



Green Energy
Markets

Small-scale technology certificates Data modelling for 2019 to 2021

Final Report to the Clean Energy Regulator

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Disclaimer

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Executive Summary

The Clean Energy Regulator (CER) has engaged Green Energy Markets Pty Ltd (GEM) to provide an estimate of the Small-scale technology certificates (STCs) likely to be created during the 2019 calendar year, and for the 2020 and 2021 calendar years.

In developing our projections for small generating units (SGUs) and solar water heater (SWH) we utilised our existing models and databases. We have also made extensive use of the registry data provided by the CER and interviewed a range of solar industry participants.

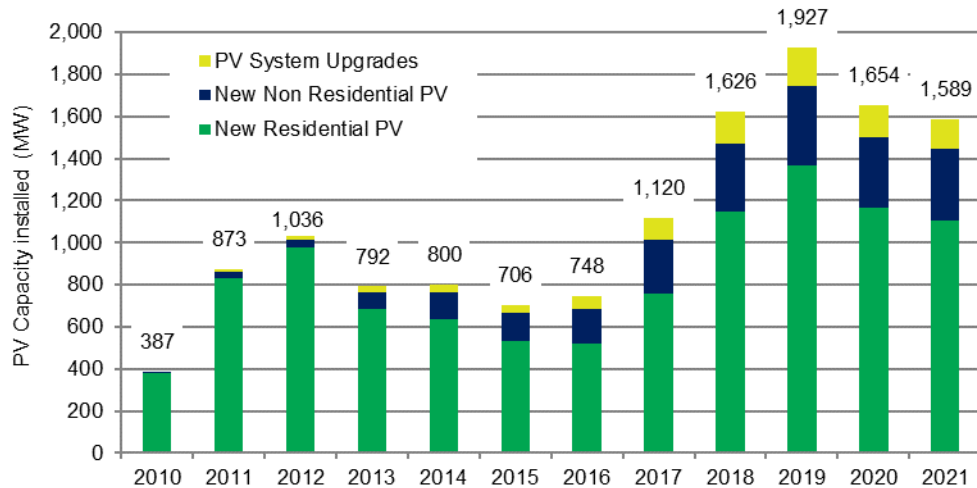
We have segmented the solar market into the following sub-markets to more accurately forecast the level of installations:

- SGU PV – New Residential market
- SGU PV – Upgrade Residential market
- SGU PV – Non-residential (commercial market)
- SGU PV – Upgrade Non-residential market
- SWH – New building market
- SWH - Replacement or existing dwelling market

The following factors have been influential in the development of our estimates of the level of future solar installations:

- Wholesale power prices are expected to remain high in 2019 in the eastern states and are not expected to decline until 2020. This means that solar PV will remain a attractive financial proposition for consumers through 2019 and we expect a decline from 2020 onwards as financial returns reduce.
- The Victorian Solar Program which contributes up to \$2225 to the cost of a residential PV system will see a surge in the level of solar PV installations in Victoria over the forecast period;
- The average system size for new residential installations is expected to continue increase, but at a more modest rate as we begin approaching the typical network connection constraint of 6.5 kW (5 kW on a basis);
- The number of non-residential (commercial size) PV system installations is expected to continue to increase through 2019 and then we expect a slight reduction in 2020 and 2021 as system paybacks increase due to falls in the wholesale electricity price; and
- The number of SWH systems installed in new homes is expected to decline over the forecast period in line with declines in the expected rate of new home commencements. This will be more than offset by an increase in the replacement market largely through the new rebate of \$1000 for residential solar hot water systems in Victoria which will see an increase in Victorian SWH installations in 2019 and beyond.

We estimate that 1626 MW of solar PV was installed in 2018 which is 45% increase on 2017 levels. We expect that the level of 2019 installations will increase further (by 19%), supported by strong growth in the residential market. The capacity installed in new residential market is expected to grow strongly due to the impact of the Victorian Solar Program. As wholesale electricity prices fall further from 2020 onwards, together with reduced contribution from STCs we expect that solar PV capacity installed will fall from 2020 onwards.



Over the 2018 calendar year nearly 30 million STCs were approved by the CER which exceeded the STC target of 22.1 million by 7.9 million STCs.

We expect that 32.5 million STCs will be submitted for registration in 2019 and we expect this to reduce significantly over the 2020 and 2021 calendar years.

Summary of results are as follows:

Year of installation	Actual 2015	Actual 2016	Actual 2017	Forecast 2018	Forecast 2019	Forecast 2020	Forecast 2021
STCs for systems installed in the year							
Solar PV	14,166	15,067	21,073	28,357	30,741	24,067	20,963
SWH	1,797	1,905	1,931	1,989	2,031	2,086	2,101
Total	15,962	16,972	23,004	30,346	32,772	26,153	23,064
Less STCs submitted following year (lag)	1,321	1,897	2,580	3,357	3,625	2,893	2,551
Add Previous year installs created this year	1,409	1,321	1,897	2,580	3,357	3,625	2,893
STCs submitted for creation	16,051	16,396	22,322	29,569	32,504	26,885	23,405

The key uncertainties in developing the estimates have centred on:

- The level of STCs finally created for the 2018 generation year;
- The extent to which wholesale power prices fall and the resultant contraction in the new residential solar PV market as high levels of saturation are reached;
- The response to the Victorian Government's Solar program; and
- The level of growth in the commercial PV market.

We have undertaken a sensitivity analysis and have developed a lower-bound estimate for 2019 of 29.3 million and an upper-bound estimated of 37.4 million.

'000 STCs Submitted for Creation	2017	2018	2019	2020	2021
Total Certificates - Base Case	22,322	29,569	32,504	26,885	23,405
Total Certificates - High Case		30,160	37,380	30,918	26,916
Total Certificates - Low Case		28,978	29,254	24,197	21,065

1. Project Scope

The Clean Energy Regulator (CER) has engaged Green Energy Markets Pty Ltd (GEM) to provide an estimate of Small-scale technology certificates (STCs) likely to be created during the 2019 calendar year and for the 2020 and 2021 calendar years.

The details and outputs of the report will influence and inform the Regulator in facilitating any update on the binding and non-binding STP estimates in the Regulations.

Data input into the model to estimate the number of Small-scale Technology Certificates (STCs) must generally include, but is not limited to:

- eligible system STC creation for previous years showing the historical trend in small-scale technology uptake using data to be provided by the CER;
- certificates remaining in the Registry from the previous compliance period. Delayed STC creation from installations in previous years may be relevant;
- STC price modelling (although STC price may be included as an input to the modelling exercise);
- estimates of any over or under-hang of STCs in 2018 from the previous compliance year;
- State and Commonwealth incentive schemes and any expected changes to these schemes over the timeframe i.e. impact of potential change to state policies around Feed-in tariffs;
- State based renewable energy targets and schemes (emerging or operating). In the case of Victoria it is assumed that the Solar Scheme will support 720,000 new installations over 10 years (72,000 solar PV and SWH systems per annum);
- relevant historical legislative changes to the eligibility rules and criteria for Solar Hot Water and Small Generation Units;
- existing, and potential changes to, building codes and regulations including energy efficiency measures which impact the uptake of various technologies;
- change in cost of STC eligible systems due to new technological and manufacturing improvements and changes in the cost of system components;
- global financial conditions, such as changes in currency values, and changes to cost of raw materials;
- changes in financial (e.g. due to Clean Energy Finance Corporation loans, power purchase agreements) and technological (e.g. battery storage) innovation;
- changes to electricity prices, network regulatory reform;
- trends in residential and non-residential buildings, including ABS Building Approvals data (8731.0) and building industry projections;
- changes in the size (kilowatts) and output of photovoltaic systems;
- impacts of phasing out of deeming arrangements under the Renewable Energy Target; and
- any other relevant factor the CER or GEM deems appropriate.

2. Methodology and Assumptions

In undertaking this project for the CER we have gone through the following steps:

- Review of current STC creation;
- Interviews with a range of Solar industry participants;
- Estimate likely level of solar installations in 2018 and estimate of the level of STC surplus at the end of 2018;
- Forecast the level of solar installations and STCs to be created for 2019, 2020 and 2021.

In estimating the level of STC creation for 2018 we have relied on historical creation figures provided by the CER for the period to 1 January 2019. We have then considered historical creation patterns and lags to estimate the total expected level of creation for systems installed in 2018. We have then cross referenced this with recent weekly creation patterns moderated by feedback received from industry interviews.

For the 2019 to 2021 period, GEM has broadly utilised the same methodology as we have in previous reports for the CER. We have developed forward estimates separately for each of the small-scale technologies that are able to produce STCs. Modelling approaches have been tailored to the specific market attributes of each technology and market segment.

In determining the level of STCs to be created we have initially forecast the likely number of SGU and SWH installations in each of the forecast years and then estimated the resulting level of certificates. We then make adjustments for the lag in certificate creation to arrive at the number of STCs to be submitted to the CER for approval in any given year.

We have relied on data provided by the CER on eligible systems that have been installed and created certificates. A system is determined as valid if the number of certificates created less the number of certificates failed at audit is greater than zero.

Modelling solar PV certificates

The demand for solar PV systems in Australia continues to be driven by the financial attractiveness of solar as represented by reducing exposure to high energy prices. There are a range of other factors that will also impact on the demand for solar PV including the level of up-front cost, industry marketing, expanded media coverage, environmental awareness and government incentives such as feed-in tariffs.

Our modelling for solar PV STCs is split into four segments, with each treated differently due to different drivers and attributes:

- New Residential systems;
- Residential Upgrade systems, this will also include replacement systems to 31 January 2018 after which time they will not be eligible;
- New Non Residential systems;
- Non Residential Upgrade systems

Modelling new residential PV system installations

Modelling for these systems is based on inputs to our payback model, with the resultant payback period feeding into projected demand for each state. As penetration levels have risen across all states we have refined our modelling approach for this sector by also considering the level of new homes built. Based on these estimates, the solar zone rating and the average system sizes, STC creation is forecast.

Payback period is modelled using Green Energy Markets payback model. Explicit assumptions used in the model include:

- Installed system cost;
- The value of STCs and any other rebate;
- Avoidable electricity cost for self-consumption in each state;
- Value of exported electricity in each state including relevant state feed-in tariff rates; and
- Level of exported electricity.

System prices are based on industry forecasts of equipment prices, installation costs and exchange rates (AUD/USD exchange rate of 0.72 assumed). Changes in the cost of raw materials will be implied in the above.

Modelling non-residential (commercial) PV systems

The number of commercial or non-residential systems being installed is increasing and is also becoming a more important part of the market as saturation levels for residential PV increases. We develop a historical picture of these systems based on the data provided and then assess the financial attractiveness by state based on average system paybacks.

Modelling upgrades, expansions and replacements of residential and non-residential PV systems

This market sector is increasing albeit from a low base. Many customers have small 1 kW systems that received the \$8,000 PV Rebate and are considering expanding their systems in response to higher power prices and lower panel prices. While this market sector is still very small we expect it to continue to grow and become a much more important feature of the industry in future years as saturation in the residential market increases. As a result, we separately assess these segments to determine its relative size and importance.

Modelling solar water heating certificates

Water heater systems are essential appliances and subject to state regulations increasingly limiting choice in some applications. As such, water heater system choices are based on different factors which include: the existing system type (if being replaced); the relevant state regulations; the type of premises; access to reticulated gas, and also net system up-front costs (after taking incentives into account). Operational costs, such as changes in future electricity and gas prices are also factored into the attractiveness of SWH.

The solar water heater (SWH) market has two sub-markets which are each subject to different incentives and regulations – these are the new building market (residential), and the replacement market (for existing water heaters in residences). The commercial market which had been important in previous years, is not significant and is not separately analysed.

SWH systems in each state and each sub-market are separately modelled. Major inputs into this analysis include new building forecasts, system replacement rates and market shares for each water heater technology by year.

The model considers relative market shares together with the following factors:

- State regulations for new/replacement systems;
- Access to reticulated gas;
- STC price;
- System prices (prior to incentives);
- Other state and federal government incentives (if any); and
- Economic factors.

SWH system installation forecasts will be combined with average certificate per systems (based on the most recent data) to estimate total certificate creation in each state and each submarket.

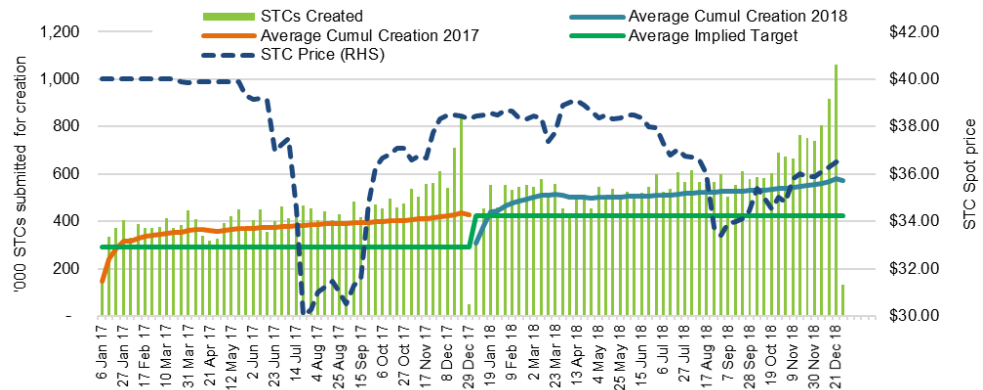
Market Participant Interviews

As part of the data modelling exercise we interviewed a range of solar market participants for their views of the solar PV and SWH market over the coming three years. The views of these businesses assisted in the development and refinement of our assumptions.

3. STC Market Overview and Industry Interviews

The level of STCs submitted for creation in 2018 has well exceeded the STC target and at the end of December 2018 was 36% above the STC Target (refer to Figure 3.1). A strong seasonal element remains with creation in 2018 surging from mid-October as it had in the previous year.

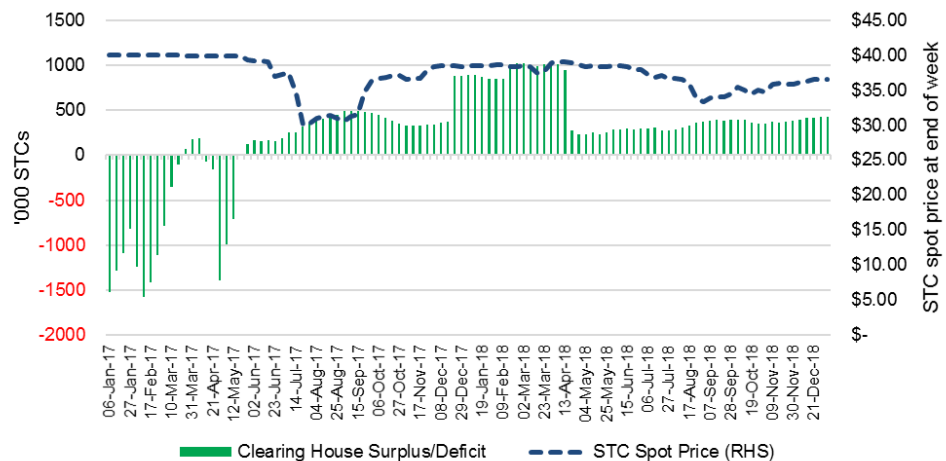
Figure 3.1 STC spot price and weekly STCs submitted for registration



As the level of creation continued to exceed the target the STC price started to fall from the \$39 level achieved after the April 2018 quarter surrender. The ACCC's recommendation to wind up the SRES scheme was released in June and the adverse market sentiment resulted in a drop in the STC price to below \$34. The price subsequently improved after the Government stated that it would not prematurely close the scheme.

The continued oversupply of STCs over the last two years has meant that the Clearing House has not come into play and has remained in surplus (Figure 3.2).

Figure 3.2 STC Clearing House Surplus / (Deficit)



Solar industry participant interviews

As part of the review process we interviewed a cross section of solar market participants (including some of the largest participants in each market sector) to obtain their views on the current level of solar installations and expected activity over the coming years.

Some key observations that have informed our assessment and assumptions used in the modelling are set out below:

- There are concerns that the growth in 2018 has led to capacity constraints, particularly securing batteries from some suppliers and challenges in securing accredited installers. This situation is perhaps more acute in Victoria following the increase in demand due to the Victorian Solar Program. One of the impacts of this is likely to see an increase in installation costs until additional trained installers come through the system;
- Consumer interest in residential and commercial sectors remains strong off the back of higher power prices and improved financial attractiveness. Interestingly environmental concerns are now starting to appear as a customer motivator to consider solar (this could well be due to concerns regarding higher temperatures and drought);
- With increased saturation the cost of generating leads in some states is starting to increase noticeably. There are still considerable opportunities in the commercial sector, however sales take longer to close;
- While there has been considerable customer interest in batteries, the overall level of battery sales has not grown as much as some participants expected (approximately 20,000 battery installations expected in 2019);
- Panel prices were lower than expected in 2018 however growing global demand will see some increase in pricing in 2019; and
- Continued trend to larger system sizes, though starting to level out a bit as approaching 6.5 kW (5kW on an AC basis). Connection process can be much more complicated and costly for systems above this size.

4. Estimating STC creation for 2018 installations

Registered Agents and their customers have 12 months from the date of installation of a small-scale system to create the certificates. This means that we will only know at the end of 31 December 2019 what the number of certificates created from the installation of solar systems in 2018 will be.

We have analysed the level of STCs that have been submitted for creation on a weekly basis by year of installation for the key market sectors. Figures 4.1 and 4.2 show the lag in creation for new residential and new non-residential solar PV installations. The lag in creation for all market sectors are summarised in Attachment 11.

