity accredited, noting that it can take a number of months following accreditation for wind and solar farms to achieve full generation.

Figure 11: LGCs by technology type, Q1 2018 to Q4 2019



[19] Connection delays in Victoria have not been factored in this estimate.

Three large solar farms in New South Wales accounted for a significant proportion of accredited capacity in Quarter 4 2019 (see Figure 13). Combined, these solar farms are expected to generate over 1,700 GWh per annum at full generation.

Across Australia, 112 accredited power stations were mid-scale solar PV systems between 100 kilowatt (kW) and 5 MW in capacity. Businesses installing solar across a portfolio of sites, such as shopping centres, supermarkets and retail chains, continues to be a strong growth area. Capacity installed in Quarter 4 2019 increased 11 per cent compared to Quarter 3 2019, to 53 MW.

Figure 12: Capacity of new accredited power stations by state, Q4 2019

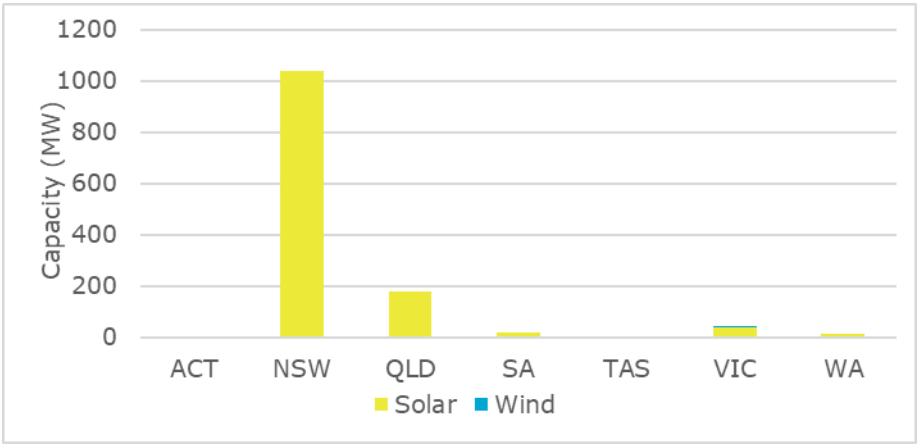
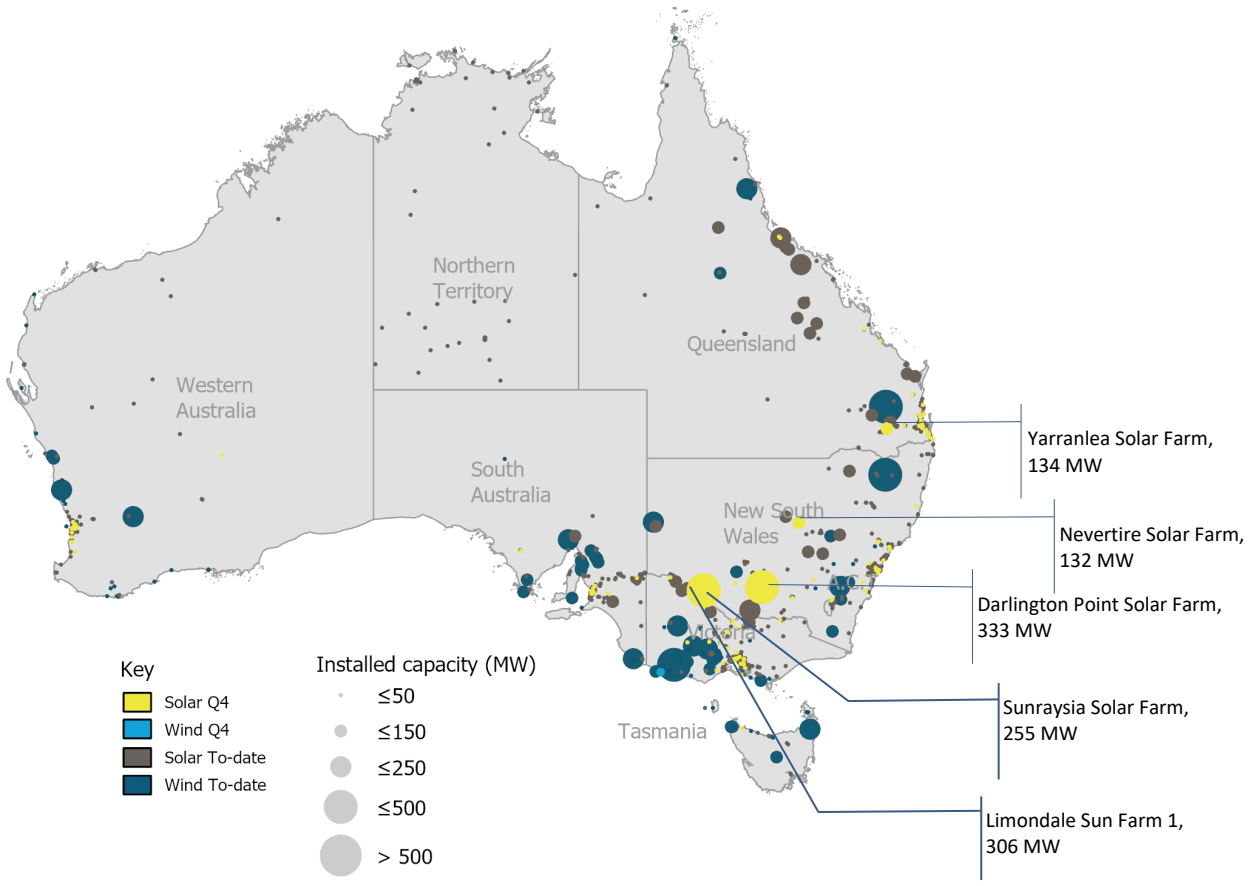


Figure 13: Wind and solar power stations accredited capacity by location, Q4 2019 and scheme to-date



Committed projects

Figure 14 shows how the capacity reaching financial close (committed projects) in a time period can be 'lumpy' from quarter to quarter and across years. However, the actual investment in build may be spread across one to two years depending on the size of the project. Hence, the capacity delivered in each year tends to be less variable.

2017 and 2018 were record years for capacity of projects reaching financial close. The market signal to invest in those years was very strong with high wholesale electricity prices ($100 per MWh) and high LGC prices ($85 per MWh).

In 2019, the material additional supply of electricity resulted in the combined build signal falling by about half, so a lower capacity reached financial close. This is the normal way markets work, that is high prices bring on a boom and that brings prices down resulting in a pullback in investment. Increased grid constraints and falling MLFs in 2019 also made it more difficult to get projects to financial close.

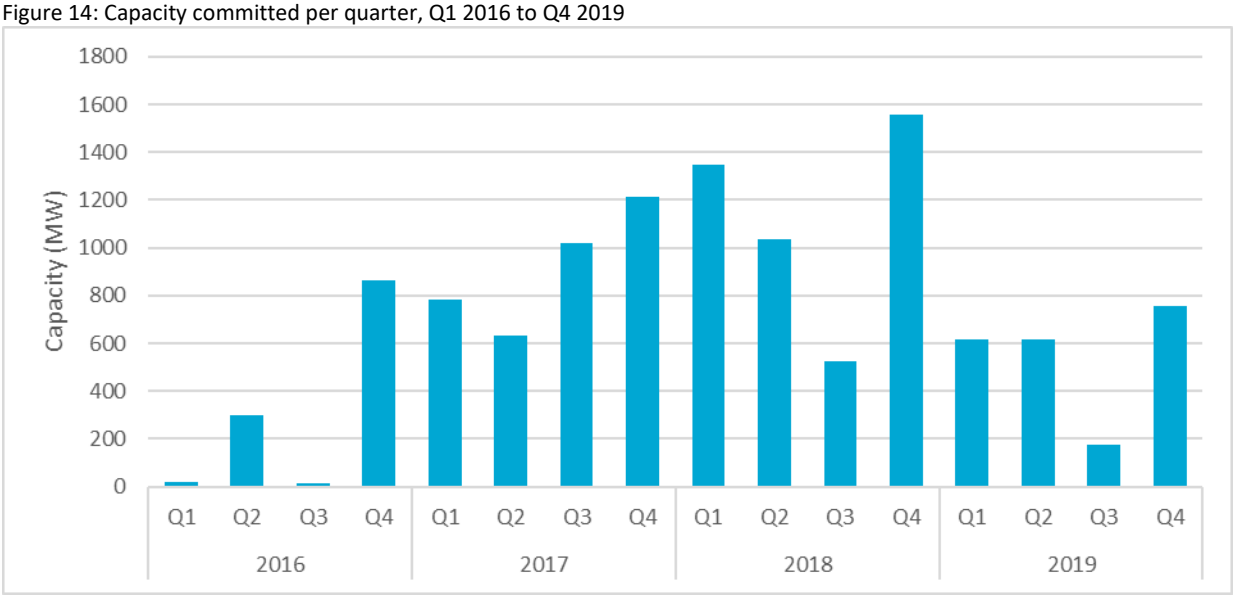
However, in a historical context, 2019 was a very solid year for total capacity reaching financial close. The total was almost double 2016 and 5 times the average in the first 15 years of the scheme.

Quarter 4 2019 saw an upswing in investment compared to Quarter 3, with 755 MW committed[20] (a similar level to Quarter 1 and Quarter 2 2019).

The state of investment and the market going forward is explored further in Section 7.

Of the current 13.9 GW[21] pipeline, 10.7 GW of the capacity is contracted through publicly disclosed Power Purchase Agreements (PPA)[22]. The Clean Energy Regulator's data indicates 17 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 have also shown interest in investing in renewables through PPAs.

Figure 14: Capacity committed per quarter, Q1 2016 to Q4 2019



[20]Committed projects refer to large-scale energy projects that have received all development approvals and reach financial close 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 50 GW.