Figure 4.1 Weekly STC Creation – new residential PV systems by install year

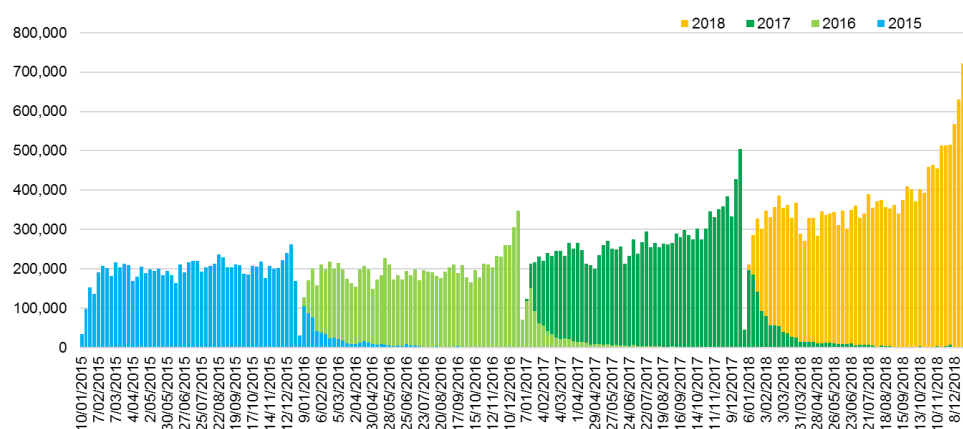
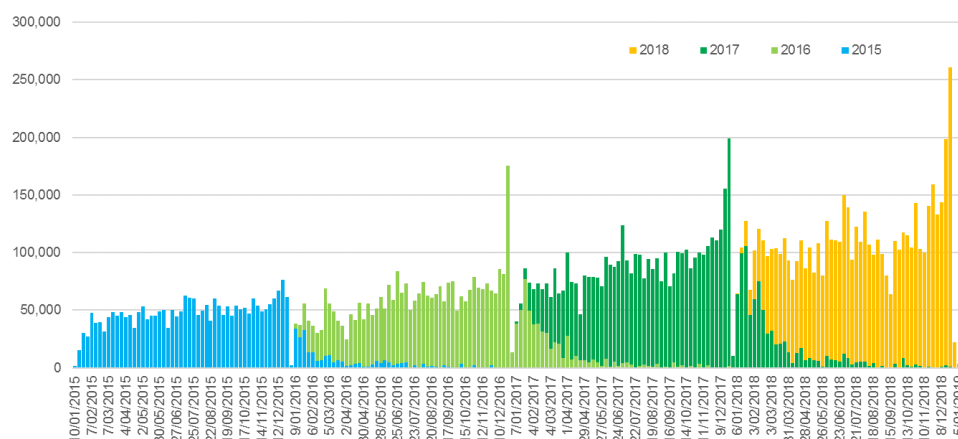


Figure 4.2 Weekly STC Creation – new non-resid. PV systems by install year



On analysis by market segment (Table 4.1) it is quite apparent that delays in creation are significantly higher for non-residential PV systems and for SWH systems in new buildings. To determine the level of STCs that are still to be created at the end of December 2018 for systems installed in 2018 we have used the same proportion that applied in 2017.

Table 4.1 Proportion of Valid STCs still to be created in following year (as a proportion of STCs created to end December)

Installation Year	Following Year Creation as % of STCs created to end Dec		
	2016	2017	2018
New Residential PV	8.6%	9.3%	9.3%
New Non-Residential PV	19.7%	20.2%	20.2%
Upgrade PV	11.6%	14.8%	14.8%
New Building SWH	32.5%	27.3%	27.3%
Replacement SWH	9.6%	9.0%	9.0%

A summary of total STC creation by market segment and the delays in creation is included as Attachment 11.

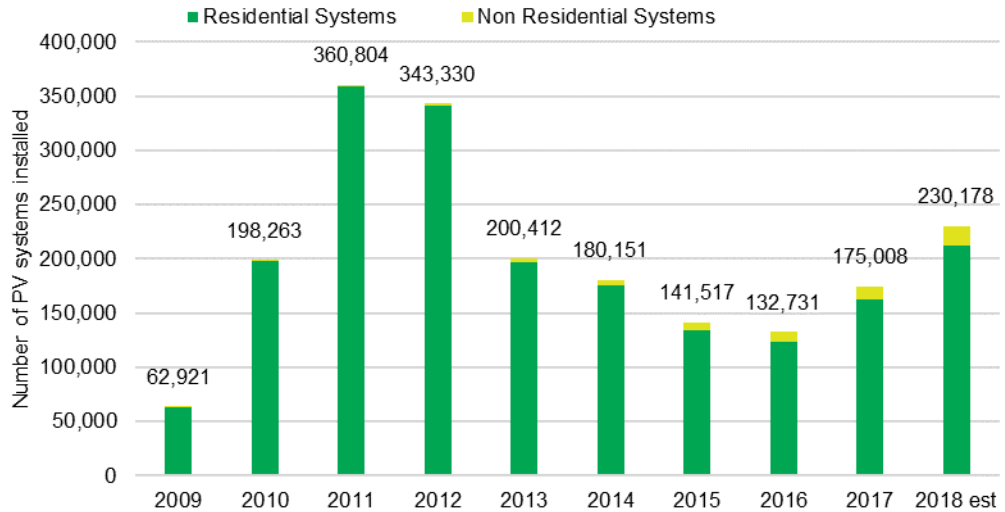
Estimating STC surplus for 2018

We estimate that a total of 30.0 million STCs will be approved for registration in 2018 (refer to Attachment 1). This means that there will be a surplus of approximately 7.9 million STCs (as at 31 December 2018) that will be eligible to meet the 2018 STC Target of 22.1 million (surrendered by 14 February 2019).

5. Solar PV and SWH - Market Review

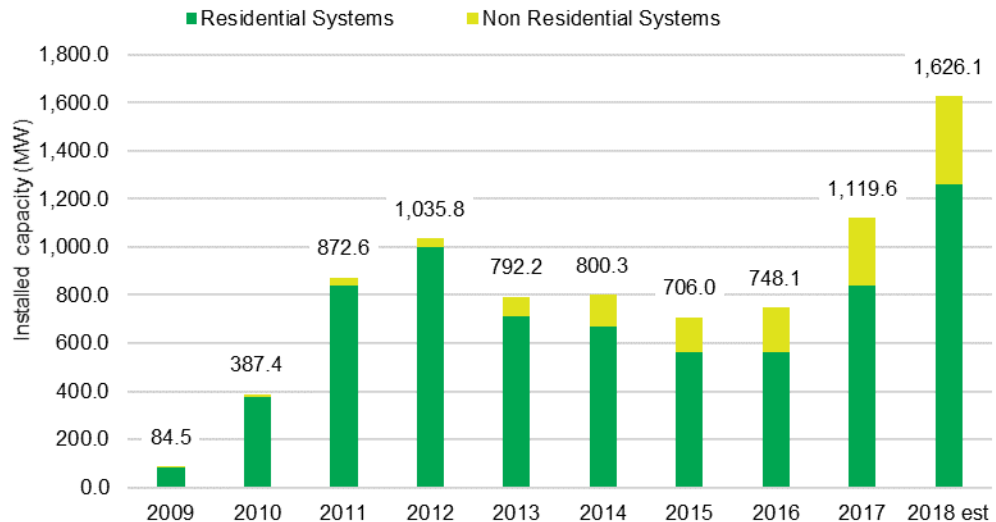
The number of solar PV systems installed continued to increase in 2018 as concern over rising power prices and the improved economics for solar systems due to high wholesale power prices led to increase in demand (Figure 5.1).

Figure 5.1 Number of Solar PV installations claiming Certificates by Segment



The total installed capacity is expected to be 1626 MW in 2018 a 45% increase on 2017 levels (Figure 5.2).

Figure 5.2 Solar PV installed capacity claiming Certificates by Segment

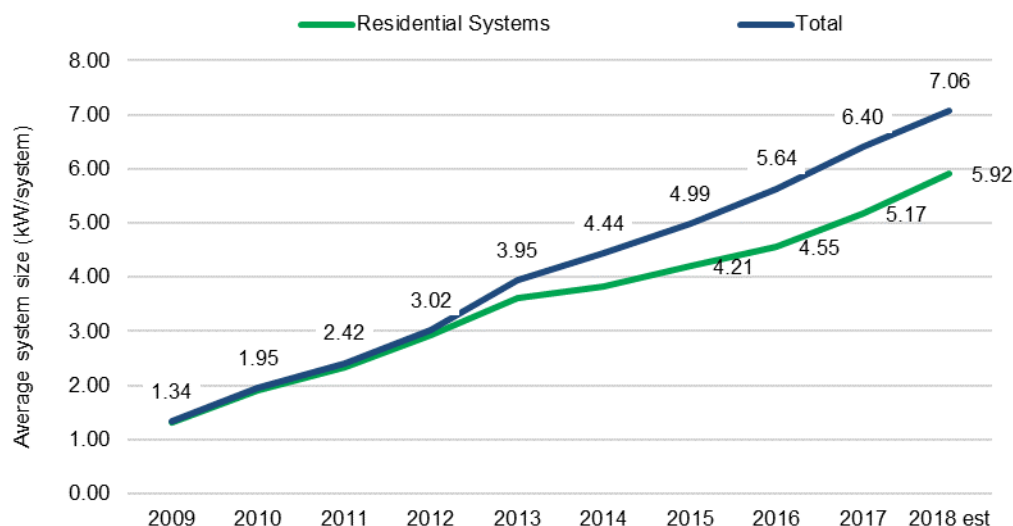


The number of non-residential systems has continued to increase and is expected to reach 367 MW in 2018 and account for 23% of capacity installed for the year. Interestingly the non-residential market share fell slightly from 24% in 2017.

The overall average size of PV systems has continued to increase and reached 7.06 kW per system in 2018 (Figure 5.3). The increase in average system size has been driven by the significant increase in the number of non-residential systems, and also by

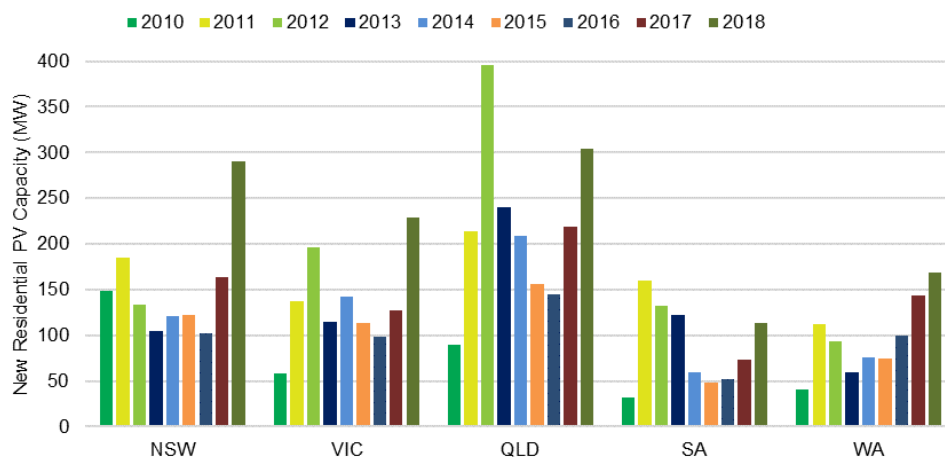
the improved financial returns from larger residential systems. The average system size for residential installations (including upgrades) continued to increase significantly in 2018 reaching 5.92 kW per system.

Figure 5.3 Average size of system installations (Australia as a whole)

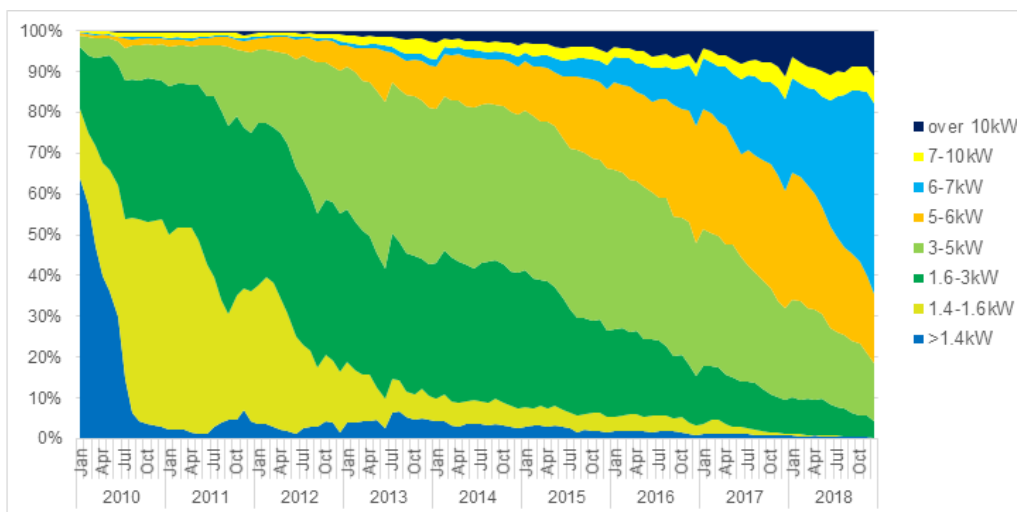


All major states have seen a significant increase in the installed capacity over the 2017 and 2018 period (Figure 5.4). Victoria has seen the largest percentage increase in 2018 (79%) largely due to the commencement of the roll-out of the Solar rebate program in September 2018.

Figure 5.4 New Residential PV system capacity (MW) installed for key states



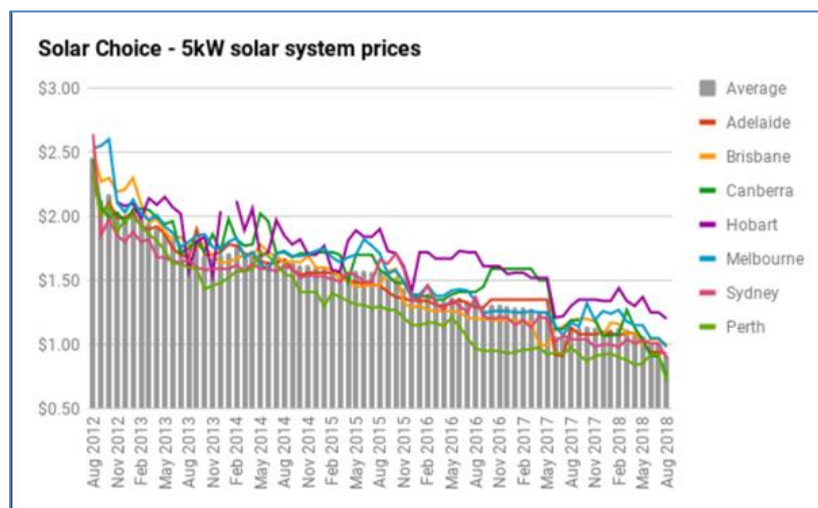
The changing nature of Australia's solar PV market with the move to larger system sizes can best be shown graphically (Figure 5.5). Very few solar PV systems were installed in 2018 at less than 5 kW in capacity. The most popular size of solar PV system is now in the 6 to 7kW bracket which reflects the typical 5kW (AC) connection constraints (DC capacity can be up to 30% higher).

Figure 5.5 Number of systems installed by capacity bands

Forecasting Installed PV costs

Installed system costs continued to drift lower during 2018 as Australia is seen as an attractive destination for surplus Chinese product.

Solar Choice publishes average installed system prices (Figure 5.6) which incorporates the value of STCs and so reflects the net cost to the customer. The Solar Choice analysis shows that net system prices reduced slightly after April 2018. The Solar Choice analysis represents pricing from Solar Choice's installer network database and as such the average price may not be representative of the market as a whole. The trend shown by the data is however reasonably representative of the broader market.

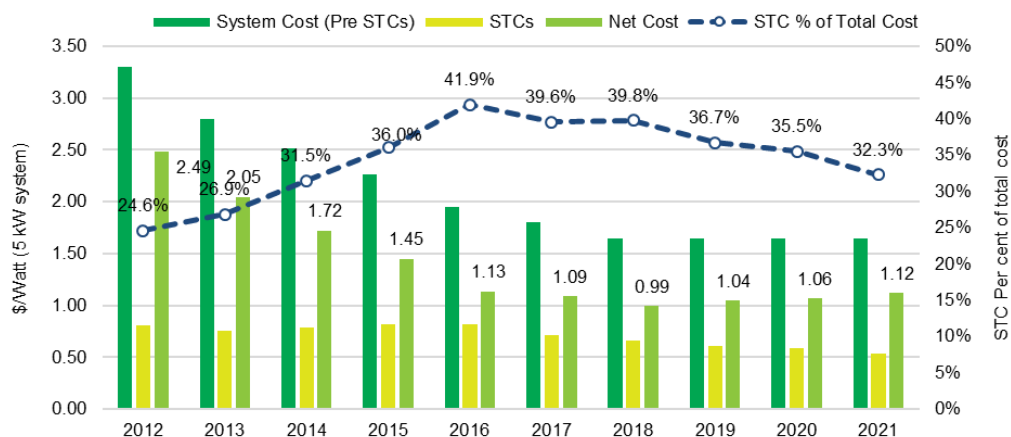
Figure 5.6 Installed system Costs (after STCs) for 5kW system (\$/Watt) (Solar Choice, September 2018)

<https://www.solarchoice.net.au/blog/solar-power-system-prices>

We estimate that the average installed system cost (pre STCs) in 2018 will average \$1.65 per Watt which is slightly lower than the \$1.80 per Watt in 2017. We expect that the installed cost (pre STCs) in 2019 and for 2020 and 2021 will remain at this level in nominal terms (Figure 5.7).

STCs will continue to play an important role in making solar PV attractive to customers even as the years of deeming reduce. The net STC price (after creation fees) averaged \$36.53 in 2018 and is expected to remain at this level in 2019 and then increase to \$38.53 in 2020 and 2021 as the STC target is adjusted for the surplus of STCs.

Figure 5.7 Forecast Installed system costs for 5 kW system (\$/Watt)

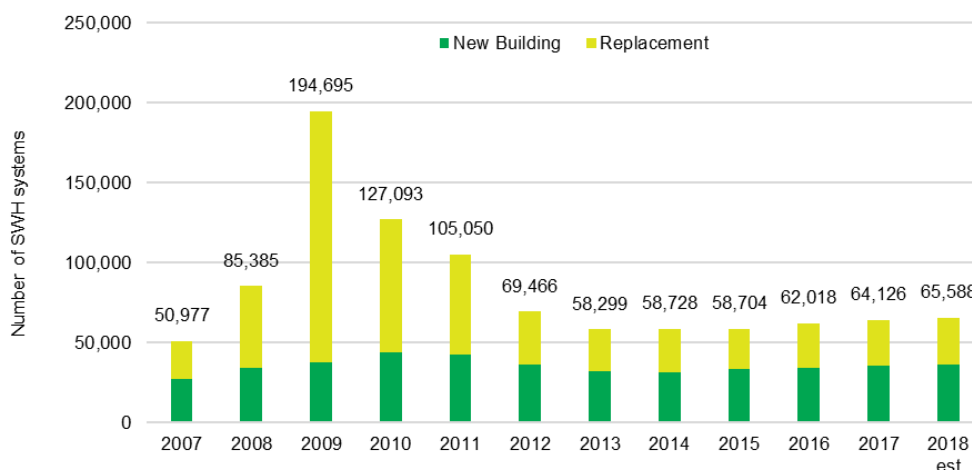


STCs accounted for nearly 40% of the total cost of the system in 2018 and this is expected to drop to 36.7% in 2019 and then continue to fall as the number of years deeming reduces.

SWH Market

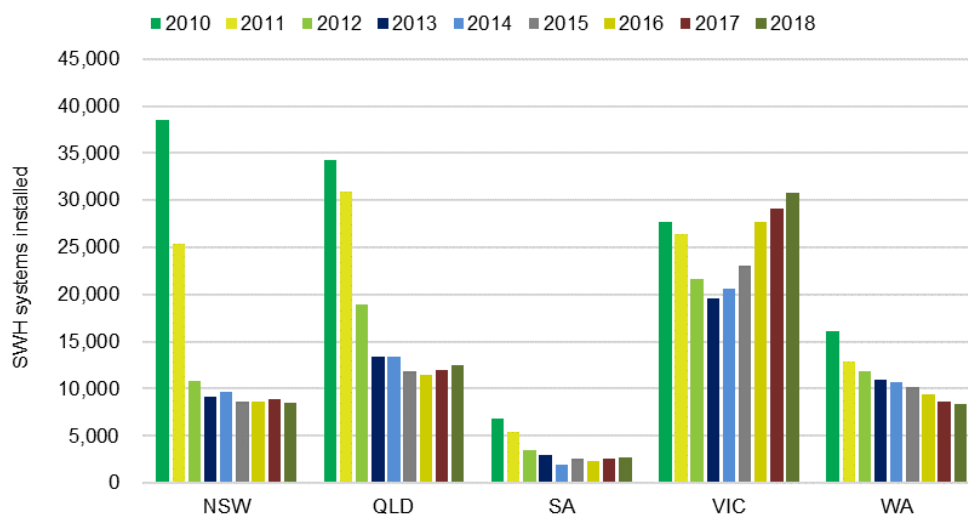
The SWH market can usefully be segmented into the new building and replacement markets (Figure 5.8). The new building market has been relatively stable broadly moving in line with the level of new home building. The replacement market on the other hand has proved to be very volatile and has been historically driven by the level of rebates for the replacement of electric resistance water heaters.

Figure 5.8 SWH Systems installed and creating certificates by market segment



The SWH market overall has been growing at very modest levels over the last four years and increased by 2.3% in 2018.

Installations of SHW systems across all main states (with the exception of Victoria) have been fairly flat over the last three years (Figure 5.9).

Figure 5.9 SWH Systems installed in NSW, Qld, SA, Vic and WA

Victoria continues to be the largest market for SWH. The strong Victorian market reflects the support provided by the Victorian Energy Upgrade (VEU) Scheme for replacing electric water heaters with SWH (replacement market) and strong growth in SWH installs in new homes due to building regulations and strong growth in residential building activity.

There have been several interesting developments over the last few years in the SWH market which are worth watching as they may have ramifications in future years. These are the increase in the number of Air Sourced Heat Pumps (Figure 5.10) that are being installed and the growing proportion of SWH installations replacing existing SWH systems (Figure 5.11).

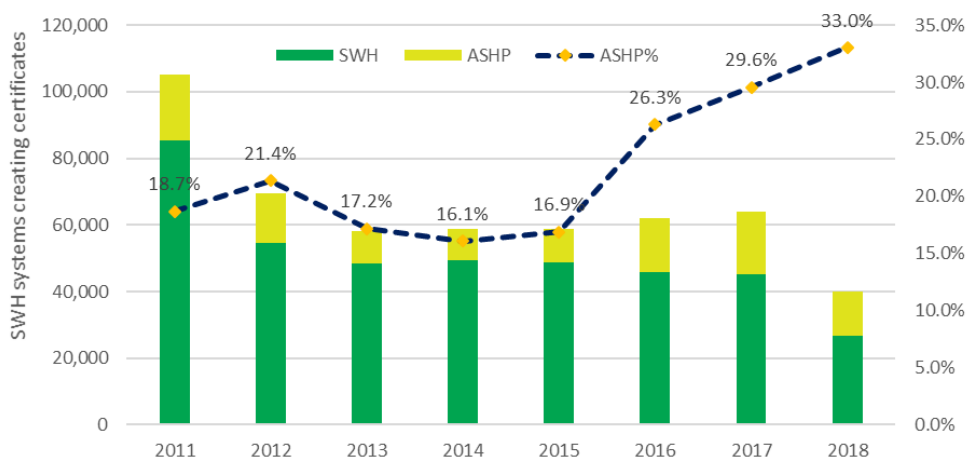
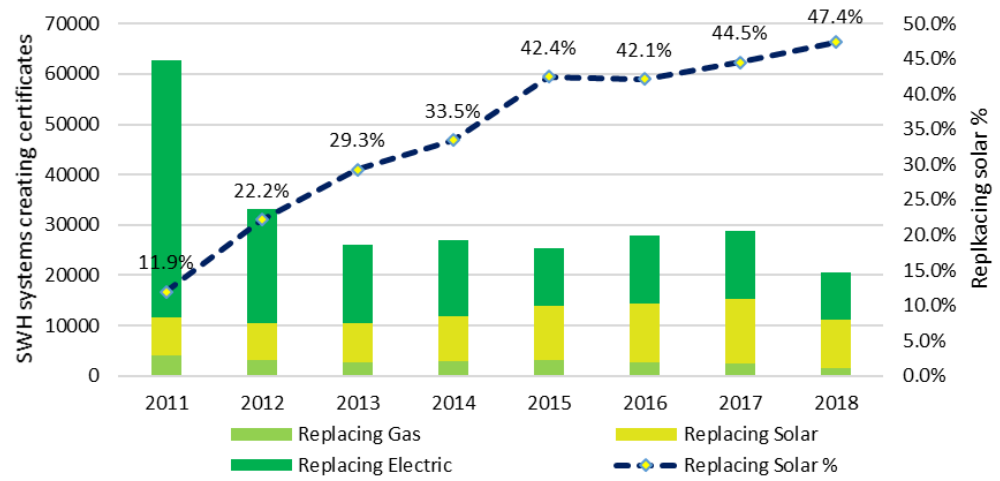
Figure 5.10 Type of SWH being installed

Figure 5.11 SWH Replacement market – system being replaced



6. Solar PV Projections – New Residential

The new residential PV market remains the most significant segment and is expected to account for 71% of PV capacity installed in 2019 under the SRES.

Systems are generally sold into this market on the basis of financial attractiveness ie. the time it take to payback the initial investment. Our projections for the residential sector for the 2019, 2020 and 2021 calendar years have been made on a state basis and are principally derived from our payback model. Changes in payback determine the expected demand for PV systems and we assess this against saturation levels in each state based on the proportion of eligible owner-occupied households. Future demand is also impacted by our assessment of relative market competitiveness, industry promotion and response to heightened media concern for higher power prices. We also separately account for the number of PV systems likely to be installed on relatively new homes. Once we have forecast the level of expected installation we project the average system size by state to arrive at the expected level of certificate creation.

Forecasting payback periods

We have adopted a simple payback approach to represent the relative financial attractiveness of PV to consumers in each state. The system payback is derived by dividing the installed cost of the system (less the value of STCs) by the value of electricity produced in the year of installation.

Explicit assumptions used in the model include:

- STC price averaging \$36.53 (after creation costs) for 2018. We have assumed a price of \$36.53 for 2019 which reflects the value that STCs are currently traded in the forward market. STC prices are expected to increase to \$38.53 in 2020 and 2021 as the STC surplus gets factored into future STC targets;
- Electricity import replacement prices reflect AEMC's latest projections (December 2018 Report) and are adjusted for standing charges utilising AEMC demand estimates. We have adjusted wholesale prices for 2020 and 2021 to reflect changes in forward wholesale prices of electricity in line with the forward market through ASX Energy (refer to Figure 6.1). Prices are expected to reduce significantly over the 2020 to 2021 period;
- For payback modelling purposes we use a generic average system size for each state and is assumed to be generally 5.5 kW other than in Queensland and SA where we assume 6.0 kW. We have also assumed that the average system size in Tasmania reduces to 5.0 kW from 2020 as power prices fall and attractiveness reduces;
- Electricity exports are determined by state and are linked to the average system size and the average consumption levels in each state. Export levels range from 60% in the NT to 75% in most other states;
- Total installed cost of solar PV is assumed to be \$1.65 per Watt in 2019 and remain at this level in nominal terms for 2019 through to 2021.

The installed cost and the contribution that STCs make is shown graphically in Figure 5.7 and Attachment 2.

Figure 6.1 ASX , Base electricity futures price for 2019 to 2022

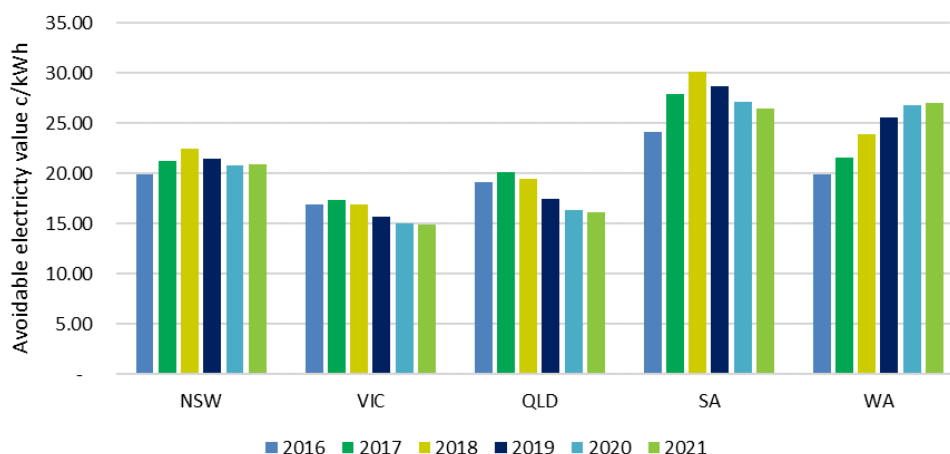
Cal Base Future Prices Tue 15 Jan 2019					Full Historical Data
	<u>NSW</u>	<u>VIC</u>	<u>QLD</u>	<u>SA</u>	
2019	92.33	99.98	78.22	102.69	
2020	77.50	80.53	65.34	82.50	
2021	67.09	65.05	55.86	68.00	
2022	72.53	68.23	63.14	85.00	

Average assumed electricity consumption by state is based from the AEMC report and is reproduced in Table 6.1 below:

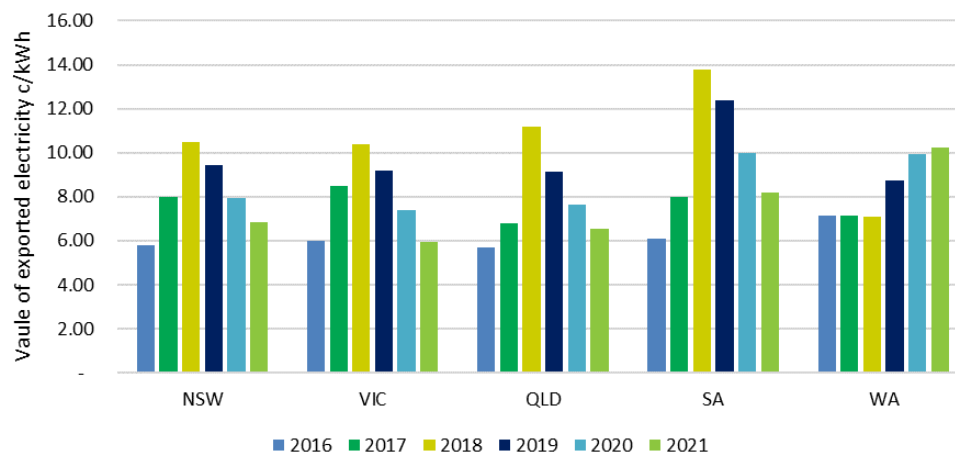
Table 6.1 Annual electricity consumption by state (AEMC)

Jurisdiction	Annual consumption (kWh)
Queensland	5,240
NSW	4,215
ACT	7,151
Victoria	3,865
Tasmania	7,908
NT	6,613
South Australia	5,000
WA	5,196

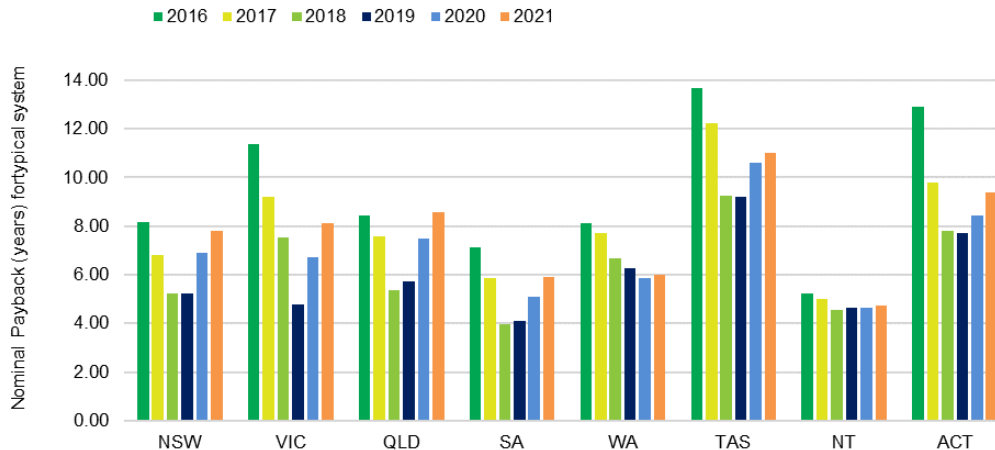
The wholesale electricity price is expected to reduce from 2020 according to the AEMC's December 2017 Electricity Price trends report. This is also illustrated by the prices at which ASX futures are currently trading (Figure 6.1) where 2021 prices are 2 to 3 cents/kWh lower than 2019 levels. The avoidable electricity price in all key NEM states reduces from 2019 as the wholesale price falls and standing charges continue to increase (refer to Figure 6.2).

Figure 6.2 Avoidable electricity price (variable cents per kWh component)

The value of exported electricity in the NEM states is also expected to reduce considerably over the next few years, predominantly as the wholesale price falls. The value of exported electricity assumed for key states is summarised in Figure 6.3.

Figure 6.3 Value of exported electricity for key states (cents per kWh)

Average system paybacks dropped dramatically in most NEM states during 2018 due to high wholesale prices and lower system costs. Paybacks for systems installed in 2019 are expected to be comparable to 2018 levels, other than for Victoria which is discussed separately. System paybacks are then expected to increase significantly from 2020 (Figure 6.4) as the wholesale power prices fall and directly impact the value of electricity produced by solar PV. Reductions in the contribution from STCs also adversely impacts system paybacks.

Figure 6.4 Simple Payback for typical residential PV system

Demand for solar PV

Solar PV is a discretionary purchase for most households so financial attractiveness will be the key determinant of the underlying demand. Like other discretionary purchases uptake will also be significantly impacted by the level of sales, marketing and promotion activity. In addition, concerns regarding the future economic outlook and the impact that any economic and budget contraction will have on discretionary household expenditure will constrain the near-term outlook for solar PV. Offsetting this to some extent is the emergence of financing solutions that result in the customer not having to outlay any cash upfront for a system.

Demand curves have been developed on a state basis based on historical residential system installations. Demand curves are represented as a proportion of owner

occupied relevant dwellings. We have recalibrated our dwelling database utilising the detailed data made available by the ABS from the 2016 census.

Based on ABS data there were 5.1 million occupied detached and semi-detached dwellings in Australia in 2016 (refer to Table 6.2).