[21]Of the 13.9 GW pipeline that the Clean Energy Regulator tracks, 8.6 GW is accredited, 3.8 GW is committed, and 1.5 GW is probable.

[22]PPA data is sourced from publicly 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 constructions has commenced.

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 4 2019, a total of 84,952 LGCs were voluntarily surrendered. 2019 saw a changing dynamic in voluntary surrender with increasing business surrenders outside of GreenPower. More information is provided in Section 4 on voluntary carbon markets.

2.4. Market trading

Over Quarter 4 2019, 14.4 million LGCs were traded through 911 transactions with an average transaction size of 15,800 LGCs. Transactions during this quarter were more frequent than Quarter 3 2019 and of higher volumes as liable entities source LGCs to meet their obligations for the 2019 assessment year. Volumes traded in 2019 were higher than 2018, as expected with an increasing target (see Figure 15). Liable entities may have been looking to secure their surrender positions early in a relatively tight market.

2.5. Spot price

The LGC spot price was volatile over Quarter 4 2019. Prices hit a high of $51 at the middle of Quarter 4 2019 before decreasing to $39 at the end of December 2019 (see Figure 16). The volatility in spot price is likely due to a relatively tight LGC market and liable entities preparing for their surrender positions.

Forward spot prices for the end of Quarter 4 start to ease from $39 per LGC in Calendar 2019 (Cal 19) to $15.50 by Calendar 2022 (Cal22). Clarification on the tax treatment of shortfall refund was announced during Quarter 4 2019, potentially contributing to the moderation in price at the end of Quarter 4 2019 and allowing liable entities to make informed decisions relating to shortfall and refund in future years.

Figure 15: LGC market transactions, Q1 2018 to Q4 2019

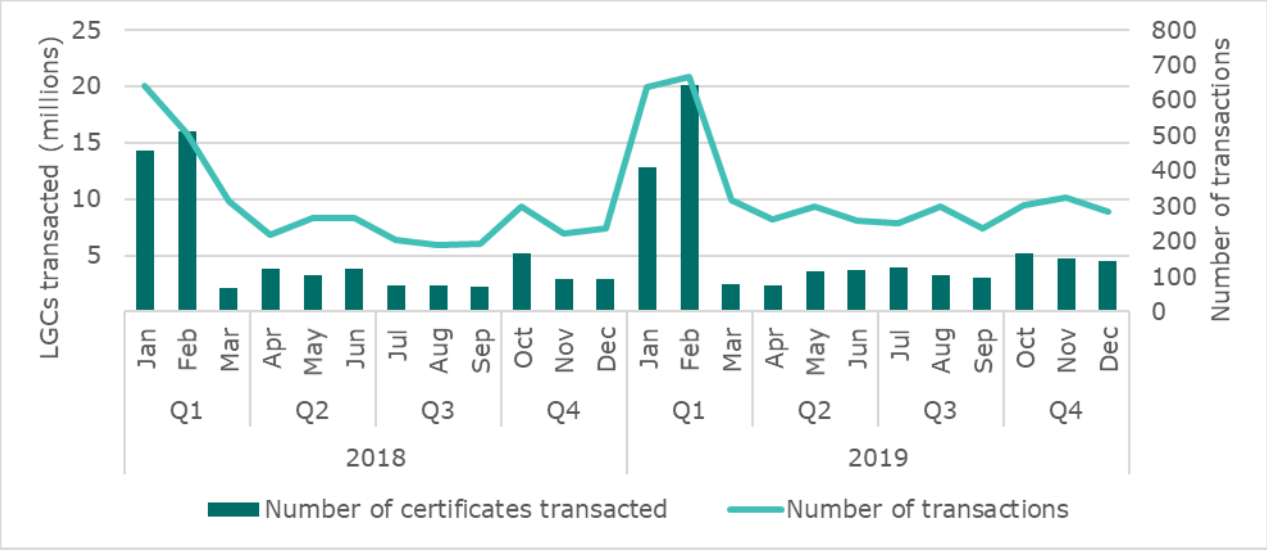
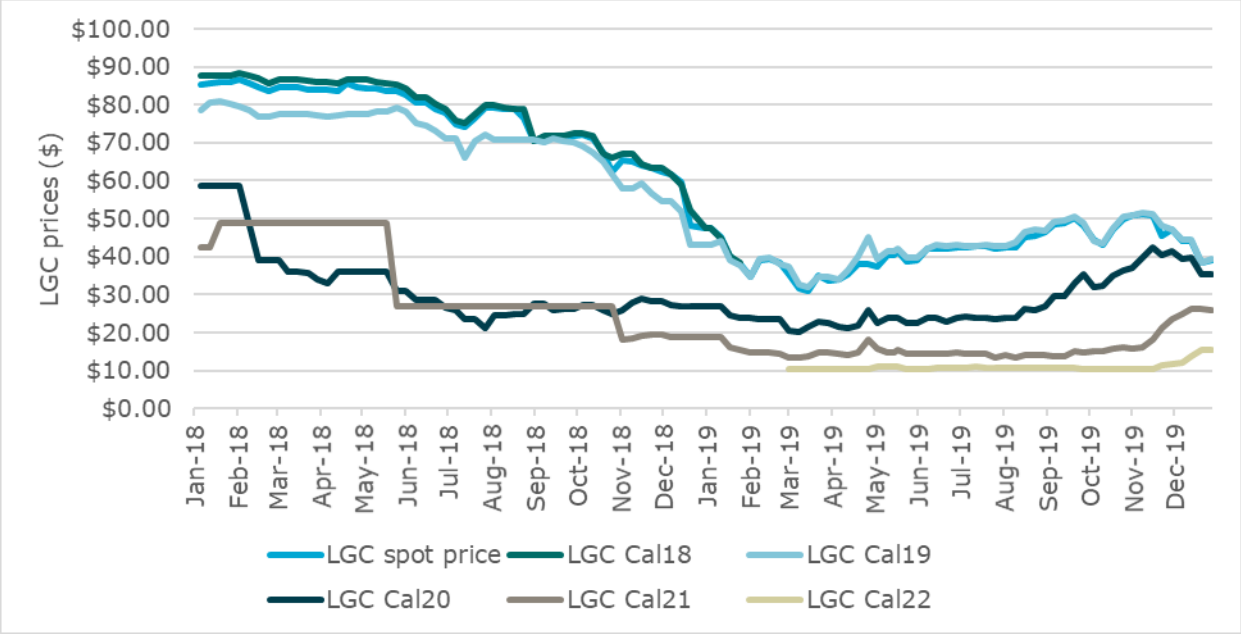


Figure 16: LGC spot and forward prices, 2018 to 2019[23]



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.
March and April 2020	**Participating in Australia's carbon markets to meet corporate climate goals: National Seminar Series & Webinar 2020**	The 2020 webinar and seminar series, led by the Carbon Market Institute and the Clean Energy Regulator, will be held in Melbourne, Sydney, Brisbane, Perth, and Adelaide. The series will provide foundational information about Australia's carbon markets and focus on opportunities for voluntary participation in these markets.
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.

[23] Source TFS Green.

3. Small-scale technology certificates

- In Quarter 4 2019, average small-scale solar PV system size and installations increased by nine and 29 per cent respectively compared to Quarter 4 2018, increasing supply of STCs.
- Creations exceeded mandated surrenders with a surplus of over nine million STCs after Quarter 4 surrender in February 2020.
- In 2019 small-scale solar PV set a new record with 2.2 GW installed nationally.
- The STC spot price remained steady ending Quarter 4 2019 at $37.40.

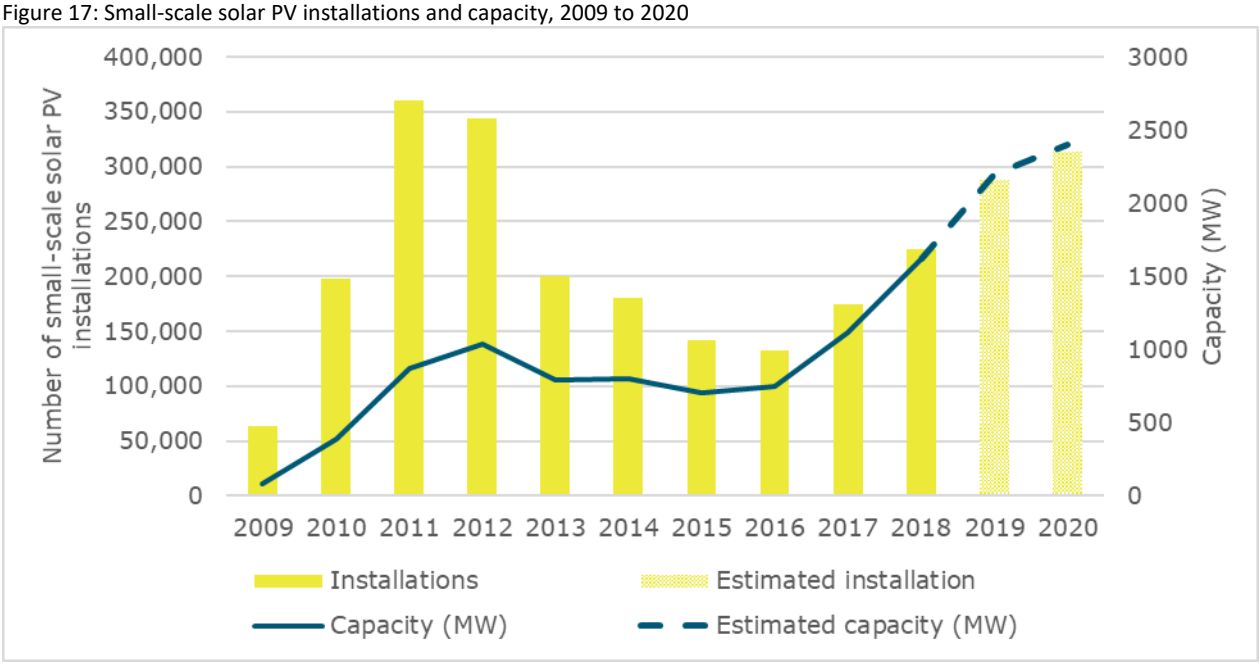
3.1. Supply and demand balance

At the close of Quarter 4 2019, over 10 million STCs were registered in the market, of which 321,000 STCs were pending clearing house sale. Approximately 5.6 million STCs were required to be surrendered for Quarter 4 2019 on 14 February 2020. With additional 2019 vintage STCs validated before 14 February, there was a surplus post surrender of over 9 million STCs.