Table 6.2 Detached and semi-detached dwellings by state
(source: ABS, 2016 Census)

State	Sum of 2006 Dwellings	Sum of 2011 dwellings	Sum of 2016 dwellings
ACT	70,982	82,867	96,547
NSW	1,400,462	1,464,706	1,505,461
NT	23,525	24,633	28,476
QLD	856,368	925,049	970,731
SA	394,030	410,767	425,461
TAS	126,111	132,554	134,991
VIC	1,201,789	1,278,158	1,358,214
WA	469,699	517,903	579,335
Total	4,542,966	4,836,637	5,099,216

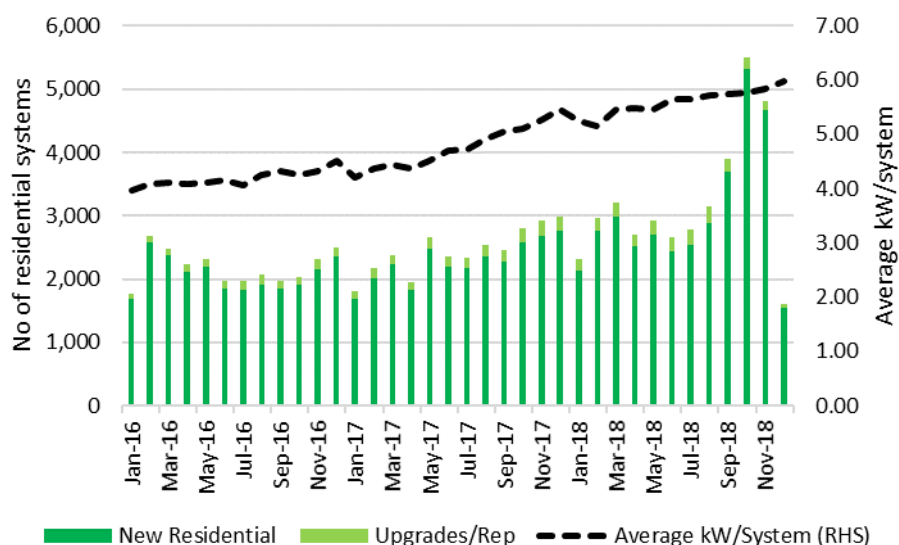
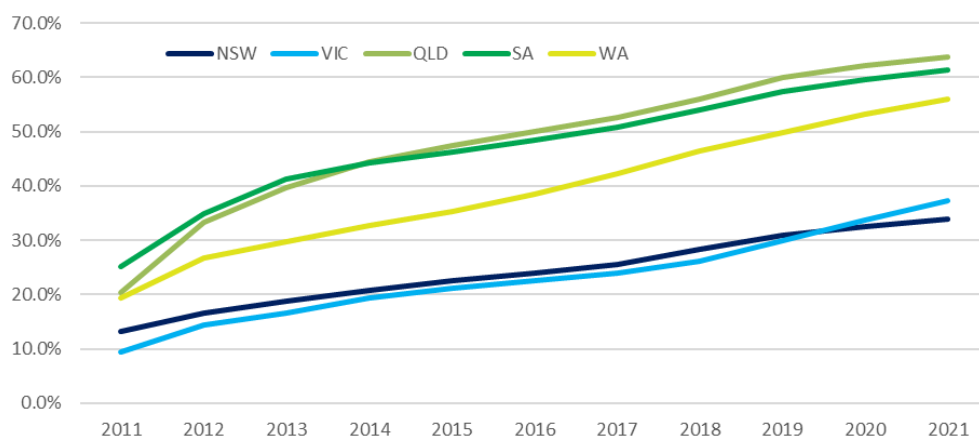
Demand curves have been further refined to account for the level of marketing and promotion activity, and the relative attractiveness of the state (that is not picked up through the factors incorporated in the payback model) and covers factors such as state economic conditions, relevant level of retirees and income levels.

The demand curves are then further scaled based on the level of saturation in each state. We have used an average of 2015 and 2016 years as a base for calibrating our demand curves. Over the three years to 2021 the cumulative PV systems installed in each state grows considerably with very high saturation rates achieved in Queensland and South Australia, reaching over 60% by 2020.

New residential demand for solar PV in Victoria has been treated differently from other states due to state governments solar program which will support 720,000 solar PV, SWH and battery systems over 10 years. The program provides eligible households a rebate of up 50% of the cost of a solar PV system installed before 30 June 2019, up to a maximum rebate of \$2225. The Government has announced that after 30 June 2019 it will pay the full up-front cost of the system with the household able to pay off half the cost via an interest free loan (<https://www.premier.vic.gov.au/applications-now-open-for-half-price-solar-panel-rebates/>).

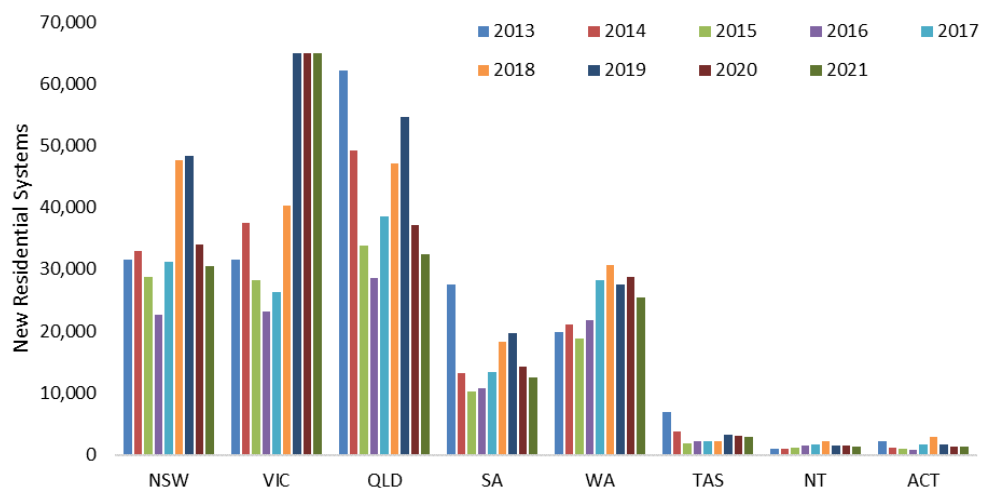
The Victorian Government initially announced that the package would support 650,000 residential solar PV systems over 10 years, equivalent to 65,000 systems each year. It is not clear how the government will ration the available rebates and for the purpose of our modelling we have assumed that the program supports 65,000 solar PV systems each year and 7,000 SWH systems each year.

We do not believe that the Victorian Government will have trouble in securing customers for the program and note that the number of solar residential PV systems installed in Victoria since the program started in September has seen a surge in installations (Figure 6.5). It is important to remember that many of the systems installed in the last quarter of 2018 will not have submitted applications for STC creation. To be able to meet the 65,000 notional annual target will require that 5400 solar PV systems be installed per month. The months of October and November in 2018 will clearly exceed this once all STCs are submitted for creation.

Figure 6.5 Victorian monthly residential PV installations**Figure 6.6 Penetration level by key state**

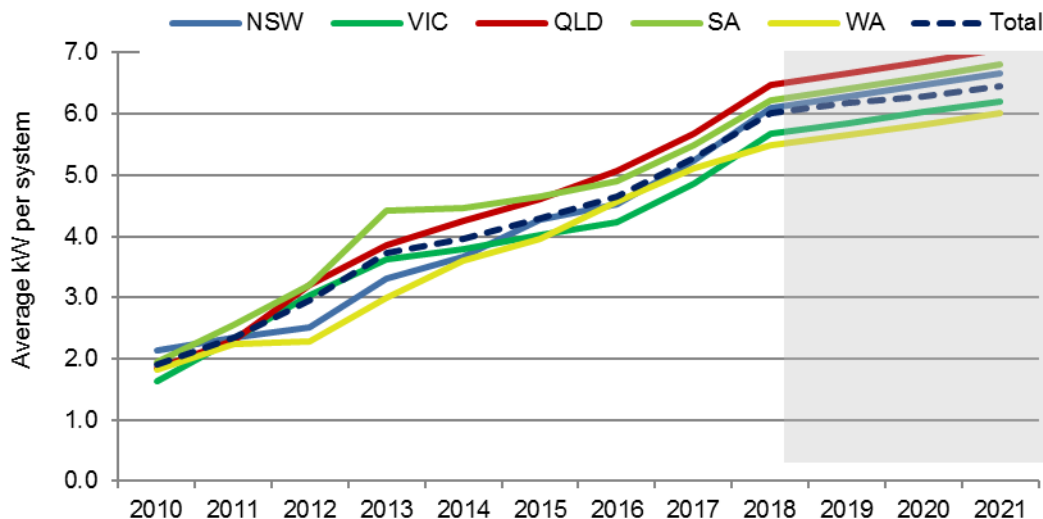
Note: Penetration rate represents the cumulative proportion of residential systems installed as a proportion of owner occupied houses (separate and semi-detached)

Projected system installations and penetration levels for each state is included in Attachment 3. The data is shown diagrammatically as Figure 6.7. In all states other than Victoria we expect to see a material reduction in the level of system installation from 2020, predominantly driven deteriorating financial attractiveness and by rising levels of saturation.

Figure 6.7 Residential PV systems installed by state

Determining the level of certificate creation

The average new residential system size installed has continued to increase reaching 5.88 kW per system in 2018 (refer to Attachment 4 for details). All states have seen an increase in system size (refer to Figure 6.8).

Figure 6.8 Average system size installed for NSW, Qld, SA, Vic and WA

We forecast that the average system size will continue to increase, but at a slower rate than experienced over the last few years. Improved panel performance will result in increased generation capacity for a given area however as the value of exported electricity decreases there will be less incentive to opt for bigger systems. In Tasmania we expect that average system sizes will actually decrease as smaller systems with less power exported will be more financially attractive.

The total number of systems installed and associated certificates created for new residential systems is detailed in Attachment 4 and summarised in Table 6.3.

Table 6.3 Number of New Residential Systems and Certificate Creation

Year of installation	2016	2017	Estimate 2018	Forecast 2019	Forecast 2020	Forecast 2021
Number of Systems Installed	111,461	143,080	191,249	221,585	185,121	171,428
Avg kW/system	4.64	5.29	6.01	6.18	6.28	6.46
Avg Certificates/kW	20.1	18.8	17.4	15.9	14.4	13.1
MW Installed	517.5	756.9	1,149.8	1,368.3	1,163.3	1,106.7
Eligible Certificates ('000)	10,401	14,247	20,022	21,732	16,801	14,474

7. Solar PV Projections – Non-residential (Commercial)

We have in the past generally segmented the commercial market into those systems where the installed capacity of the system is greater than 10 kW. This had been a proxy for commercial systems. While in some ways it is an arbitrary delineation, it had generally reflected industry convention. As we identified in Section 2 of this report, the CER has been collecting data on the type of premises that the system was installed since mid-2014. We have used the CER's delineation from 2015 when a full years data was available. For systems installed prior to 2015 we have continued to use systems greater than 10 kW as a proxy for non-residential systems.

Potential Demand

By the end of 2018 we estimate there will have been nearly 55,000 commercial sized systems installed across Australia. This is still only a relatively small proportion of potential sites and there remains considerable scope for this sector to continue to expand.

It is difficult to obtain data on the potential size of the market as we need to consider:

- Those businesses that own their own facilities, or at least have considerable time remaining on their lease;
- Business sites that have appropriate roof space available to accommodate a large number of solar panels; and
- Business sites that consume a reasonable amount of electricity so that not too much of the electricity produced is exported.

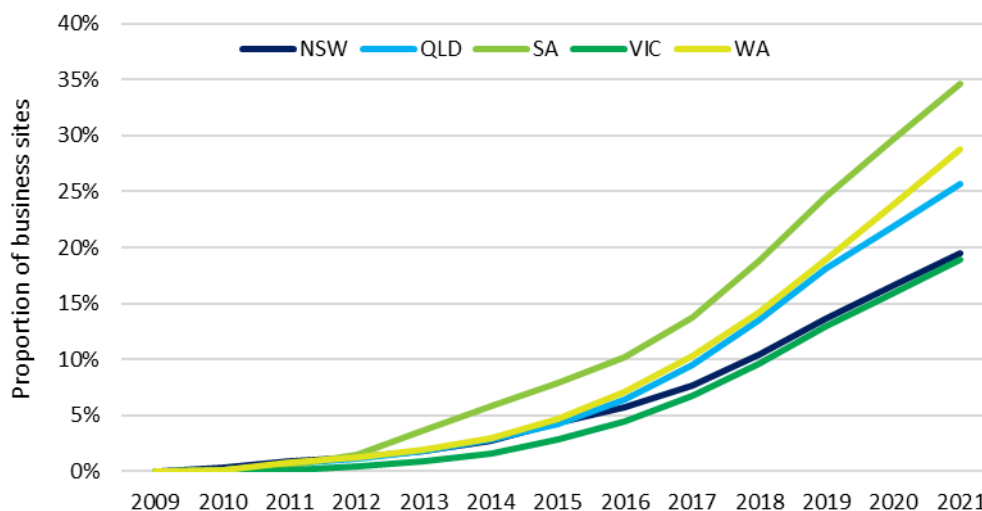
Data is not available by state that represents the above characteristics and we have developed a proxy to assist in assessing market prospects and growth over time. The ABS publishes data on the number of registered businesses (ABS No of businesses 816501) by number of employees and the Energy Supply Association of Australia (ESAA) publishes data by state on the number of business connections (Electricity Gas Australia – 2014 Report). This information is summarised by state in Table 7.1.

Table 7.1 Number of Businesses and Electricity Connections (2013)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Business Connections (ESAA)	371,874	319,840	221,300	98,783	128,942	44,777	15,104	15,495	1,216,115
Total Businesses (ABS)	688,766	538,767	414,423	143,300	215,938	37,529	14,244	25,298	2,078,265
Businesses >1 employee (ABS)	282,421	210,315	159,015	50,604	81,425	15,100	5,691	10,729	815,300
Proportion >1employee	41.0%	39.0%	38.4%	35.3%	37.7%	40.2%	40.0%	42.4%	39.2%

According to the ESAA there were 1.2 million business connections in Australia in 2013. The ABS estimates that 39% of businesses employ more than one person and we have scaled the ESAA connection data by this ratio to arrive at a proxy for the number of potential sites. Many of these sites will not be suitable for PV due to being rented or not having sufficient roof space.

We have analysed the proportion of businesses that have installed solar by state and this is summarised in Figure 7.1. Queensland and WA had achieved nearly 15% market penetration by 2018. Victoria and NSW have quite a bit lower penetration rate at around 10% with South Australia having nearly 20%.

Figure 7.1 Estimated Proportion of Business Sites with Solar PV (larger states)

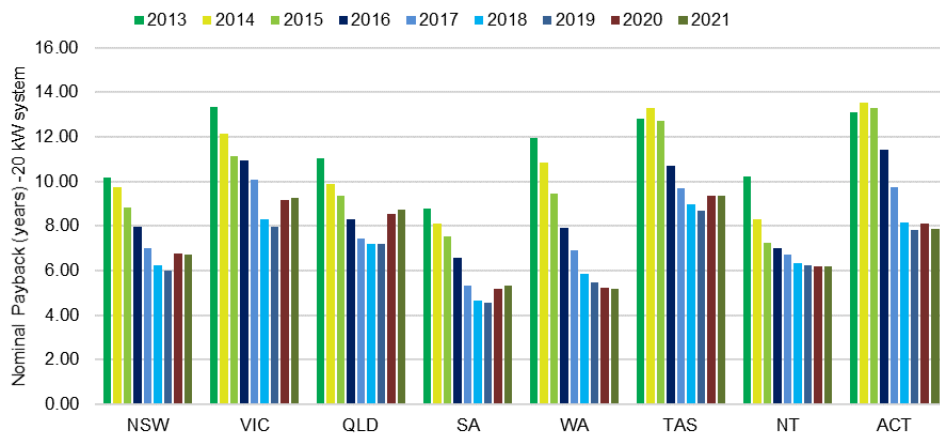
The availability of roof space and owning the site are key requirements for solar PV to be considered by a business customer. It would appear that sites that are outside of the major metropolitan areas of capital cities are more likely to have these characteristics and therefore more likely to be attractive for solar PV. Postcode analysis that we have undertaken indicates that nearly 50% of non-residential installations occur outside major urban areas, which is twice the proportion of residential dwellings.

Financial attractiveness

Most business sites consume less than 160 MWh of electricity per annum and pay electricity tariffs that are broadly similar to residential customers. To the extent that these businesses can mainly offset their on-site power use (and avoid exporting significant levels of power) then an investment in PV can be quite attractive. The simple payback for a commercial system of average size (20 kW) is shown diagrammatically in Figure 7.2.

Assumptions used in the payback analysis are consistent with the assumptions used for residential systems only with a lower export proportion (20% of power is assumed to be exported) and the value of the electricity exported is assumed to be zero (other than in Victoria where systems less than 100kW are eligible for a feed-in tariff).

The increase in the wholesale price of electricity for south eastern Australian states over the last few years has generally resulted in an improvement in the payback period to 2018 (Table 7.1). However as wholesale prices are forecast to reduce which combined with a reduction in the contribution of STCs will see an increase in payback periods to 2021.

Figure 7.2 Simple payback for a 20 kW Solar PV System

In assessing the potential market for solar PV, a relative attractive investment may not get implemented as high up-front cost activities such as PV suffer a number of barriers, these include:

- The split incentive: most small-to-medium businesses lease their premises. Payback may take longer than the lease term, and the building owner does not pay the electricity bill;
- Businesses' preference to invest in their own operations rather than in non-core activities;
- The frequency of non-working periods (eg weekends) for such businesses, which leads to power export and a consequent reduction in attractiveness; and
- Electricity represents a relatively small proportion of a business's costs and as such gets little attention from business owners.

The level of commercial PV installations (in MW terms) is expected to have increased by 32% in 2018. We forecast a continued increase but at a lower rate of growth than experienced in the past. We assume that the capacity installed increases by 18% in 2019 and then falls in 2020 and 2021 as system paybacks deteriorate due to lower avoidable power prices.

For the forecast period, we have assumed that the average system size in each state for 2018 period applies.

The total number of systems installed, and associated certificates created for the non-residential PV market is detailed in Attachment 5 and summarised in Table 7.2.

Table 7.2 Commercial System Installations and Certificates (all states)

Year of installation	2016	2017	Estimate 2018	Forecast 2019	Forecast 2020	Forecast 2021
Number of Systems Installed	8,338	11,584	15,243	17,961	16,105	16,018
Avge kW/system	20.13	22.03	21.06	21.06	21.09	21.09
Avge Certificates/kW	20.2	18.7	17.4	16.1	14.8	13.4
MW Installed	167.9	255.2	321.1	378.2	339.7	337.8
Eligible Certificates ('000)	3,388	4,785	5,601	6,087	5,017	4,536

8. Solar PV Projections – Upgrades

We have separately analysed the solar PV systems that have created certificates at an address that already had a system installed. These installations will either represent instances where a solar system has been upgraded (ie. the capacity has been increased) or where the previous system has been replaced. From 1 February 2018 replacement systems will no longer be eligible to create certificates. We have segmented these installations into residential and non-residential.

With rising penetration in the new residential market segment solar resellers and installers are increasingly targeting their existing customers to upgrade their systems. More than 600,000 solar PV systems were installed before 2012, the vast majority of which were less than 1.6 kW. With the average size of new residential system installed in 2018 being above 5.5 kW there is enormous potential for the progressive upgrading of these systems. There is however a disincentive to upgrade systems where attractive feed-in tariffs are in place. Falling panel prices and increases in the value of exported electricity due to higher wholesale power prices has created a strong incentive to add capacity to existing systems. With the forecast reduction in wholesale prices reducing the financial attractiveness of solar PV we expect to see a softening in the demand for system upgrades.

Upgrade systems also incorporate replacement systems to 31 January 2018 after which time they will not be eligible. The amount of replacement systems that have been claiming STCs has been increasing over the last three years and amounted to more than 50% of the upgrade systems installed in 2017.

The total number of systems installed, and associated certificates created for the upgrade PV market is detailed in Attachment 6 and 7 and summarised in Tables 8.1 and 8.2.

Table 8.1 Residential upgrade systems and certificates

Year of installation	2016	2017	Estimate 2018	Forecast 2019	Forecast 2020	Forecast 2021
Number of Systems Installed	11,984	18,968	21,619	26,235	21,565	19,884
Avg kW/system	3.69	4.24	5.06	5.02	5.01	5.01
Avg Certificates/kW	20.4	19.0	17.6	16.2	14.8	13.5
MW Installed	44.2	80.4	109.5	131.6	108.0	99.5
Eligible Certificates ('000)	901	1,530	1,932	2,127	1,604	1,345

Table 8.2 Non Residential upgrade systems and certificates

Year of installation	2016	2017	Estimate 2018	Forecast 2019	Forecast 2020	Forecast 2021
Number of Systems Installed	948	1,376	2,068	2,346	2,073	2,150
Avg kW/system	19.44	19.66	22.12	20.91	20.94	20.92
Avg Certificates/kW	20.5	18.9	17.5	16.2	14.9	13.5
MW Installed	18.4	27.1	45.7	49.0	43.4	45.0
Eligible Certificates ('000)	377	511	802	795	645	608

9. SWH and Air Sourced Heat Pump Projections

Overview

We estimate that nearly 65,600 SWH systems will be installed and create certificates in 2018 which will amount to 2.0 million STCs. The most important drivers have been the level of new home building and policy support measures such as building regulations and energy efficiency schemes.

New building market

The number of systems installed by state in the new building market has been reasonably stable on a year to year basis across nearly all states (refer to Figure 5.1 and Attachment 10). This is in sharp contrast to the replacement market.

The primary drivers behind purchase behaviour in this segment include:

- The number of new dwellings
- Building regulations
- The availability of gas to the new development
- Other factors — such as builder influence, environmental performance and industry marketing, as well as capital and operating costs

SWH sales data, sourced from Industry, suggests that the number of SWH systems that create certificates is between 10 to 15% lower than the total number of systems sold. This is not a new trend, and we see no reason for this to change. The SWH systems that do not create certificates are generally thought to be the result of difficulties that home builders/renovators face when faced with the prospect of creating certificates. The difficulties arise from the confusion and uncertainty as to who has the right to create the certificates. Specifically, when the future owner of the home/building may not own the system at the time it was installed. This means that using SWH systems creating certificates will understate the real level of SWH installations in new homes by 20 to 25%.

Using the data provided by the CER we have isolated the SWH systems installed in new buildings and analysed historic trends. We use this analysis as the basis for forecasting SWH installations for the new-build submarket.

The level of new home starts is forecast to fall in NSW and Victoria, with other states generally expected to increase (Table 9.1).

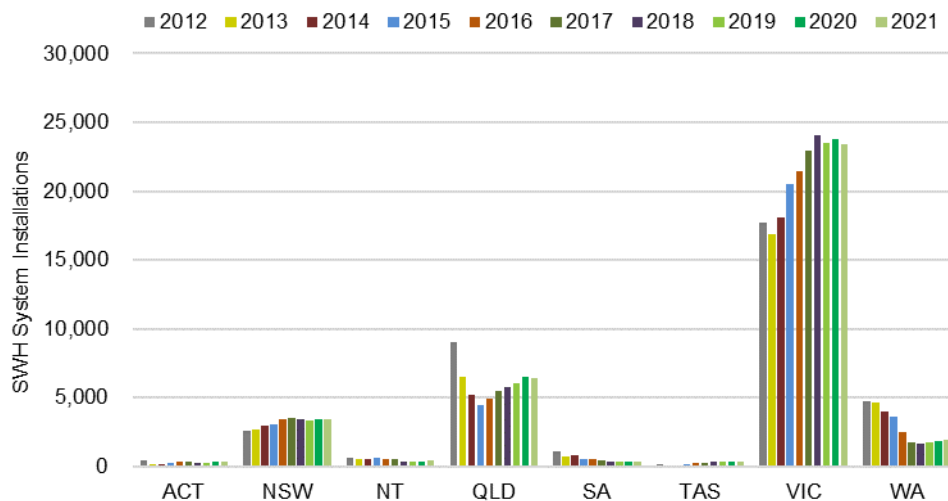
Table 9.1 Master Builders Association (MBA) – New Home starts

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
2013	8.5%	2.6%	4.1%	13.6%	10.7%	3.8%	3.6%	-6.8%	6.3%
2014	15.5%	7.6%	11.3%	8.4%	10.9%	25.4%	2.8%	-9.6%	10.6%
2015	11.2%	9.9%	7.1%	-3.9%	-10.7%	9.9%	0.5%	-18.5%	3.9%
2016	6.7%	5.1%	0.9%	-1.5%	-22.0%	-13.9%	-8.2%	-16.4%	-1.4%
2017	-3.6%	-0.5%	-0.7%	-1.5%	-13.4%	-7.7%	-13.8%	-3.6%	-3.4%
2018	-11.7%	-5.0%	-2.6%	-1.3%	-4.5%	2.2%	-3.2%	1.4%	-5.6%
2019	-5.4%	-3.8%	2.4%	1.5%	0.9%	3.3%	5.4%	14.4%	-1.5%
2020	2.2%	-0.3%	5.8%	2.5%	6.3%	2.0%	7.3%	7.8%	2.9%
2021	-1.0%	-3.0%	-2.0%	-3.0%	2.0%	-4.4%	4.3%	-0.5%	-1.6%

We have used the MBA forecast of new home starts as a guide and have adjusted these rates for other market factors. The number of SWH systems installed in new buildings is expected to be relatively flat over the forecast period.

The level of SWH systems creating certificates is summarised in Figure 9.1. Victoria which has the most progressive new building regulations remains the leading state for this segment.

Figure 9.1 SWH Systems installed claiming certificates for New Homes by state



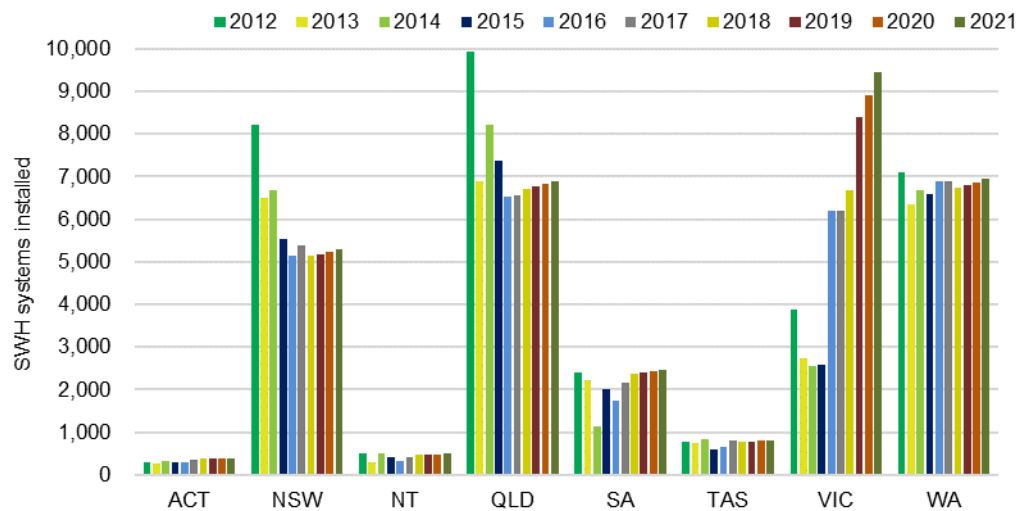
Replacement submarket

At the time of replacement, most hot water systems are replaced with the same or similar type of system. The dynamics of the replacement market, which are often dictated by a rush to replace a broken or failed water heater, mean there is little time and/or financial liquidity to make thoroughly researched decisions. Thus, historically, the majority of water heater replacements have been on a 'like-for-like' basis.

There have been a range of state-based schemes, incentives and/or regulations, particularly for the replacement of electric resistance water heaters (EWH).

The only material rebates that are currently available are in Victoria through the Victorian Energy Upgrade (VEU) which includes SWH as an eligible activity and the Government's new Solar Program. Under the VEU, a EWH system replaced by a SWH system can generate between 30 to 50 Victorian Energy Efficiency Certificates (VEECs). VEECs provide an added financial incentive of \$400 to \$1200 that helps drive extra SWH system installations in Victoria. Under the Solar Program a \$1000 rebate will be available on the installation of a SWH.

We expect the replacement market for SWH to be relatively flat over the forecast period other than in Victoria where the new solar program is expected to result in strong growth in installations over the next three years.

Figure 9.2 Replacement SWH Systems installed claiming certificates by state

Certificates created from the installation of water heater systems

We have assumed that the average certificates per system (on a state basis) for the 2019 to 2021 forecast period will be similar to the average levels achieved over the 2017 to 2018 period.

Table 9.4 Certificate creation from SWH

Year of installation	2016	2017	Estimate 2018	Forecast 2019	Forecast 2020	Forecast 2021
New Buildings						
Number of Systems Installed	34,182	35,352	36,333	35,994	37,055	36,764
Avg Certificates/System	30.3	30.0	30.1	30.1	30.1	30.1
Eligible Certificates ('000)	1,035	1,061	1,095	1,083	1,115	1,107
Replacement						
Number of Systems Installed	27,836	28,774	29,256	31,216	31,949	32,714
Avg Certificates/System	31.2	30.2	30.6	30.4	30.4	30.4
Eligible Certificates ('000)	870	870	894	948	970	994
Total						
Number of Systems Installed	62,018	64,126	65,588	67,211	69,004	69,477
Avg Certificates/System	31	30	30	30	30	30
Eligible Certificates ('000)	1,905	1,931	1,989	2,031	2,086	2,101

10. Other small generating units

Wind and Hydro SGUs remain an extremely small part of STC creation.

We do not expect certificate creation will be material over the forecast period for these fuel sources and as a result we have excluded them from this analysis.

11. Resources

Resources utilised in our modelling have included:

- Clean Energy Regulator data
- ABS 2016 Census data and other publications including:
 - 81650 Counts of Australian Businesses
 - 8752.0 Building Activity;
 - 41300 State and Territory Data;
 - 3236 Household and Family Projections;
 - 3101.0 Australian Demographic Statistics
 - 4602.0 Environmental Issues (for water heater system and gas usage data)
- GEM solar water heater and solar PV installation models
- GEM solar PV payback model
- Australian PV Institute
- State and territory government information on feed-in tariffs, SWH rebates and other programs such as the Victorian Energy Efficiency Target
- PV industry analyst module and inverter price forecasts
- Master Builder Association Housing Forecasts
- ESAA, Electricity Gas Australia 2014
- Australian Energy Market Commission, Residential Electricity Price Trends report, December 2017 and December 2018

Summary of Results

Base Case

Year of installation	Actual 2015	Actual 2016	Actual 2017	Estimate 2018	Forecast 2019	Forecast 2020	Forecast 2021
1. SGUs (PV)							
1.1 New Residential							
Number of Systems Installed	123,684	111,461	143,080	191,249	221,585	185,121	171,428
Avg kW/system	4.30	4.64	5.29	6.01	6.18	6.28	6.46
Avg Certificates/kW	20.0	20.1	18.8	17.4	15.9	14.4	13.1
MW Installed	531.3	517.5	756.9	1,149.8	1,368.3	1,163.3	1,106.7
Eligible Certificates ('000)	10,635	10,401	14,247	20,022	21,732	16,801	14,474
1.2 Residential Upgrades							
Number of Systems Installed	10,221	11,984	18,968	21,619	26,235	21,565	19,884
Avg kW/system	3.17	3.69	4.24	5.06	5.02	5.01	5.01
Avg Certificates/kW	20.2	20.4	19.0	17.6	16.2	14.8	13.5
MW Installed	32.4	44.2	80.4	109.5	131.6	108.0	99.5
Eligible Certificates ('000)	655	901	1,530	1,932	2,127	1,604	1,345
1.3 New Non Residential							
Number of Systems Installed	6,903	8,338	11,584	15,243	17,961	16,105	16,018
Avg kW/system	19.17	20.13	22.03	21.06	21.06	21.09	21.09
Avg Certificates/kW	20.2	20.2	18.7	17.4	16.1	14.8	13.4
MW Installed	132.3	167.9	255.2	321.1	378.2	339.7	337.8
Eligible Certificates ('000)	2,674	3,388	4,785	5,601	6,087	5,017	4,536
1.4 Non Residential Upgrades							
Number of Systems Installed	709	948	1,376	2,068	2,346	2,073	2,150
Avg kW/system	14.04	19.44	19.66	22.12	20.91	20.94	20.92
Avg Certificates/kW	20.3	20.5	18.9	17.5	16.2	14.9	13.5
MW Installed	10.0	18.4	27.1	45.7	49.0	43.4	45.0
Eligible Certificates ('000)	202	377	511	802	795	645	608
Total PV Systems							
Number of Systems Installed	141,517	132,731	175,008	230,178	268,127	224,864	209,480
Avg kW/system	40.68	47.90	51.22	54.26	53.16	53.32	53.47
Avg Certificates/kW	20.1	20.1	18.8	17.4	16.0	14.5	13.2
MW Installed	706.0	748.1	1,119.6	1,626.1	1,927.2	1,654.4	1,589.0
Eligible Certificates ('000)	14,166	15,067	21,073	28,357	30,741	24,067	20,963
2. SWH Systems							
2.1 SWH System (New Homes)							
Number of Systems Installed	33,263	34,182	35,352	36,333	35,994	37,055	36,764
Avg Certificates/System	30.4	30.3	30.0	30.1	30.1	30.1	30.1
Eligible Certificates ('000)	1,013	1,035	1,061	1,095	1,083	1,115	1,107
2.2 SWH System (Replacement)							
Number of Systems Installed	25,441	27,836	28,774	29,256	31,216	31,949	32,714
Avg Certificates/System	30.8	31.2	30.2	30.6	30.4	30.4	30.4
Eligible Certificates ('000)	784	870	870	894	948	970	994

Summary of Results

Base Case

Year of installation	Actual 2015	Actual 2016	Actual 2017	Estimate 2018	Forecast 2019	Forecast 2020	Forecast 2021
Total SWH Systems							
Number of Systems Installed	58,704	62,018	64,126	65,588	67,211	69,004	69,477
Avg Certificate/System	30.6	30.7	30.1	30.3	30.2	30.2	30.2
Eligible Certificates ('000)	1,797	1,905	1,931	1,989	2,031	2,086	2,101
3. Small Wind/Hydro Systems							
Number of Systems	10	10	10	2	2	2	2
Avg Certificate/System	26.8	26.8	20.4	20.4	20.4	20.4	20.4
Eligible Certificates ('000)	0	0	0	0	0	0	0
TOTAL Certificates ('000)	15,963	16,972	23,005	30,346	32,772	26,153	23,064