Total installed small-scale solar PV capacity for the quarter was 744 MW, a 41 per cent increase compared to the same quarter last year. The average kW capacity of small-scale solar PV systems increased by nine per cent from 7.2 kW in 2018 to 7.7 kW in 2019.

The increasing size of small-scale solar PV systems is contributing to higher STC creation rates.

Figure 17: Small-scale solar PV installations and capacity, 2009 to 2020



In total, 10.3 GW of capacity has been installed under the Small-scale Renewable Energy Scheme (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, an estimated 2.2 GW of small-scale solar PV capacity was installed nationally (Figure 17)[25].

3.2. Factors impacting supply

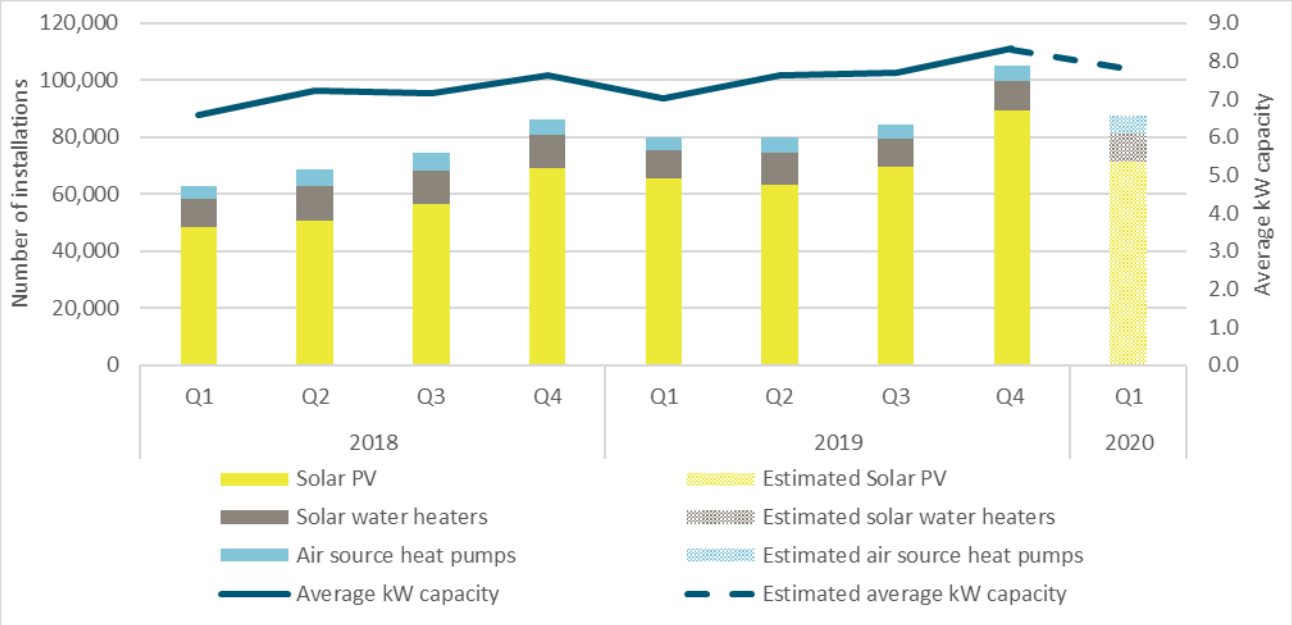
Solar PV and installations

Solar PV capacity and installations are growing strongly (Figure 18), leading to increased supply of STCs in the market. Quarter 4 consistently has the highest number of installations. In Quarter 4 2019 installations increased 29 per cent and capacity by 39 per cent compared to Quarter 3 2019 (Figure 18).

Notably, even though the degree of incentive from the SRES is declining over time, payback periods are stable. Combined with consumer sentiment for solar PV and low interest rates, it seems likely installations of small-scale solar PV will continue at high levels. Network service providers continue to look for ways to manage grid stability issues associated with high solar PV penetration. For example, network operators in Victoria (Powercor, UnitedEnergy and CitiPower) have sought approval to accommodate 95 per cent of their customers to install at least 5 kW of rooftop solar with unlimited export capacity.[26]

State based schemes are also providing incentives to install solar PV. Currently Victoria has the most generous scheme, aiming to subsidise 720,000 installations over a 10-year period. Other states such as New South Wales, Queensland and the Australian Capital Territory are providing assistance and incentives for low income households to install solar PV. While Victoria has seen strong growth in solar PV installation, other states without such generous incentives have also had strong growth.

Figure 18: SRES installations and average kW capacity, Q1 2018 to Q1 2020



[24] For this reason capacity in this section 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 the Clean Energy Regulator website.
[26] https://reneweconomy.com.au/victorian-networks-plan-for-grid-with-95-rooftop-solar-uptake-19941/

Solar PV installations make up the bulk of installations, with solar water heater installations remaining steady and air source heat pumps growing strongly from a small base (an average annual growth of 14 per cent since 2017).

Table 4: Estimated rooftop solar PV (<100 kW) capacity by state, Quarter 4 2019

	Estimated capacity (MW)
ACT	11
NSW	213
NT	8
QLD	197
SA	74
TAS	7
VIC	146
WA	88
Total	744

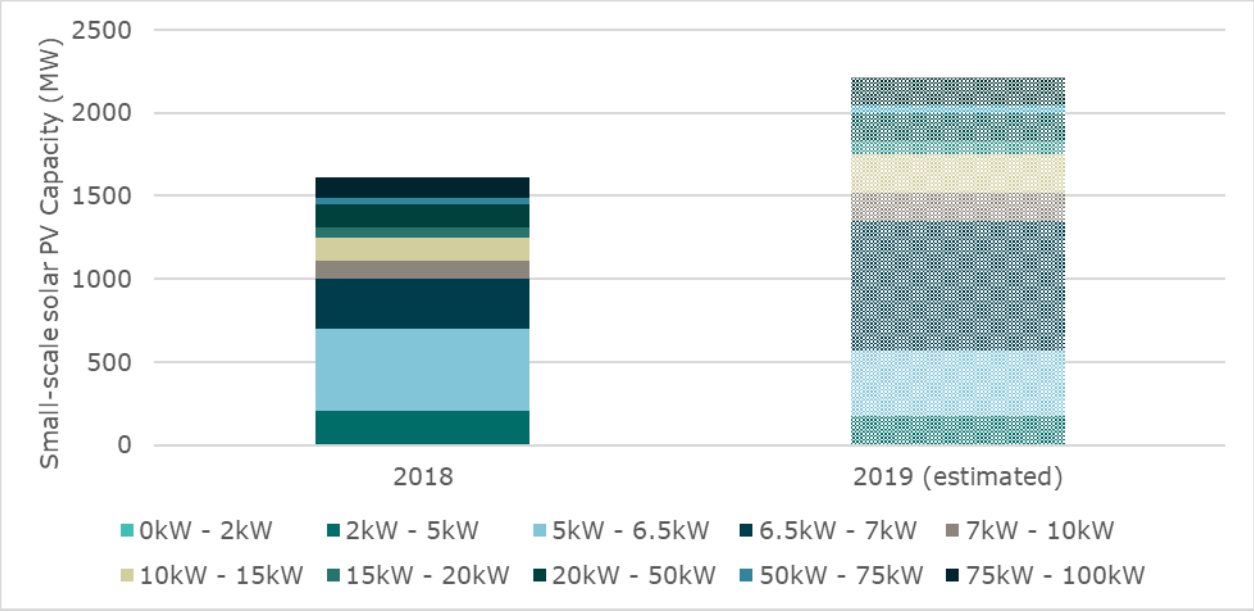
The majority of installations over Quarter 4 2019 were in New South Wales. Table 4 outlines estimated capacity installed by state for Quarter 4 2019.

System size

On average, small-scale solar PV system sizes have continued to increase (Figure 19). Average system size for all small-scale solar PV installations remains high at 8.3 kW for Quarter 4 2019. Large system size is a trend often seen in Quarter 4, as businesses make large installations before the yearly fall in the deeming rate.

System sizes 6.5 to 7 kW continue to dominate the market, balancing economies of scale with ease of network connection. However, system sizes 7 to 15 kW is a strong growth area, up 42 per cent from 2018 to 2019. This suggests that many households are finding ways to install systems that are not limited by 5 kW export limits most network service providers place on residential solar PV systems (or accept export limits capped at 5 kW). Batteries, preparation for electric vehicles and other technical solutions may be contributing to this trend. Section 6 explores in more detail the trends in battery installations with small-scale solar PV.

Figure 19: Small-scale solar PV capacity composition, 2018 and 2019



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 20).

There was a surplus of over nine million STCs post Quarter 4 surrender on 14 February 2020.

3.4. Market trading

Over Quarter 4 2019, 24.8 million STCs were traded on the open market via 3200 transactions with an average transaction size of 7750 STCs (Figure 21). Over the course of Quarter 4 2019, the total number of transactions per month was 1050 on average. This is up from an average of 980 transactions per month in Quarter 4 2018.