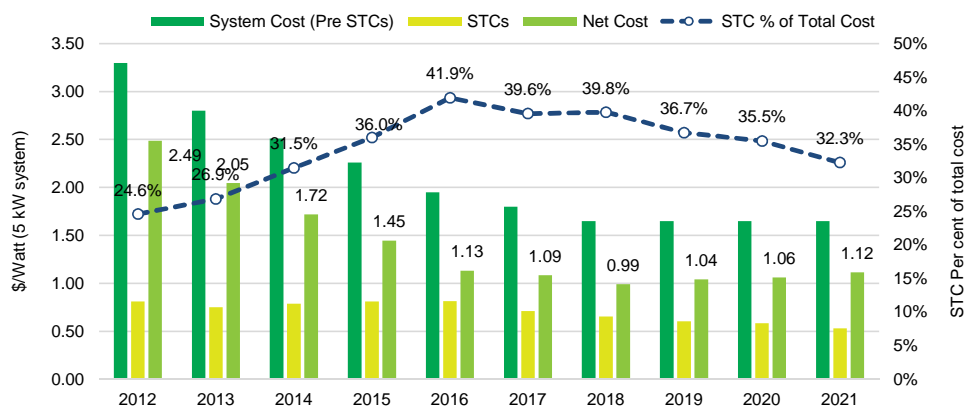
Year of installation	Actual 2015	Actual 2016	Actual 2017	Forecast 2018	Forecast 2019	Forecast 2020	Forecast 2021
STCs for systems installed in the year							
Solar PV	14,166	15,067	21,073	28,357	30,741	24,067	20,963
SWH	1,797	1,905	1,931	1,989	2,031	2,086	2,101
Total	15,962	16,972	23,004	30,346	32,772	26,153	23,064
Less STCs submitted following year (lag)	1,321	1,897	2,580	3,357	3,625	2,893	2,551
Add Previous year installs created this year	1,409	1,321	1,897	2,580	3,357	3,625	2,893
STCs submitted for creation	16,051	16,396	22,322	29,569	32,504	26,885	23,405

Attachment 2

New Residential PV Systems

PV Financial Attractiveness

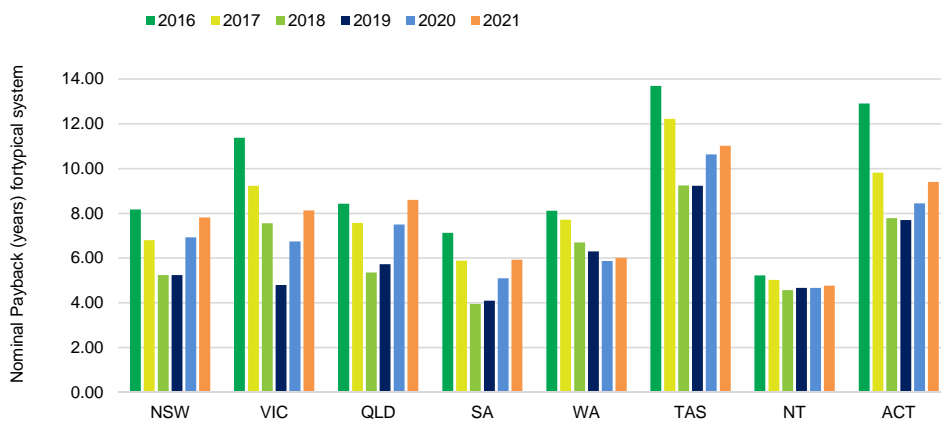
Projected Installed cost of solar PV



Average Nominal Payback (assuming 5 kW system - 73% export)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
2016	8.17	11.38	8.43	7.12	8.11	13.68	5.22	12.89
2017	6.80	9.23	7.57	5.88	7.71	12.22	5.02	9.80
2018	5.24	7.55	5.35	3.95	6.69	9.23	4.57	7.78
2019	5.24	4.79	5.71	4.09	6.29	9.22	4.66	7.70
2020	6.92	6.74	7.50	5.09	5.86	10.63	4.67	8.43
2021	7.80	8.12	8.60	5.91	6.01	11.01	4.76	9.39

Average simple paybacks on an annual basis



Solar PV Residential Systems by State

		2	3	4	5	6	7	8	9	
		NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Systems installed										
	2009	13,990	18,131	18,260	8,594	11,142	1,452	206	802	72,577
	2010	69,667	35,658	48,548	16,666	22,209	1,883	620	2,311	197,562
	2011	79,158	58,950	92,968	62,212	50,235	2,402	368	6,766	353,059
	2012	52,937	64,769	123,257	41,022	40,734	6,000	475	1,472	330,666
	2013	31,518	31,598	62,220	27,579	19,787	6,878	976	2,267	182,823
	2014	33,022	37,545	49,146	13,194	21,158	3,804	954	1,177	160,000
	2015	28,677	28,293	33,800	10,291	18,733	1,830	1,084	976	123,684
	2016	22,616	23,140	28,520	10,715	21,818	2,272	1,530	850	111,461
	2017	31,267	26,234	38,485	13,348	28,213	2,106	1,709	1,718	143,080
	2018	47,712	40,235	47,093	18,253	30,722	2,198	2,118	2,918	191,249
	2019	48,291	65,000	54,717	19,591	27,589	3,248	1,537	1,610	221,585
	2020	34,083	65,000	37,214	14,192	28,802	2,984	1,468	1,379	185,121
	2021	30,439	65,000	32,405	12,570	25,497	2,847	1,390	1,280	171,428
Cumulative Installations										
	2011	191,919	121,168	187,680	103,431	100,664	7,112	2,217	12,043	726,234
	2012	244,856	185,937	310,937	144,453	141,398	13,112	2,692	13,515	1,056,900
	2013	276,374	217,535	373,157	172,032	161,185	19,990	3,668	15,782	1,239,723
	2014	309,396	255,080	422,303	185,226	182,343	23,794	4,622	16,959	1,399,723
	2015	338,073	283,373	456,103	195,517	201,076	25,624	5,706	17,935	1,523,407
	2016	360,689	306,513	484,623	206,232	222,894	27,896	7,236	18,785	1,634,868
	2017	391,956	332,747	523,108	219,580	251,107	30,002	8,945	20,503	1,777,948
	2018	439,667	372,982	570,201	237,833	281,829	32,200	11,063	23,421	1,969,197
	2019	487,959	437,982	624,918	257,424	309,419	35,448	12,600	25,032	2,190,781
	2020	522,042	502,982	662,131	271,616	338,221	38,432	14,068	26,411	2,375,903
	2021	552,480	567,982	694,537	284,186	363,718	41,279	15,458	27,691	2,547,331
Penetration rates										
	2011	13.1%	9.5%	20.3%	25.2%	19.4%	5.4%	9.0%	14.5%	15.0%
	2012	16.6%	14.4%	33.3%	34.9%	26.7%	9.9%	10.6%	15.7%	21.6%
	2013	18.7%	16.6%	39.6%	41.3%	29.7%	15.0%	14.0%	17.6%	25.1%
	2014	20.8%	19.3%	44.4%	44.2%	32.8%	17.8%	17.2%	18.4%	28.1%
	2015	22.6%	21.1%	47.5%	46.3%	35.3%	19.1%	20.6%	19.0%	30.2%
	2016	24.0%	22.6%	49.9%	48.5%	38.5%	20.7%	25.4%	19.5%	32.1%
	2017	25.6%	23.9%	52.6%	50.7%	42.3%	21.9%	30.7%	21.0%	34.1%
	2018	28.2%	26.1%	56.1%	54.0%	46.4%	23.2%	37.1%	23.7%	37.0%
	2019	30.9%	30.0%	60.1%	57.5%	49.9%	25.3%	41.2%	25.1%	40.4%
	2020	32.6%	33.7%	62.2%	59.6%	53.3%	27.0%	44.9%	26.1%	43.0%
	2021	34.0%	37.3%	63.7%	61.4%	56.0%	28.7%	48.1%	27.0%	45.2%

Attachment 4

Certificate Creation - Solar PV Residential

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Residential Systems installed (No.)									
2010	69,667	35,658	48,548	16,666	22,209	1,883	620	2,311	197,562
2011	79,158	58,950	92,968	62,212	50,235	2,402	368	6,766	353,059
2012	52,937	64,769	123,257	41,022	40,734	6,000	475	1,472	330,666
2013	31,518	31,598	62,220	27,579	19,787	6,878	976	2,267	182,823
2014	33,022	37,545	49,146	13,194	21,158	3,804	954	1,177	160,000
2015	28,677	28,293	33,800	10,291	18,733	1,830	1,084	976	123,684
2016	22,616	23,140	28,520	10,715	21,818	2,272	1,530	850	111,461
2017	31,267	26,234	38,485	13,348	28,213	2,106	1,709	1,718	143,080
2018	47,712	40,235	47,093	18,253	30,722	2,198	2,118	2,918	191,249
2019	48,291	65,000	54,717	19,591	27,589	3,248	1,537	1,610	221,585
2020	34,083	65,000	37,214	14,192	28,802	2,984	1,468	1,379	185,121
2021	30,439	65,000	32,405	12,570	25,497	2,847	1,390	1,280	171,428
Average system size (kW/system)									
2010	2.13	1.64	1.84	1.95	1.81	1.55	1.83	2.10	1.91
2011	2.34	2.32	2.30	2.56	2.25	2.25	2.52	2.38	2.35
2012	2.52	3.04	3.21	3.21	2.29	3.09	3.62	3.09	2.95
2013	3.30	3.63	3.86	4.43	2.99	4.08	4.38	4.03	3.73
2014	3.67	3.79	4.26	4.47	3.61	4.30	4.61	3.80	3.96
2015	4.27	4.03	4.61	4.66	3.96	4.02	4.73	4.46	4.30
2016	4.52	4.24	5.06	4.90	4.56	3.94	4.84	5.20	4.64
2017	5.24	4.87	5.68	5.48	5.11	4.83	5.81	5.45	5.29
2018	6.09	5.68	6.47	6.23	5.50	5.36	6.70	5.96	6.01
2019	6.28	5.85	6.66	6.41	5.66	5.52	6.90	6.14	6.18
2020	6.47	6.03	6.86	6.60	5.83	5.00	7.11	6.32	6.28
2021	6.66	6.21	7.07	6.80	6.01	5.00	7.32	6.51	6.46
Installed Capacity (MW)									
2010	148.6	58.6	89.2	32.5	40.3	2.9	1.1	4.8	378.0
2011	185.0	137.0	213.4	159.3	112.8	5.4	0.9	16.1	829.9
2012	133.4	196.9	395.6	131.8	93.2	18.6	1.7	4.5	975.8
2013	104.1	114.8	240.1	122.1	59.3	28.0	4.3	9.1	681.8
2014	121.3	142.2	209.5	59.0	76.4	16.3	4.4	4.5	633.5
2015	122.6	114.0	155.8	48.0	74.2	7.4	5.1	4.4	531.3
2016	102.3	98.1	144.4	52.5	99.5	9.0	7.4	4.4	517.5
2017	163.7	127.8	218.7	73.2	144.1	10.2	9.9	9.4	756.9
2018	290.8	228.7	304.5	113.6	168.8	11.8	14.2	17.4	1149.8
2019	303.2	380.5	364.4	125.6	156.2	17.9	10.6	9.9	1368.3
2020	220.4	391.9	255.3	93.7	167.9	14.9	10.4	8.7	1163.3
2021	202.7	403.7	229.0	85.5	153.1	14.2	10.2	8.3	1106.7
2018 Avge Zone Rating	1.378	1.192	1.376	1.371	1.376	1.178	1.537	1.376	1.339
Average Certificates/kW installed									
2010	70.1	56.1	74.0	66.5	66.2	38.7	74.2	65.0	67.8
2011	70.1	55.7	65.6	56.8	65.0	55.3	69.9	68.6	63.2
2012	39.6	31.5	34.9	35.7	41.6	29.9	36.9	36.4	35.5
2013	21.5	18.3	21.3	20.8	21.2	18.1	23.6	20.9	20.6
2014	20.6	17.8	20.7	20.5	20.6	17.6	23.3	20.6	19.9
2015	20.7	17.8	20.6	20.6	20.6	17.6	23.2	20.6	20.0
2016	20.7	17.9	20.7	20.6	20.6	17.6	23.1	20.6	20.1
2017	19.3	16.7	19.3	19.2	19.3	16.5	21.6	19.3	18.8
2018	17.9	15.5	17.9	17.8	17.9	15.3	20.0	17.9	17.4
2019	16.5	14.3	16.5	16.5	16.5	14.1	18.4	16.5	16.1
2020	15.2	13.1	15.1	15.1	15.1	13.0	16.9	15.1	14.7
2021	13.8	11.9	13.8	13.7	13.8	11.8	15.4	13.8	13.4
Calculated Certificates ('000) ##									
2010	10,410	3,291	6,600	2,157	2,666	113	84	315	25,637
2011	12,968	7,628	13,986	9,048	7,334	298	65	1,103	52,430
2012	5,290	6,192	13,813	4,700	3,881	554	63	165	34,659
2013	2,237	2,096	5,116	2,535	1,257	507	101	191	14,040
2014	2,503	2,532	4,326	1,212	1,573	288	102	92	12,628
2015	2,535	2,033	3,215	986	1,527	130	119	90	10,635
2016	2,117	1,753	2,982	1,079	2,049	158	171	91	10,401
2017	3,158	2,133	4,215	1,406	2,774	167	214	180	14,247
2018	5,208	3,543	5,449	2,025	3,021	180	284	311	20,022
2019	5,012	5,442	6,019	2,067	2,579	254	196	163	21,732
2020	3,340	5,138	3,865	1,414	2,542	193	176	132	16,801

Notes

These are certificates that are eligible to be created on a generation year basis and do not allow for the a delay from system installation to certificate approval

New Non Residential PV installations

Attachment 5

		2015	2016	2017	2018	2019	2020	2021
Systems								
	ACT	41	71	79	114	137	133	136
	NSW	2,419	2,161	2,950	4,152	4,974	4,408	4,432
	NT	75	167	139	173	201	203	204
	QLD	1,192	1,785	2,680	3,398	3,849	3,246	3,189
	SA	702	816	1,235	1,757	2,016	1,785	1,735
	TAS	88	98	150	212	251	233	233
	VIC	1,540	2,063	2,794	3,558	4,253	3,709	3,676
	WA	846	1,177	1,557	1,879	2,281	2,388	2,413
		6,903	8,338	11,584	15,243	17,961	16,105	16,018
kw/System								
	ACT	34.91	29.01	31.48	30.24	30.24	30.24	30.24
	NSW	18.00	20.11	19.65	19.88	19.88	19.88	19.88
	NT	41.04	28.70	36.13	32.42	32.42	32.42	32.42
	QLD	18.52	19.15	21.06	20.10	20.10	20.10	20.10
	SA	18.31	22.57	25.75	24.16	24.16	24.16	24.16
	TAS	19.99	24.31	23.80	24.06	24.06	24.06	24.06
	VIC	18.80	18.81	22.84	20.82	20.82	20.82	20.82
	WA	22.05	20.20	21.90	21.05	21.05	21.05	21.05
		19.17	20.13	22.03	21.06	21.06	21.09	21.09
Installed capacity (kW)								
	ACT	1,431	2,060	2,487	3,454	4,145	4,008	4,119
	NSW	43,533	43,460	57,960	82,533	98,874	87,622	88,114
	NT	3,078	4,794	5,022	5,611	6,508	6,574	6,604
	QLD	22,072	34,176	56,433	68,307	77,370	65,250	64,095
	SA	12,854	18,419	31,798	42,456	48,696	43,134	41,916
	TAS	1,759	2,383	3,571	5,090	6,043	5,611	5,608
	VIC	28,952	38,796	63,821	74,090	88,570	77,243	76,549
	WA	18,653	23,770	34,095	39,541	48,003	50,251	50,777
		132,331	167,857	255,186	321,081	378,209	339,694	337,781
			26.8%	52.0%	25.8%	17.8%	-10.2%	-0.6%
Certificates/kW								
	ACT	20.72	20.71	18.97	17.62	16.26	14.91	13.55
	NSW	20.77	20.80	19.39	18.01	16.62	15.24	13.85
	NT	23.23	23.22	21.64	20.09	18.55	17.00	15.46
	QLD	20.77	20.78	19.40	18.02	16.63	15.25	13.86
	SA	20.69	20.60	19.28	17.90	16.52	15.15	13.77
	TAS	17.74	17.75	16.57	15.39	14.20	13.02	11.83
	VIC	18.18	18.24	16.88	15.67	14.47	13.26	12.06
	WA	20.75	20.62	19.37	17.98	16.60	15.22	13.83
		20.21	20.18	18.75	17.44	16.09	14.77	13.43
Valid RECs created								
	ACT	29,646	42,656	47,188	60,847	67,409	59,758	55,824
	NSW	904,251	904,174	1,124,082	1,486,315	1,643,630	1,335,198	1,220,630
	NT	71,494	111,299	108,671	112,741	120,700	111,775	102,066
	QLD	458,368	710,262	1,095,006	1,230,726	1,286,787	994,783	888,333
	SA	265,927	379,468	612,984	759,995	804,645	653,340	577,175
	TAS	31,211	42,298	59,160	78,305	85,829	73,042	66,374
	VIC	526,343	707,746	1,077,212	1,161,217	1,281,379	1,024,390	922,887
	WA	387,026	490,083	660,282	711,052	796,818	764,620	702,389
		2,674,266	3,387,986	4,784,585	5,601,197	6,087,196	5,016,906	4,535,677
			26.7%	41.2%	17.1%	8.7%	-17.6%	-9.6%