In Quarter 4 2019, 0.1 per cent of STCs 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[27].

Figure 20: Estimated surplus after quarterly surrender, 2019

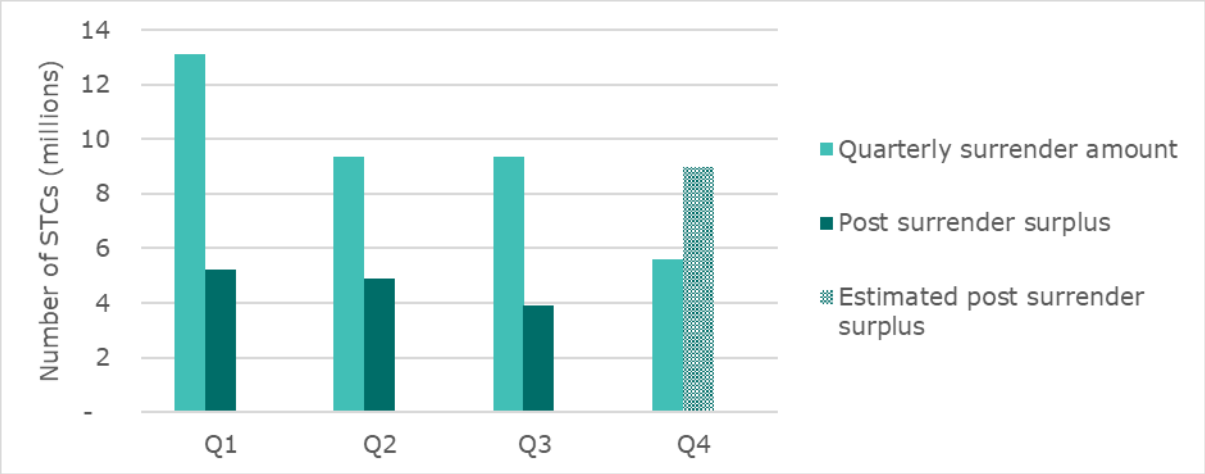
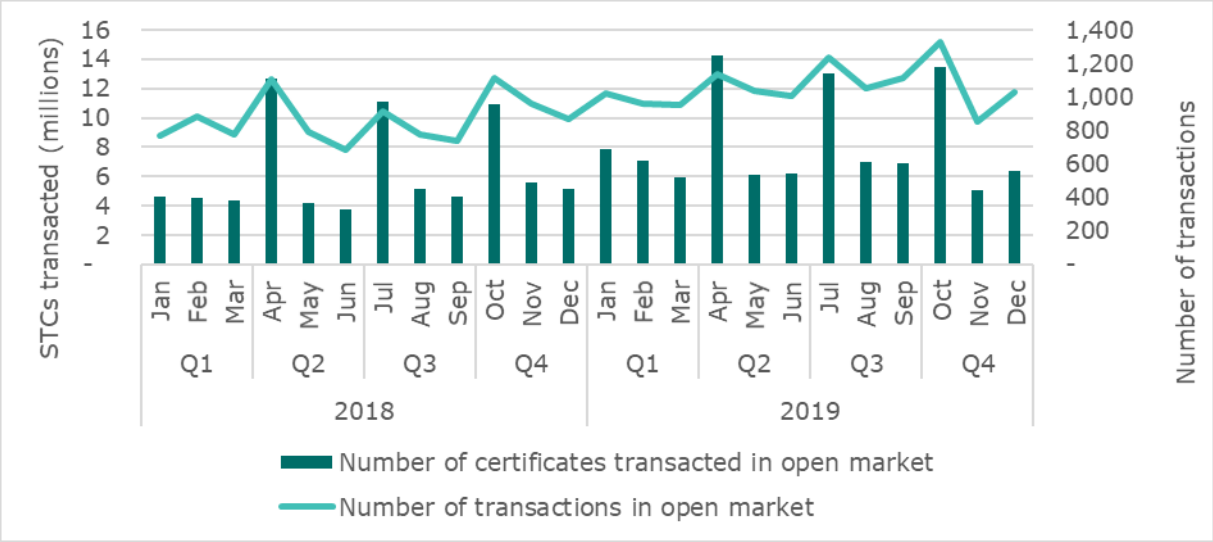


Figure 21: STC market transactions, Q1 2018 to Q4 2019

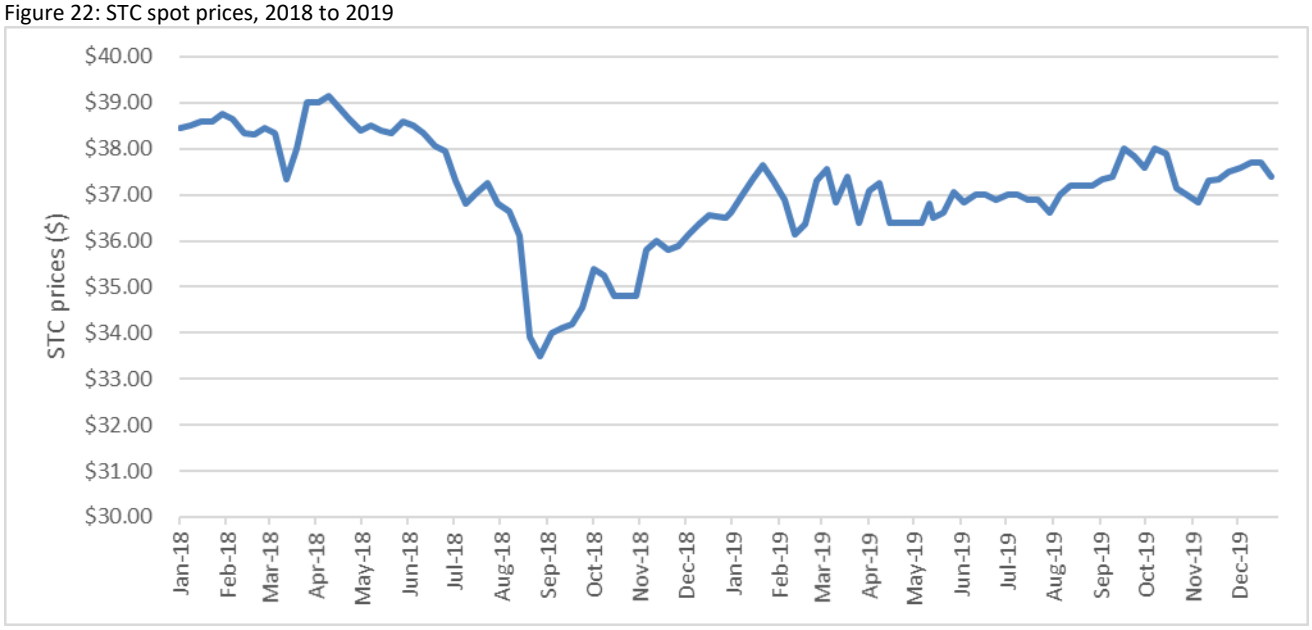


[27] See October STC market update for more information on the clearing house surplus.

3.5. Spot price

Spot prices were steady over the course of Quarter 4 2019 finishing at $37.40 (Figure 22). Spot prices have remained stable over 2019 despite a growing surplus of STCs in the market.

Figure 22: 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	Small-scale technology percentage (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.
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. Voluntary participation in carbon markets

There has been a substantial step up in Australian businesses focusing on climate risks as part of their overall financial risk management strategies. This sentiment was echoed by the Hon Kenneth Hayne AC QC stating[28] that international opinion is now firmly behind all entities with public debt or equity to respond to climate change issues in their governance, strategy and risk management, and in recording their responses to climate risk issues in their financial reports[29]. Similarly, there has been a substantial step up in companies adopting an ambition of lowering their emissions footprint.

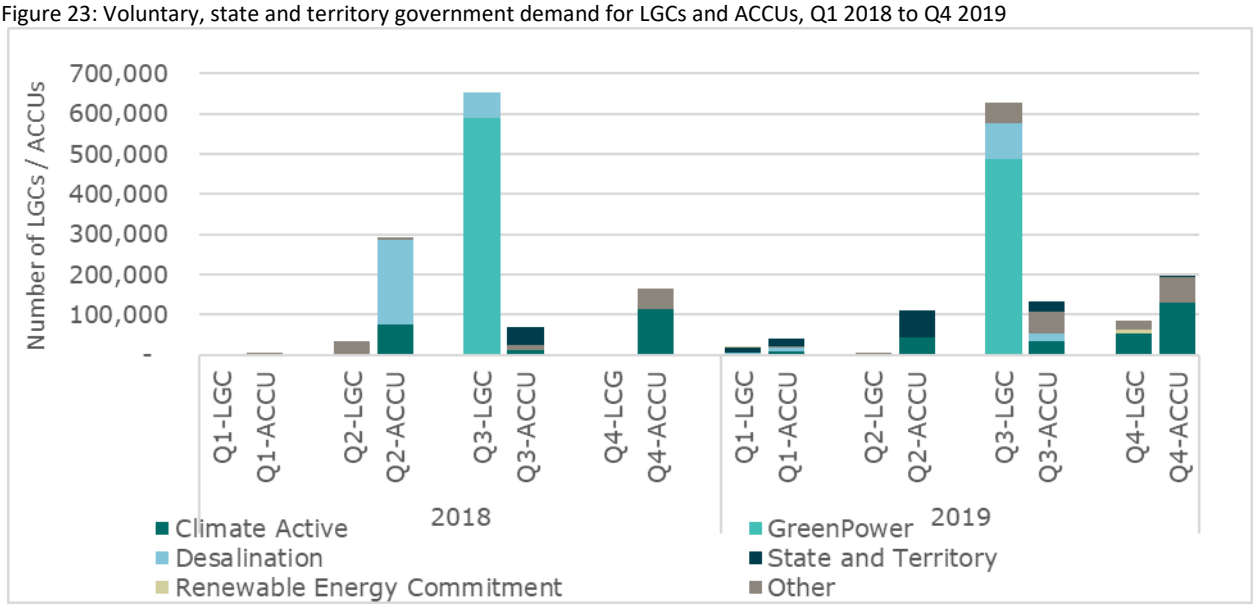
Domestic carbon market

There is evidence businesses and corporations are increasingly adopting strategies to offset emissions through voluntary participation in carbon markets. For example, membership in Climate Active, the rebranded Australian Government's carbon neutral certification scheme, has risen 41 per cent in 2019 from 2018.

In 2019, ACCU voluntary surrender totalled 476,800, down 10 per cent from 2018, and LGC voluntary surrender totalled 736,500, up seven per cent from 2018.

The decrease in voluntary ACCU demand in 2019 was mostly attributed to an 87 per cent drop in ACCU demand from desalination plants. When demand from desalination plants is removed, demand from all other sources is 448,900 in 2019 compared to 316,500 in 2018. Some desalination plants are now investigating alternative emissions reduction and offsetting arrangements to ACCUs, such as investing in renewable energy projects linked to their facilities or purchasing and surrendering LGCs. There was a 44 per cent increase in the voluntary surrender of LGCs by desalination plants in 2019 compared to 2018, primarily attributed to plants in Melbourne and Sydney.

Figure 23: Voluntary, state and territory government demand for LGCs and ACCUs, Q1 2018 to Q4 2019



[28] The Hon Kenneth Hayne AC QC (Royal Commission into Banking) speech transcript at the Centre for Policy Development's Business Roundtable on Climate and Sustainability on 21 November 2019 in Sydney.

[29] Australia's financial regulators have also been encouraging these risks to be managed appropriately with the Australian Prudential Regulator Authority (APRA) recommending climate risks are managed in line with existing risk management standards and the Australian Securities and Investment Commission (ASIC) updating guidance recommending that listed companies disclose climate risks to investors.

Of note in Quarter 4 2019 was the surrender of approximately 85,000 LGCs, 64 per cent of which was for Climate Active participants as shown in Figure 23.

Quarter 4 in recent years has seen minimal LGC surrender for voluntary purposes, making the Quarter 4 2019 surrender a significant development that demonstrates growing interest in voluntary action from corporations in offsetting emissions from electricity consumed with LGCs.

Over 194,000 ACCUs were surrendered in Quarter 4, an 18 per cent increase from Quarter 4 2018.

While ACCUs from savanna burning projects continue to meet the majority of voluntary demand, with 53 per cent of market share in 2019, the vegetation project share has increased from 26 per cent in 2018 to 42 per cent in 2019, as shown in Figure 24. Voluntary buyers often value and are prepared to pay a premium for the broader benefits associated with the underlying projects.

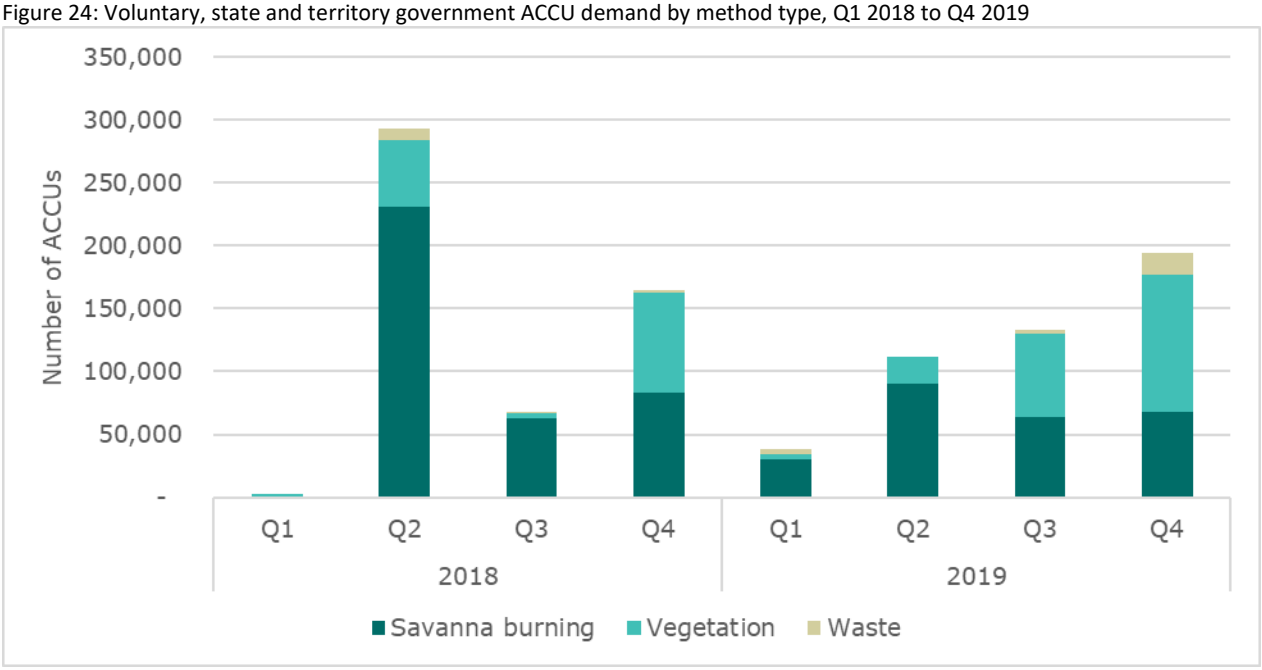
For example, savanna burning projects often support employment in indigenous and rural communities, and vegetation projects may have complementary biodiversity and/or water quality benefits.

Prices

In Quarter 4, the LGC spot price came down and the LGC forward prices rose slightly, reflecting liable entities positions on taking shortfall for the 2019 compliance year.

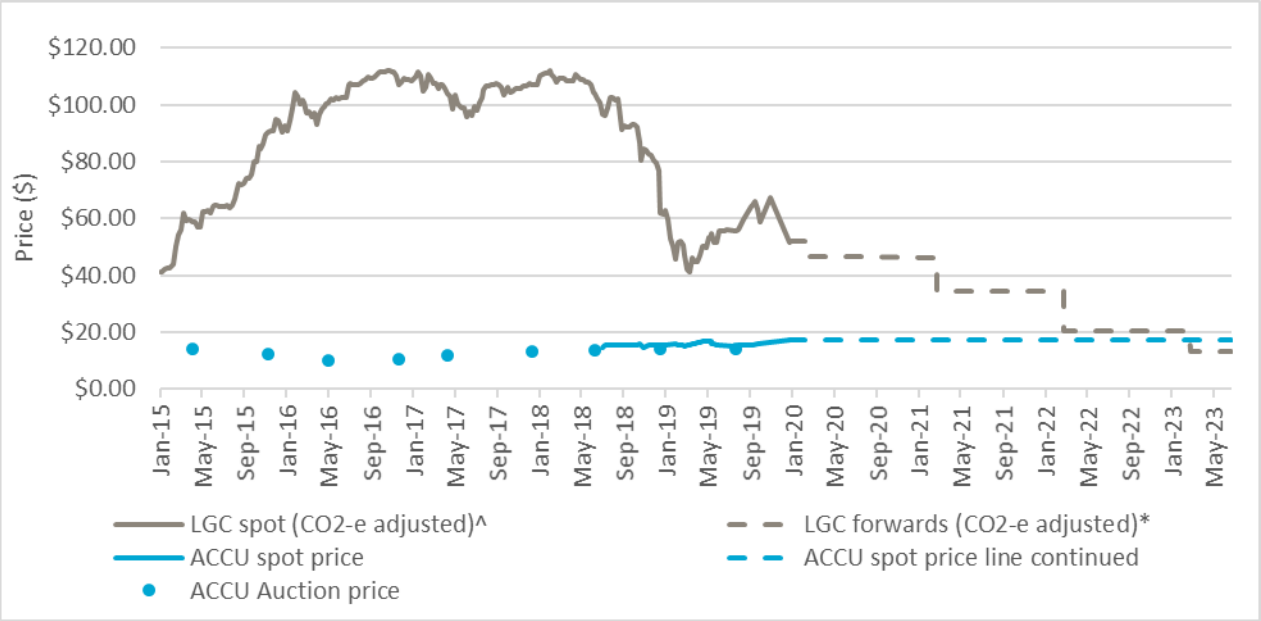
This slightly impacted the potential year of convergence[30] in Figure 25, moving from 2022 to 2023. This year is likely to continue to shift around the early 2020's as demand transitions from the compliance to the voluntary market over this period.

Figure 24: Voluntary, state and territory government ACCU demand by method type, Q1 2018 to Q4 2019



[30] Year of convergence refers to the year when ACCU price will converge with the carbon equivalent converted LGC price.

Figure 25: ACCU and LGC price convergence, 2015 to 2023[31]



Use of LGCs and ACCUs for voluntary surrender

Recent developments in observing the transition to voluntary demand for LGCs include:

- Renewables developers and consultants have reported to the Clean Energy Regulator that they are examining opportunities for new uses of LGCs as surpluses emerge post 2020. Developers are considering business cases with sensitivity analysis on non-zero LGC prices as a material surplus emerges beyond 2020.
- Market participants have reported to the Clean Energy Regulator that businesses are contemplating new models to utilise LGCs as an offset. Prices are likely to converge between ACCUs and the implicit carbon content of LGCs, at which point the market may effectively use LGCs for their carbon unit value.
- Climate Active has recently released a consultation paper on how LGCs can be used to reduce scope 2 emissions. The proposed market-based method enables LGCs to be treated as having zero emissions (without needing to be converted to tonnes CO2-e). This is likely to incentivise the use of LGCs for participants.
- The Clean Energy Regulator will soon consult on a new mechanism to assist businesses to transparently report voluntary surrenders.