Residential PV Upgrades

Attachment 6

		2015	2016	2017	2018	2019	2020	2021
Systems								
	ACT	41	71	147	187	218	207	194
	NSW	2,175	4,452	8,668	8,728	10,038	7,925	7,319
	NT	30	36	88	142	161	167	171
	QLD	4,334	3,864	4,915	5,667	6,107	4,855	4,411
	SA	994	948	1,462	2,039	2,265	1,899	1,703
	TAS	96	106	119	232	267	242	243
	VIC	1,399	1,389	2,045	2,576	4,674	3,463	2,995
	WA	1,152	1,118	1,524	2,048	2,506	2,807	2,849
		10,221	11,984	18,968	21,619	26,235	21,565	19,884
kw/System								
	ACT	3.11	5.29	4.43	5.35	5.35	5.35	5.35
	NSW	3.39	3.52	3.94	4.85	4.85	4.85	4.85
	NT	3.89	3.19	3.33	3.52	3.52	3.52	3.52
	QLD	2.95	3.99	4.88	5.68	5.68	5.68	5.68
	SA	4.40	4.23	4.77	5.43	5.43	5.43	5.43
	TAS	3.83	3.99	4.14	4.56	4.56	4.56	4.56
	VIC	3.42	3.48	3.99	4.51	4.51	4.51	4.51
	WA	2.20	3.04	3.77	4.73	4.73	4.73	4.73
		3.17	3.69	4.24	5.06	5.02	5.01	5.01
Installed capacity (kW)								
	ACT	127	376	652	1,002	1,165	1,110	1,038
	NSW	7,371	15,683	34,151	42,336	48,690	38,439	35,498
	NT	117	115	293	502	566	589	602
	QLD	12,766	15,420	23,990	32,196	34,698	27,585	25,063
	SA	4,371	4,009	6,973	11,065	12,293	10,307	9,241
	TAS	368	423	493	1,057	1,217	1,102	1,108
	VIC	4,786	4,827	8,150	11,624	21,089	15,627	13,513
	WA	2,531	3,396	5,742	9,687	11,854	13,276	13,477
		32,437	44,249	80,443	109,468	131,571	108,035	99,539
					36.1%	20.2%	-17.9%	-7.9%
Certificates/kW								
	ACT	20.58	20.64	19.24	17.88	16.49	15.12	13.74
	NSW	20.81	20.83	19.32	17.96	16.56	15.18	13.80
	NT	23.60	23.35	21.67	20.04	18.57	17.03	15.48
	QLD	20.59	20.62	19.28	17.89	16.52	15.15	13.77
	SA	20.53	20.57	19.24	17.86	16.49	15.12	13.74
	TAS	17.64	17.63	16.44	15.29	14.09	12.92	11.75
	VIC	17.85	17.95	16.74	15.55	14.35	13.16	11.96
	WA	20.51	20.55	19.22	17.86	16.47	15.10	13.73
		20.20	20.37	19.02	17.65	16.17	14.85	13.51
Valid RECs created								
	ACT	2,623	7,751	12,539	17,915	19,208	16,781	14,262
	NSW	153,402	326,642	659,733	760,393	806,225	583,456	489,833
	NT	2,754	2,685	6,344	10,051	10,507	10,027	9,316
	QLD	262,812	318,014	462,459	576,086	573,329	417,815	345,100
	SA	89,712	82,482	134,156	197,565	202,715	155,804	126,989
	TAS	6,493	7,458	8,105	16,156	17,157	14,236	13,018
	VIC	85,453	86,642	136,457	180,788	302,663	205,587	161,611
	WA	51,911	69,786	110,356	173,031	195,282	200,470	185,006
		655,160	901,460	1,530,149	1,931,984	2,127,086	1,604,175	1,345,134
			37.6%	69.7%	26.3%	10.1%	-24.6%	-16.1%

Non Residential Upgrade PV installations

Attachment 6

		2015	2016	2017	2018	2019	2020	2021
Systems								
	ACT	8	9	5	14	17	16	17
	NSW	207	285	400	618	708	627	659
	NT	8	12	14	10	12	12	13
	QLD	181	256	382	568	624	526	540
	SA	96	126	150	295	331	293	298
	TAS	6	11	18	37	44	40	42
	VIC	137	163	295	411	470	410	425
	WA	66	86	112	115	141	148	156
		709	948	1,376	2,068	2,346	2,073	2,150
kw/System								
	ACT	23.20	13.83	28.29	10.65	19.47	19.47	19.47
	NSW	13.69	18.60	17.87	20.83	19.35	19.35	19.35
	NT	42.91	32.09	14.41	36.48	25.45	25.45	25.45
	QLD	11.66	21.77	19.78	21.10	20.44	20.44	20.44
	SA	15.20	21.73	22.60	29.39	25.99	25.99	25.99
	TAS	6.32	8.03	20.07	26.42	23.25	23.25	23.25
	VIC	15.26	17.12	19.00	20.31	19.65	19.65	19.65
	WA	13.47	16.60	23.64	20.56	22.10	22.10	22.10
		14.04	19.44	19.66	22.12	20.91	20.94	20.92
Installed capacity (kW)								
	ACT	186	124	141	147	322	311	334
	NSW	2,835	5,301	7,147	12,864	13,694	12,135	12,758
	NT	343	385	202	377	305	308	323
	QLD	2,110	5,572	7,558	11,993	12,753	10,756	11,045
	SA	1,459	2,738	3,390	8,670	8,605	7,622	7,744
	TAS	38	88	361	971	1,014	942	982
	VIC	2,091	2,791	5,605	8,347	9,237	8,055	8,346
	WA	889	1,427	2,647	2,360	3,120	3,266	3,444
		9,952	18,427	27,052	45,728	49,050	43,396	44,976
			85.2%	46.8%	69.0%	7.3%	-11.5%	3.6%
Certificates/kW								
	ACT	20.71	20.70	19.33	17.93	16.56	15.18	13.80
	NSW	20.84	20.79	19.45	18.07	16.67	15.28	13.90
	NT	23.45	23.82	21.98	20.89	18.84	17.27	15.70
	QLD	20.73	20.77	19.40	17.98	16.63	15.25	13.86
	SA	20.66	20.61	19.29	17.88	16.53	15.16	13.78
	TAS	17.71	17.72	16.56	15.39	14.20	13.01	11.83
	VIC	17.96	18.55	17.05	15.67	14.62	13.40	12.18
	WA	20.83	20.69	19.40	17.95	16.63	15.24	13.86
		20.26	20.46	18.90	17.53	16.21	14.86	13.51
Valid RECs created								
	ACT	3,844	2,576	2,734	2,630	5,333	4,727	4,608
	NSW	59,064	110,215	139,044	232,498	228,332	185,485	177,277
	NT	8,050	9,172	4,436	7,874	5,745	5,321	5,070
	QLD	43,749	115,748	146,649	215,641	212,116	163,982	153,090
	SA	30,159	56,418	65,395	155,065	142,268	115,516	106,688
	TAS	671	1,565	5,985	14,937	14,399	12,253	11,619
	VIC	37,558	51,759	95,583	130,788	135,020	107,941	101,665
	WA	18,523	29,537	51,360	42,353	51,885	49,789	47,725
		201,618	376,990	511,186	801,786	795,097	645,013	607,742
			87.0%	35.6%	56.8%	-0.8%	-18.9%	

SWH Systems - New Buildings

Attachment 7

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
SWH systems installed															
ACT	39	113	507	236	422	432	190	135	266	374	364	255	295	323	326
NSW	3,276	3,675	3,361	5,098	4,522	2,579	2,646	2,946	3,076	3,464	3,576	3,436	3,303	3,424	3,441
NT	548	410	346	436	522	653	578	525	655	581	547	340	363	396	419
QLD	10,414	12,631	10,652	10,497	9,359	9,042	6,529	5,219	4,419	4,900	5,461	5,811	6,035	6,474	6,444
SA	903	1,023	1,126	1,669	1,677	1,060	765	801	546	554	459	365	376	391	385
TAS	113	172	177	266	192	137	83	111	208	278	236	327	343	355	344
VIC	7,480	12,449	17,124	20,119	20,559	17,726	16,873	18,058	20,490	21,494	22,906	24,089	23,528	23,805	23,450
WA	4,535	3,606	4,123	5,728	5,077	4,710	4,652	4,000	3,603	2,537	1,803	1,710	1,751	1,888	1,954
Total	27,308	34,079	37,416	44,049	42,330	36,339	32,316	31,795	33,263	34,182	35,352	36,333	35,994	37,055	36,764
SWH certificates created															
ACT	1,111	3,641	18,125	7,501	13,138	12,503	6,071	4,684	9,304	12,528	12,509	7,926	9,666	10,568	10,673
NSW	100,171	130,824	131,981	172,125	145,841	83,654	87,769	97,782	98,380	110,068	108,922	108,311	102,359	106,107	106,655
NT	16,672	13,851	10,468	13,429	13,929	18,070	15,734	15,266	19,750	17,451	15,961	10,735	11,042	12,018	12,720
QLD	330,947	418,149	374,016	339,788	275,585	259,317	198,795	171,276	145,694	151,905	168,901	177,330	185,408	198,881	197,965
SA	28,075	36,438	38,281	54,845	51,074	29,642	22,678	25,088	17,466	17,122	14,229	11,764	11,889	12,368	12,177
TAS	3,301	8,056	11,377	8,115	4,994	3,889	2,401	3,429	6,115	8,356	7,047	9,878	10,298	10,654	10,341
VIC	184,040	325,693	457,839	533,397	531,095	434,730	461,636	511,680	589,200	626,379	672,817	713,425	693,951	702,125	691,650
WA	150,930	121,986	142,995	188,152	162,535	144,164	143,109	131,865	126,916	91,052	60,810	55,857	58,121	62,676	64,877
Total	815,247	1,058,638	1,185,082	1,317,352	1,198,191	985,969	938,193	961,070	1,012,825	1,034,861	1,061,196	1,095,226	1,082,735	1,115,398	1,107,060
Certificates per SWH System															
ACT	28.5	32.2	35.7	31.8	31.1	28.9	32.0	34.7	35.0	33.5	34.4	31.1	32.7	32.7	32.7
NSW	30.6	35.6	39.3	33.8	32.3	32.4	33.2	33.2	32.0	31.8	30.5	31.5	31.0	31.0	31.0
NT	30.4	33.8	30.3	30.8	26.7	27.7	27.2	29.1	30.2	30.0	29.2	31.6	30.4	30.4	30.4
QLD	31.8	33.1	35.1	32.4	29.4	28.7	30.4	32.8	33.0	31.0	30.9	30.5	30.7	30.7	30.7
SA	31.1	35.6	34.0	32.9	30.5	28.0	29.6	31.3	32.0	30.9	31.0	32.2	31.6	31.6	31.6
TAS	29.2	46.8	64.3	30.5	26.0	28.4	28.9	30.9	29.4	30.1	29.9	30.2	30.0	30.0	30.0
VIC	24.6	26.2	26.7	26.5	25.8	24.5	27.4	28.3	28.8	29.1	29.4	29.6	29.5	29.5	29.5
WA	33.3	33.8	34.7	32.8	32.0	30.6	30.8	33.0	35.2	35.9	33.7	32.7	33.2	33.2	33.2
Total	29.9	31.1	31.7	29.9	28.3	27.1	29.0	30.2	30.4	30.3	30.0	30.1	30.1	30.1	30.1

SWH Systems - Replacement Market

Attachment 8

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
SWH systems installed															
ACT	414	888	1,467	724	616	302	263	316	306	303	341	375	379	382	386
NSW	5,489	16,528	82,095	33,427	20,809	8,231	6,499	6,695	5,536	5,147	5,388	5,134	5,185	5,237	5,289
NT	866	826	1,385	867	745	518	306	501	408	339	418	480	484	489	494
QLD	6,416	10,699	26,007	23,765	21,578	9,931	6,881	8,214	7,386	6,542	6,562	6,702	6,769	6,837	6,905
SA	1,966	4,080	7,668	5,143	3,767	2,413	2,218	1,129	2,011	1,727	2,157	2,378	2,402	2,426	2,450
TAS	237	734	2,092	1,167	1,533	762	744	851	595	669	797	778	786	794	802
VIC	1,677	8,759	24,996	7,614	5,887	3,868	2,735	2,555	2,597	6,208	6,213	6,672	8,407	8,911	9,446
WA	6,604	8,792	11,569	10,337	7,785	7,102	6,337	6,672	6,602	6,901	6,898	6,736	6,804	6,872	6,940
Total	23,669	51,306	157,279	83,044	62,720	33,127	25,983	26,933	25,441	27,836	28,774	29,256	31,216	31,949	32,714
SWH certificates created															
ACT	12,141	28,397	50,169	22,897	19,099	9,354	8,345	10,163	10,135	11,177	11,177	12,050	12,292	12,415	12,539
NSW	170,768	713,696	3,021,137	1,167,325	662,471	262,431	210,361	212,620	173,598	165,374	165,374	158,934	159,837	161,435	163,050
NT	26,915	26,505	65,827	31,740	20,807	14,673	8,781	13,514	11,362	12,288	12,288	13,426	13,900	14,039	14,179
QLD	191,928	346,445	1,045,900	793,279	666,758	309,804	217,464	256,632	231,221	202,000	202,000	209,737	210,110	212,211	214,333
SA	60,666	133,496	321,816	170,271	109,047	68,624	64,718	34,607	59,195	62,987	62,987	70,155	70,501	71,206	71,918
TAS	6,653	58,209	143,895	61,940	40,289	22,502	23,303	25,070	18,256	24,859	24,859	24,207	24,483	24,728	24,975
VIC	47,899	578,923	1,652,280	398,889	184,229	118,345	85,835	79,966	83,416	186,059	186,059	202,536	253,473	268,681	284,802
WA	184,539	287,502	385,193	310,613	220,545	198,832	185,532	194,235	196,657	205,085	205,085	203,156	203,733	205,770	207,828
Total	701,509	2,173,173	6,686,217	2,956,954	1,923,245	1,004,565	804,339	826,807	783,840	869,829	869,829	894,200	948,328	970,485	993,623
Certificates per SWH System															
ACT	29.3	32.0	34.2	31.6	31.0	31.0	31.7	32.2	33.1	36.9	32.8	32.1	32.5	32.5	32.5
NSW	31.1	43.2	36.8	34.9	31.8	31.9	32.4	31.8	31.4	32.1	30.7	31.0	30.8	30.8	30.8
NT	31.1	32.1	47.5	36.6	27.9	28.3	28.7	27.0	27.8	36.2	29.4	28.0	28.7	28.7	28.7
QLD	29.9	32.4	40.2	33.4	30.9	31.2	31.6	31.2	31.3	30.9	30.8	31.3	31.0	31.0	31.0
SA	30.9	32.7	42.0	33.1	28.9	28.4	29.2	30.7	29.4	36.5	29.2	29.5	29.3	29.3	29.3
TAS	28.1	79.3	68.8	53.1	26.3	29.5	31.3	29.5	30.7	37.2	31.2	31.1	31.1	31.1	31.1
VIC	28.6	66.1	66.1	52.4	31.3	30.6	31.4	31.3	32.1	30.0	29.9	30.4	30.2	30.2	30.2
WA	27.9	32.7	33.3	30.0	28.3	28.0	29.3	29.1	29.8	29.7	29.7	30.2	29.9	29.9	29.9
Total	29.6	42.4	42.5	35.6	30.7	30.3	31.0	30.7	30.8	31.2	30.2	30.6	30.4	30.4	30.4

Solar PV (by Property Installation Type)

(Including Pending Registration)

Summary of REC-Registry Data

(Certificates created as at 1 January 2019)

Attachment 9

Solar PV (New) Systems

2015				2016			2017			2018		
State	Residential	Non-Residential	Total	Residential	Non-Residential	Total	Residential	Non-Residential	Total	Residential	Non-Residential	Total
Installed Capacity												
ACT	4,357	1,431	5,789	4,421	2,060	6,480	9,368	2,487	11,855	15,909	3,212	19,121
NSW	122,554	43,533	166,087	102,316	43,460	145,776	163,729	57,960	221,689	266,053	72,451	338,504
NT	5,129	3,078	8,207	7,404	4,794	12,198	9,928	5,022	14,950	12,984	4,900	17,884
QLD	155,775	22,072	177,846	144,363	34,176	178,539	218,704	56,433	275,137	278,606	60,232	338,838
SA	47,970	12,854	60,823	52,512	18,419	70,931	73,197	31,798	104,994	103,961	37,836	141,797
TAS	7,361	1,759	9,120	8,951	2,383	11,333	10,162	3,571	13,733	10,784	4,419	15,202
VIC	113,984	28,952	142,936	98,097	38,796	136,893	127,764	63,821	191,585	200,060	68,739	268,799
WA	74,167	18,653	92,820	99,455	23,770	123,225	144,057	34,095	178,152	154,483	33,256	187,739
	531,298	132,331	663,628	517,518	167,857	685,375	756,909	255,186	1,012,096	1,042,840	285,045	1,327,884
Valid RECs created												
ACT	89,795	29,646	119,441	91,033	42,656	133,689	180,393	47,188	227,581	284,550	57,656	342,206
NSW	2,534,511	904,251	3,438,762	2,116,823	904,174	3,020,997	3,158,437	1,124,082	4,282,519	4,765,278	1,306,298	6,071,576
NT	119,140	71,494	190,634	171,139	111,299	282,438	214,097	108,671	322,768	259,512	98,266	357,778
QLD	3,215,293	458,368	3,673,661	2,981,886	710,262	3,692,148	4,214,535	1,095,006	5,309,541	4,985,244	1,084,561	6,069,805
SA	986,063	265,927	1,251,990	1,079,426	379,468	1,458,894	1,405,521	612,984	2,018,505	1,853,002	675,424	2,528,426
TAS	129,832	31,211	161,043	157,869	42,298	200,167	167,424	59,160	226,584	165,106	67,986	233,092
VIC	2,032,748	526,343	2,559,091	1,753,346	707,746	2,461,092	2,133,068	1,077,212	3,210,280	3,099,694	1,079,273	4,178,967
WA	1,527,391	387,026	1,914,417	2,049,269	490,083	2,539,352	2,773,894	660,282	3,434,176	2,763,855	597,411	3,361,266
	10,634,773	2,674,266	13,309,039	10,400,791	3,387,986	13,788,777	14,247,369	4,784,585	19,031,954	18,176,241	4,966,875	23,143,116
Systems												
ACT	976	41	1,017	850	71	921	1,718	79	1,797	2,670	95	2,765
NSW	28,677	2,419	31,096	22,616	2,161	24,777	31,267	2,950	34,217	43,652	3,454	47,106
NT	1,084	75	1,159	1,530	167	1,697	1,709	139	1,848	1,938	144	2,082
QLD	33,800	1,192	34,992	28,520	1,785	30,305	38,485	2,680	41,165	43,086	2,827	45,913
SA	10,291	702	10,993	10,715	816	11,531	13,348	1,235	14,583	16,700	1,462	18,162
TAS	1,830	88	1,918	2,272	98	2,370	2,106	150	2,256	2,011	176	2,187
VIC	28,293	1,540	29,833	23,140	2,063	25,203	26,234	2,794	29,028	35,201	2,960	38,161
WA	18,733	846	19,579	21,818	1,177	22,995	28,213	1,557	29,770	28,108	1,563	29,671
	123,684	6,903	130,587	111,461	8,338	119,799	143,080	11,584	154,664	173,366	12,681	186,047
Average kW/system												
ACT	4.46	34.91	5.69	5.20	29.01	7.04	5.45	31.48	6.60	5.96	33.81	6.92
NSW	4.27	18.00	5.34	4.52	20.11	5.88	5.24	19.65	6.48	6.09	20.98	7.19
NT	4.73	41.04	7.08	4.84	28.70	7.19	5.81	36.13	8.09	6.70	34.03	8.59
QLD	4.61	18.52	5.08	5.06	19.15	5.89	5.68	21.06	6.68	6.47	21.31	7.38
SA	4.66	18.31	5.53	4.90	22.57	6.15	5.48	25.75	7.20	6.23	25.88	7.81
TAS	4.02	19.99	4.76	3.94	24.31	4.78	4.83	23.80	6.09	5.36	25.11	6.95
VIC	4.03	18.80	4.79	4.24	18.81	5.43	4.87	22.84	6.60	5.68	23.22	7.04
WA	3.96	22.05	4.74	4.56	20.20	5.36	5.11	21.90	5.98	5.50	21.28	6.33
	4.30	19.17	5.08	4.64	20.13	5.72	5.29	22.03	6.54	6.02	22.48	7.14