[31] Data sourced from TFS Green and CommTrade Carbon.

Other Units

Table 5 compares domestic and international market spot prices. Since last quarter all unit prices, other than LGCs, were up, indicating a growing demand for carbon abatement.

Further evidence to support the growing voluntary market is shown through the voluntary surrenders of Certified Emission Reductions (CERs) in the ANREU.

These units can be surrendered for voluntary action by Australian companies either as Climate Active participants or for voluntary action outside of this scheme. Voluntary surrenders of CERs rose from 0.8 million in 2018 to 4.1 million in 2019, a fivefold increase. Negotiations about the use of these units for the Paris Agreement period will continue at the next Conference of Parties planned for November 2020.

Table 5: Domestic and international carbon market spot prices

Product	Spot price AUD (31 December 2019)[32]	Quarterly trend	Change in Price
ACCU	$17.25	Up	+$1.15
LGC (CO2-e)	$51.50	Down	-$9.25
ESC	$23.30	Up	+$1.15
VEEC	$30.50	Up	+$8.00
CER	$0.35	Up	+$0.01
EUA	$40.36	Up	+$3.49
NZU	$28.19	Up	+$5.03

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

[32] Data sourced from OMF CommTrade, TFS Green, Thomson Reuters and Korea Exchange.

5. Carbon abatement

Carbon abatement from activities under the schemes administered by the Clean Energy Regulator has been rising by an average rate of 21 per cent each year from 2011 to 2019. In 2019, abatement reached 50 million tonnes of CO2-e with 22 million from LRET, 13 million from SRES and 15 million from the ERF.

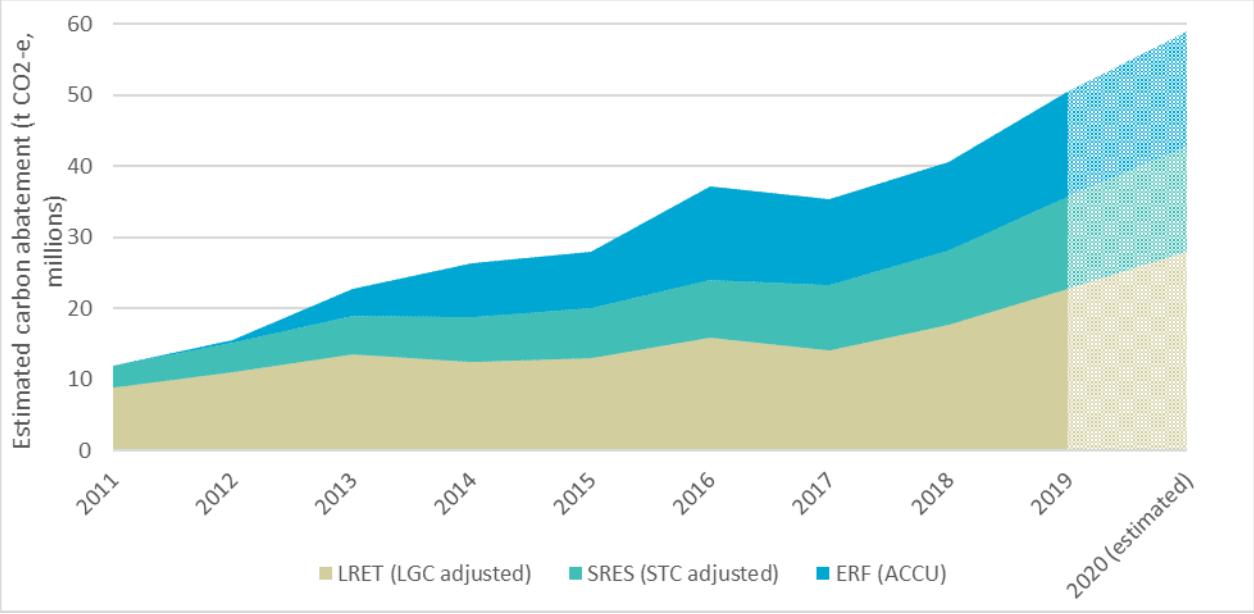
In 2020, carbon abatement is estimated to reach 59 million tonnes as shown in Figure 26.

Of this, 28 million tonnes are estimated to come from the LRET and 15 million tonnes from the SRES, an increase of 27 per cent and 14 per cent respectively from 2019.

The ERF is estimated to contribute 16 million tonnes of abatement in 2020, a 10 per cent increase from 2019. This is facilitated by an increase in number of projects transitioning to their crediting phase. Further abatement may eventuate driven by CSF implementation activities.

The carbon abatement 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. In order to convert the renewable generation into a carbon abatement equivalent value, it has been multiplied by the emissions intensity factor of the Australian electricity network. This 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[33].

Figure 26: Estimated carbon abatement from ERF and RET, 2011 to 2020



[33] Further details on the calculation methodology are set out in the accompanying workbook.

6. Market spotlight: Tracking residential battery trends throughout Australia

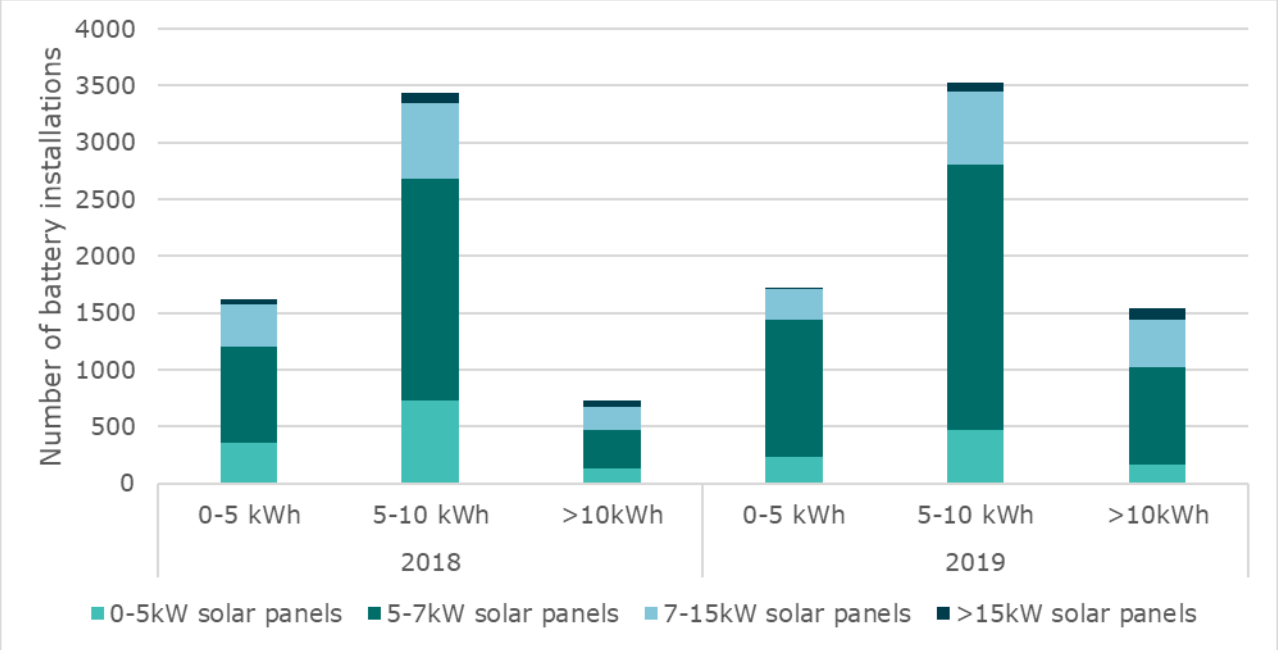
The number of battery installations Australia-wide has grown over the past few years and is forecast by AEMO to continue to grow significantly over the next decade[34].

Based on the Clean Energy Regulator's data, the number of concurrent solar PV and battery installations has grown from 1,250 at the start of 2016 to over 20,000 at the end of Quarter 4 2019. The Clean Energy Regulator's data indicates a cumulative installation of at least 85 MW of battery capacity. When accounting for battery installations not captured through the Clean Energy Regulator's data, a total of 150 to 200 MW of household battery storage is estimated.

Battery sizes

Concurrent battery installations are showing a trend towards larger sized batteries (Figure 27). The number of 0 to 5 kW hour (kWh) and 5 to 10 kWh batteries has remained relatively constant over the last two years. In contrast, the number of batteries with a capacity greater than 10 kWh has doubled from 2018 to 2019. This growth in larger capacity batteries may be promoted by the Australian Capital Territory and South Australian battery incentive schemes as they grant subsidies on a per kWh of battery capacity basis.

Figure 27: Change in battery installations 2018 to 2019



[34] AEMO, 2019 ESOO PV and battery storage data, accessed at 30 January, 2020

Battery data collected by Clean Energy Regulator

The Clean Energy Regulator collects information on a voluntary basis, when batteries are installed concurrently with solar PV.

More detailed information has been collected for the past two years including make and model, with about 50 per cent of concurrent installations in 2018 and 2019 having this information provided.

AEMOs Distributed Energy Resources Register will provide more detail and is due to be released in March 2020, building on the CER register.

The relationship between solar system size and battery capacity

Table 6 compares the average size of batteries installed on 5 to 7 kW solar PV systems with those installed on 7 to 15 kW solar PV systems over the past two years. For 5 to 7 kW PV systems, the average battery capacity is following a relatively constant trend. In comparison, the average size of batteries on 7 to 15 kW solar systems is following an upward trend. Large solar PV combined with larger capacity batteries unlocks the most additional value from a solar PV and storage system by storing excess electricity during the day for use during peak evening hours.

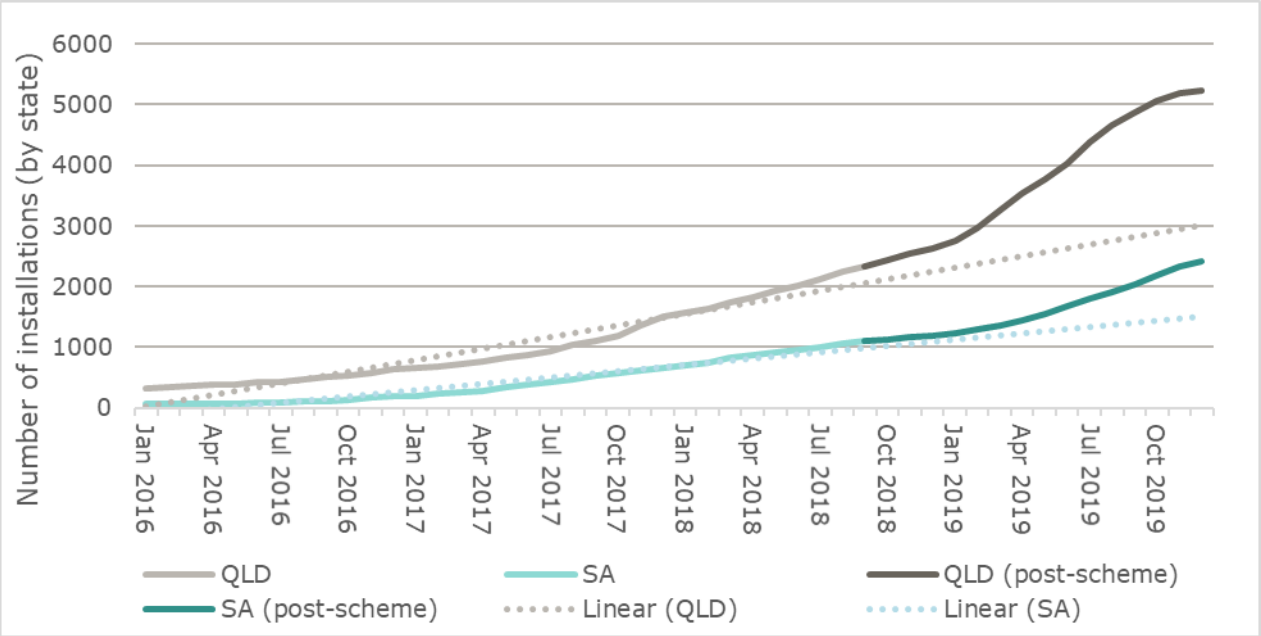
Table 6: average residential battery capacity by solar panel band (kWh/installs)

	5 to 7 kW Solar panels	7 to 15 kW Solar panels
2018	7.10	7.73
2019	7.63	9.20

The impact of state-based rebate schemes on the number of battery installations

The state-based residential battery incentive schemes support further uptake of residential batteries. Figure 28 suggests the South Australia and Queensland battery programs have increased battery uptake beyond the business-as-usual levels. The total number of concurrent solar PV and battery installations in Queensland and South Australia almost doubled within the first 12 months of their schemes. The battery penetration rate for new PV systems in the Australian Capital Territory in 2019 was almost one in 10 new PV installations. Although decreasing battery costs may be increasing battery uptake, the same levels of growth have not been observed in states that do not have battery incentive schemes in place.

Figure 28: Cumulative number of battery installations pre and post scheme implementation



State battery schemes

South Australia implemented its home battery scheme in October 2018. The scheme provides a subsidy of $500 (or $600 for energy concession holders) per kWh of capacity, up to a maximum subsidy of $6,000. It is expected to support up to 40,000 new battery installations.

Queensland implemented its interest free loans for solar and battery storage scheme in October 2018. The scheme provides interest free loans up to $6,000 ($10,000 for combined battery and solar systems) and/or grants up to $3,000 for battery installations on residential premises. It is expected to support up to 4,000 new battery installations.

Australian Capital Territory implemented round two of its next generation energy storage program in June 2016, which included household battery storage rebates. The rebate provided is $825 per kWh of battery capacity, up to a maximum capacity of 30 kWh. It is expected to support up to 5,000 new battery installations.

7. Market spotlight: renewables capacity reaches new level in 2019

In 2019, 6.3 GW of new renewable energy capacity was delivered across Australia, up 24 per cent from the previous record set in 2018 (see figure 29). A similar total capacity is expected to be delivered in 2020. This step up over the last few years is around 4 times the average from 2010 to 2016.

A record utility scale capacity of 3.9 GW was delivered. New financial close announcements of 2 GW were very solid in the context of falling wholesale electricity prices, LGC prices and increasing grid constraints.

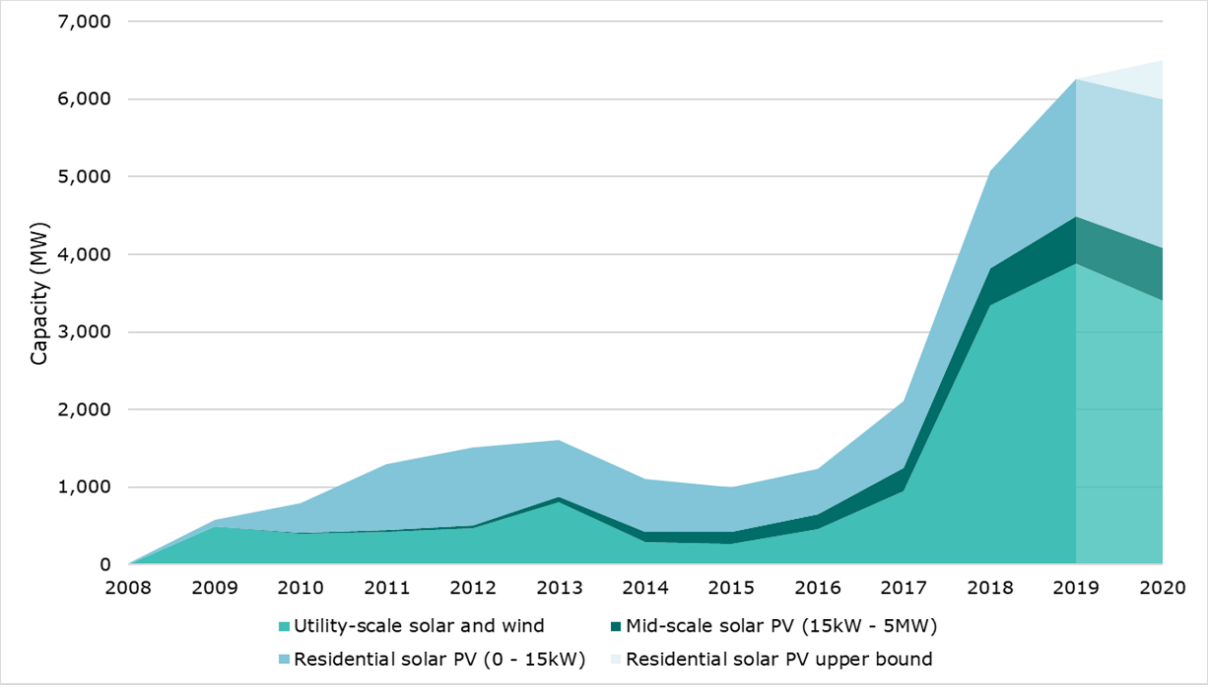
Household and commercial rooftop solar grew by 40 per cent from 1.7 GW in 2018 to 2.4 GW in 2019. Total electricity generated or displaced from renewables was 44 TWh, up from 37 TWh in 2018.

Early signs suggest 2020 will bring forward similar levels of renewable capacity (between 6.0 to 6.5 GW) with growing rooftop installations.

Australia's rapid transition to renewables is continuing with 25 per cent of electricity in the NEM from renewables by the end of 2019[35]. This aligns with the Department of Environment and Energy projections, released in December 2019 where Australia's electricity supply is projected to be 34 per cent renewable by June 2023[36].

AEMO released the 2020 draft Integrated System Plan (ISP) which shows the potential for connecting up to 13 GW of capacity in the NEM until the next grid upgrades and infrastructure work is completed. It also identifies priority transmission projects and renewable energy zones, that will facility additional renewables capacity.

Figure 29: Estimated accredited and installed renewable capacity 2008 to 2020



[35] Renewables penetration includes estimated rooftop solar and all other sources of renewable energy for Q4 in the NEM. Data sourced form AEMO and OpenNEM

[36] This projection uses up to date Clean Energy Regulator and Australian Energy Market Operator (AEMO) estimates.

Renewable investment waves

Figure 30 shows the trend in renewables over the past decade. Like any market, investment in renewables ramps up and down in response to market signals.

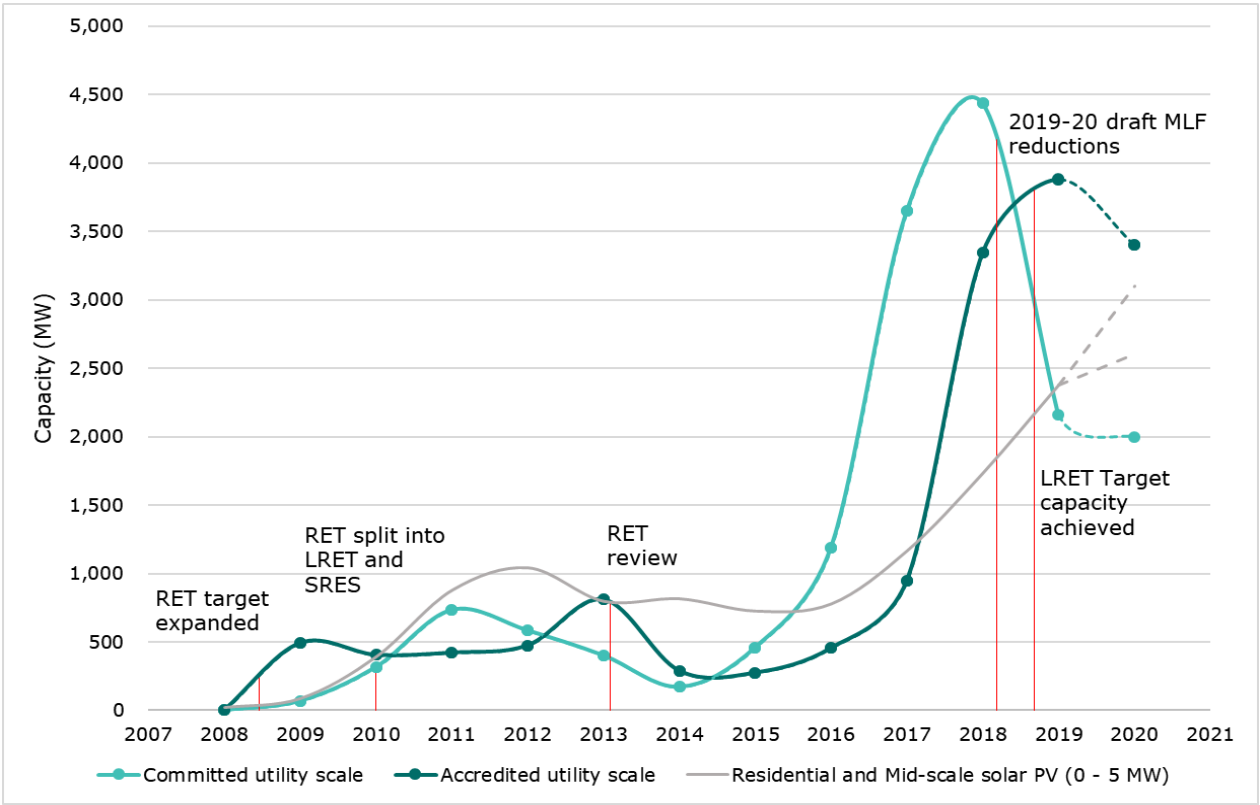
A relative surge of investment in 2011 and 2012 was underpinned by the development of large wind farms across Victoria, New South Wales and South Australia. At this time, the RET had been expanded and high LGC prices coupled with a low penetration of renewables supported the investment in these wind farms in ideal locations.

An estimate was provided in the Clean Energy Regulator's 2016 Annual Statement that 6.4 GW was required to be committed from 2016 to 2019 to meet the 2020 target of 33, 000 GWh.

High LGC and wholesale electricity prices provided a very strong build signal. In response, a total of approximately 9.5 GW of utility-scale capacity was committed between 2016 and 2018, about 3 GW more than the required capacity. This level of investment placed significant downward pressure on LGC and wholesale electricity prices, reducing current investment signals for new renewables.

Grid constraint challenges have emerged in connecting and integrating this large wave of large-scale renewable projects into the grid in some places. This has resulted in reduced marginal loss factors, generation curtailment and significant delays in the connection of new projects. Figure 30 shows there is a time-lag between projects reaching financial close and when they are constructed and start generating. If the connection and grid congestion issues worsen, this time lag is expected to lengthen. There nevertheless remains substantial capacity in the grid.

Figure 30: Estimated renewable capacity committed and accredited, 2009 to 2020



Rooftop PV continues at pace

While constraints and barriers are emerging in the utility-scale market, consumer-based drivers have continued to strengthen. Many industries and large corporations are turning to renewables to address their energy needs and sustainability ambitions. As a result, a significant uptake of solar PV on large off-grid resource projects as well as new solar 5 – 30 MW projects located close to load sources has been observed. On the residential side, a growing trend of batteries being installed concurrently with solar PV and increased system sizes resulting in greater penetration of rooftop solar PV up to 5 MW is being observed.

The continued growth in the rooftop and behind-the-meter markets also show that changes need to be made at a distribution level to enable high levels of annual rooftop solar capacity additions to continue and contribute towards the decarbonisation of Australia.

2020 and beyond

The data shows that investment in renewables has not collapsed as some have claimed and some data apparently supporting those claims has been revised. According to Clean Energy Regulator's data, investment commitments of some 5.3 GW of capacity remains in the delivery pipeline and will be delivered as actual investment in 2020 and beyond.

When combined with the 9 GW already delivered from 2016 to 2018, the total delivery pipeline is more than double the 6.4 GW required to meet the 2020 target. The RET has not acted as a cap on investment. New projects accredited between 2020 and 2030 are still eligible to receive LGCs that can be used to meet legislated or voluntary demand.

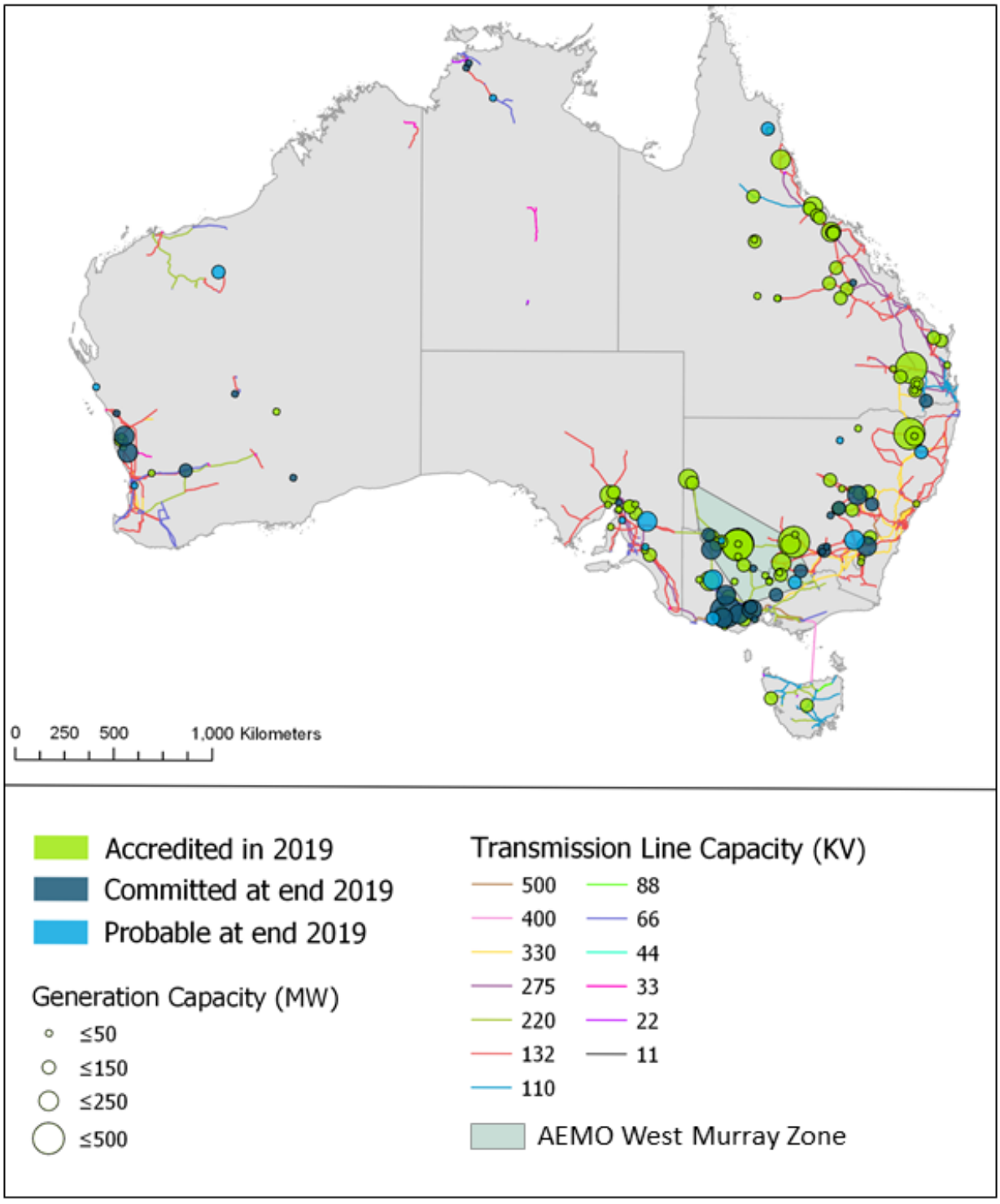
However, network constraints in north west Victoria and south western New South Wales demonstrate that there is an urgent need for investment in transmission infrastructure and firming to support an ongoing strong pipeline of renewable projects and the reduction in emissions from the transition to renewable energy. Where possible, market participants are finding ways to innovate and identify new areas and new approaches to installing additional renewables. This includes installing less than 30 MW sized power stations close to load in unconstrained parts of the gird, an increase in grid scale battery announcements, a surge in large off grid and resource sector renewables, and continued growth in mid-scale (100 kW-5 MW) sized installations.

West Murray zone connection

AEMO has identified the West Murray zone in north western Victoria and south western New South Wales as remote and electrically weak. This zone has attracted significant investment in utility scale wind and solar generation which is now experiencing curtailment and connection delays.

Figure 31 shows that while these connections affect a number of project developers, the vast majority of the current delivery pipeline is outside this zone. These delays are likely to have an impact on LGC supply. Once more is known about the length of delays, an assessment of supply impacts will be provided in a future quarterly carbon market report.

Figure 31: Delivery pipeline, 2019 to 2022, highlighting the West Murray zone, Victoria



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	ESC
EU allowance unit	EUA
Large-scale generation certificate	LGC
Large-scale Renewable Energy Target	LRET
Land Restoration Fund	LRF
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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