Solar PV (by Property Installation Type)

(Including Pending Registration)

Summary of REC-Registry Data

(Certificates created as at 1 January 2019)

Attachment 9

Solar PV (Upgrade/Replacement) Systems

2015				2016			2017			2018		
State	Residential	Non-Residential	Total	Residential	Non-Residential	Total	Residential	Non-Residential	Total	Residential	Non-Residential	Total
Installed Capacity												
ACT	127	186	313	376	124	500	652	141	793	873	128	1,000
NSW	7,371	2,835	10,205	15,683	5,301	20,984	34,151	7,147	41,298	36,878	11,205	48,084
NT	117	343	460	115	385	500	293	202	495	437	328	765
QLD	12,766	2,110	14,876	15,420	5,572	20,992	23,990	7,558	31,547	28,046	10,447	38,492
SA	4,371	1,459	5,830	4,009	2,738	6,747	6,973	3,390	10,363	9,638	7,553	17,191
TAS	368	38	406	423	88	511	493	361	854	921	846	1,766
VIC	4,786	2,091	6,877	4,827	2,791	7,618	8,150	5,605	13,754	10,126	7,271	17,397
WA	2,531	889	3,420	3,396	1,427	4,823	5,742	2,647	8,390	8,438	2,056	10,493
	32,437	9,952	42,388	44,249	18,427	62,676	80,443	27,052	107,495	95,356	39,833	135,189
Valid RECs created												
ACT	2,623	3,844	6,467	7,751	2,576	10,327	12,539	2,734	15,273	15,605	2,291	17,896
NSW	153,402	59,064	212,466	326,642	110,215	436,857	659,733	139,044	798,777	662,363	202,524	864,887
NT	2,754	8,050	10,804	2,685	9,172	11,857	6,344	4,436	10,780	8,755	6,859	15,614
QLD	262,812	43,749	306,561	318,014	115,748	433,762	462,459	146,649	609,108	501,817	187,841	689,658
SA	89,712	30,159	119,871	82,482	56,418	138,900	134,156	65,395	199,551	172,095	135,074	307,169
TAS	6,493	671	7,164	7,458	1,565	9,023	8,105	5,985	14,090	14,073	13,011	27,084
VIC	85,453	37,558	123,011	86,642	51,759	138,401	136,457	95,583	232,040	157,481	113,927	271,408
WA	51,911	18,523	70,434	69,786	29,537	99,323	110,356	51,360	161,716	150,724	36,893	187,617
	655,160	201,618	856,778	901,460	376,990	1,278,450	1,530,149	511,186	2,041,335	1,682,913	698,420	2,381,333
Systems												
ACT	41	8	49	71	9	80	147	5	152	163	12	175
NSW	2,175	207	2,382	4,452	285	4,737	8,668	400	9,068	7,603	538	8,141
NT	30	8	38	36	12	48	88	14	102	124	9	133
QLD	4,334	181	4,515	3,864	256	4,120	4,915	382	5,297	4,936	495	5,431
SA	994	96	1,090	948	126	1,074	1,462	150	1,612	1,776	257	2,033
TAS	96	6	102	106	11	117	119	18	137	202	32	234
VIC	1,399	137	1,536	1,389	163	1,552	2,045	295	2,340	2,244	358	2,602
WA	1,152	66	1,218	1,118	86	1,204	1,524	112	1,636	1,784	100	1,884
	10,221	709	10,930	11,984	948	12,932	18,968	1,376	20,344	18,832	1,801	20,633
Average kW/system												
ACT	3.11	23.20	6.39	5.29	13.83	6.25	4.43	28.29	5.22	5.35	10.65	5.72
NSW	3.39	13.69	4.28	3.52	18.60	4.43	3.94	17.87	4.55	4.85	20.83	5.91
NT	3.89	42.91	12.10	3.19	32.09	10.42	3.33	14.41	4.85	3.52	36.48	5.75
QLD	2.95	11.66	3.29	3.99	21.77	5.10	4.88	19.78	5.96	5.68	21.10	7.09
SA	4.40	15.20	5.35	4.23	21.73	6.28	4.77	22.60	6.43	5.43	29.39	8.46
TAS	3.83	6.32	3.98	3.99	8.03	4.37	4.14	20.07	6.24	4.56	26.42	7.55
VIC	3.42	15.26	4.48	3.48	17.12	4.91	3.99	19.00	5.88	4.51	20.31	6.69
WA	2.20	13.47	2.81	3.04	16.60	4.01	3.77	23.64	5.13	4.73	20.56	5.57
	3.17	14.04	3.88	3.69	19.44	4.85	4.24	19.66	5.28	5.06	22.12	6.55

Solar Hot Water by Segment
(Includes Pending Registration)

Summary of REC-Registry Data
(Certificates created as at 1 January 2019)

Attachment 10

SWH Certificates

	New Building												Replacement									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ACT	3,641	18,125	7,501	13,138	12,503	6,071	4,684	9,304	12,528	12,509	6,226	28,397	50,169	22,897	19,099	9,354	8,345	10,163	10,135	9,535	11,177	11,055
NSW	130,824	131,981	172,125	145,841	83,654	87,769	97,782	98,380	110,068	108,922	85,083	713,696	3,021,137	1,167,325	662,471	262,431	210,361	212,620	173,598	158,119	165,374	145,811
NT	13,851	10,468	13,429	13,929	18,070	15,734	15,266	19,750	17,451	15,961	8,433	26,505	65,827	31,740	20,807	14,673	8,781	13,514	11,362	9,709	12,288	12,317
QLD	418,149	374,016	339,788	275,585	259,317	198,795	171,276	145,694	151,905	168,901	139,301	346,445	1,045,900	793,279	666,758	309,804	217,464	256,632	231,221	203,310	202,000	192,419
SA	36,438	38,281	54,845	51,074	29,642	22,678	25,088	17,466	17,122	14,229	9,241	133,496	321,816	170,271	109,047	68,624	64,718	34,607	59,195	51,229	62,987	64,362
TAS	8,056	11,377	8,115	4,994	3,889	2,401	3,429	6,115	8,356	7,047	7,760	58,209	143,895	61,940	40,289	22,502	23,303	25,070	18,256	20,408	24,859	22,208
VIC	325,693	457,839	533,397	531,095	434,730	461,636	511,680	589,200	626,379	672,817	560,428	578,923	1,652,280	398,889	184,229	118,345	85,835	79,966	83,416	188,755	186,059	185,813
WA	121,986	142,995	188,152	162,535	144,164	143,109	131,865	126,916	91,052	60,810	43,878	287,502	385,193	310,613	220,545	198,832	185,532	194,235	196,657	204,032	205,085	186,382
	1,058,638	1,185,082	1,317,352	1,198,191	985,969	938,193	961,070	1,012,825	1,034,861	1,061,196	860,350	2,173,173	6,686,217	2,956,954	1,923,245	1,004,565	804,339	826,807	783,840	845,097	869,829	820,367

SWH Systems Installed

New Building												Replacement											
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
ACT	113	507	236	422	432	190	135	266	374	364	200	888	1,467	724	616	302	263	316	306	303	341	344	
NSW	3,675	3,361	5,098	4,522	2,579	2,646	2,946	3,076	3,464	3,576	2,699	16,528	82,095	33,427	20,809	8,231	6,499	6,695	5,536	5,147	5,388	4,710	
NT	410	346	436	522	653	578	525	655	581	547	267	826	1,385	867	745	518	306	501	408	339	418	440	
QLD	12,631	10,652	10,497	9,359	9,042	6,529	5,219	4,419	4,900	5,461	4,565	10,699	26,007	23,765	21,578	9,931	6,881	8,214	7,386	6,542	6,562	6,149	
SA	1,023	1,126	1,669	1,677	1,060	765	801	546	554	459	287	4,080	7,668	5,143	3,767	2,413	2,218	1,129	2,011	1,727	2,157	2,182	
TAS	172	177	266	192	137	83	111	208	278	236	257	734	2,092	1,167	1,533	762	744	851	595	669	797	714	
VIC	12,449	17,124	20,119	20,559	17,726	16,873	18,058	20,490	21,494	22,906	18,923	8,759	24,996	7,614	5,887	3,868	2,735	2,555	2,597	6,208	6,213	6,121	
WA	3,606	4,123	5,728	5,077	4,710	4,652	4,000	3,603	2,537	1,803	1,343	8,792	11,569	10,337	7,785	7,102	6,337	6,672	6,602	6,901	6,898	6,180	
	34,079	37,416	44,049	42,330	36,339	32,316	31,795	33,263	34,182	35,352	28,541	51,306	157,279	83,044	62,720	33,127	25,983	26,933	25,441	27,836	28,774	26,840	

Certificates per SWH System

New Building												Replacement											
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
ACT	32.2	35.7	31.8	31.1	28.9	32.0	34.7	35.0	33.5	34.4	31.1	32.0	34.2	31.6	31.0	31.0	31.7	32.2	33.1	31.5	32.8	31.7	
NSW	35.6	39.3	33.8	32.3	32.4	33.2	33.2	32.0	31.8	30.4	31.0	43.2	36.8	34.9	31.8	31.9	32.4	31.8	31.4	30.7	30.7	30.5	
NT	33.8	30.3	30.8	26.7	27.7	27.2	29.1	30.2	30.0	29.2	31.0	32.1	47.5	36.6	27.9	28.3	28.7	27.0	27.8	28.6	29.4	27.7	
QLD	33.1	35.1	32.4	29.4	28.7	30.4	32.8	33.0	31.0	30.9	30.3	32.4	40.2	33.4	30.9	31.2	31.6	31.2	31.3	31.1	30.8	30.7	
SA	35.6	34.0	32.9	30.5	28.0	29.6	31.3	32.0	30.9	31.0	31.9	32.7	42.0	33.1	28.9	28.4	29.2	30.7	29.4	29.7	29.2	29.2	
TAS	46.8	64.3	30.5	26.0	28.4	28.9	30.9	29.4	30.1	29.9	29.5	79.3	68.8	53.1	26.3	29.5	31.3	29.5	30.7	30.5	31.1	31.0	
VIC	26.2	26.7	26.5	25.8	24.5	27.4	28.3	28.8	29.1	29.4	29.5	66.1	66.1	52.4	31.3	30.6	31.4	31.3	32.1	30.4	29.9	30.1	
WA	33.8	34.7	32.8	32.0	30.6	30.8	33.0	35.2	35.9	33.7	32.4	32.7	33.3	30.0	28.3	28.0	29.3	29.1	29.8	29.6	29.7	29.4	
	31.1	31.7	29.9	28.3	27.1	29.0	30.2	30.4	30.3	30.0	30.1	42.4	42.5	35.6	30.7	30.3	31.0	30.7	30.8	30.4	30.2	30.6	

Solar Hot Water by Segment

(Includes Pending Registration)

Summary of REC-Registry Data

(Certificates created as at 1 January 2019)

Attachment 10

SWH Certificates

	Total Market										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ACT	32,038	68,294	30,398	32,237	21,857	14,416	14,847	19,439	22,063	23,686	17,281
NSW	844,520	3,153,118	1,339,450	808,312	346,085	298,130	310,402	271,978	268,187	274,296	230,894
NT	40,356	76,295	45,169	34,736	32,743	24,515	28,780	31,112	27,160	28,249	20,750
QLD	764,594	1,419,916	1,133,067	942,343	569,121	416,259	427,908	376,915	355,215	370,901	331,720
SA	169,934	360,097	225,116	160,121	98,266	87,396	59,695	76,661	68,351	77,216	73,603
TAS	66,265	155,272	70,055	45,283	26,391	25,704	28,499	24,371	28,764	31,906	29,968
VIC	904,616	2,110,119	932,286	715,324	553,075	547,471	591,646	672,616	815,134	858,876	746,241
WA	409,488	528,188	498,765	383,080	342,996	328,641	326,100	323,573	295,084	265,895	230,260
	3,231,811	7,871,299	4,274,306	3,121,436	1,990,534	1,742,532	1,787,877	1,796,665	1,879,958	1,931,025	1,680,717

SWH Systems Installed

	Total Market										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ACT	1,001	1,974	960	1,038	734	453	451	572	677	705	544
NSW	20,203	85,456	38,525	25,331	10,810	9,145	9,641	8,612	8,611	8,964	7,409
NT	1,236	1,731	1,303	1,267	1,171	884	1,026	1,063	920	965	707
QLD	23,330	36,659	34,262	30,937	18,973	13,410	13,433	11,805	11,442	12,023	10,714
SA	5,103	8,794	6,812	5,444	3,473	2,983	1,930	2,557	2,281	2,616	2,469
TAS	906	2,269	1,433	1,725	899	827	962	803	947	1,033	971
VIC	21,208	42,120	27,733	26,446	21,594	19,608	20,613	23,087	27,702	29,119	25,044
WA	12,398	15,692	16,065	12,862	11,812	10,989	10,672	10,205	9,438	8,701	7,523
	85,385	194,695	127,093	105,050	69,466	58,299	58,728	58,704	62,018	64,126	55,381

Certificates per SWH System

	Total Market										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ACT	32.0	34.6	31.7	31.1	29.8	31.8	32.9	34.0	32.6	33.6	31.8
NSW	41.8	36.9	34.8	31.9	32.0	32.6	32.2	31.6	31.1	30.6	31.2
NT	32.7	44.1	34.7	27.4	28.0	27.7	28.1	29.3	29.5	29.3	29.3
QLD	32.8	38.7	33.1	30.5	30.0	31.0	31.9	31.9	31.0	30.8	31.0
SA	33.3	40.9	33.0	29.4	28.3	29.3	30.9	30.0	30.0	29.5	29.8
TAS	73.1	68.4	48.9	26.3	29.4	31.1	29.6	30.3	30.4	30.9	30.9
VIC	42.7	50.1	33.6	27.0	25.6	27.9	28.7	29.1	29.4	29.5	29.8
WA	33.0	33.7	31.0	29.8	29.0	29.9	30.6	31.7	31.3	30.6	30.6
	37.8	40.4	33.6	29.7	28.7	29.9	30.4	30.6	30.3	30.1	30.3

Delay in Certificate creation

Attachment 11

1. Determining total number of STCs to be created for 2017 and 2018 generation years

Data up to and Including 2 Jan 2019

	Created in 2016	Created in 2017	Created in 2018	To be created in 2019	Total	% created in following year	Following year as % of Dec TD
New Residential PV							
2016 Installation year	9,578,371	822,420			10,400,791	7.91%	8.59%
2017 Installation year		13,034,436	1,212,933		14,247,369	8.51%	9.31%
2018 Installation year			18,176,241	1,691,409	19,867,650	8.51%	9.31%
New Non-Residential PV							
2016 Installation year	2,830,784	557,202			3,387,986	16.45%	19.68%
2017 Installation year		3,979,948	804,637		4,784,585	16.82%	20.22%
2018 Installation year			4,966,875	1,004,167	5,971,042	16.82%	20.22%
Upgrade PV							
2016 Installation year	1,088,721	189,729			1,278,450	14.84%	17.43%
2017 Installation year		1,777,569	263,766		2,041,335	12.92%	14.84%
2018 Installation year			2,381,333	353,356	2,734,689	12.92%	14.84%
Total PV							
2016 Installation year	13,497,876	1,569,351			15,067,227	10.42%	11.63%
2017 Installation year		18,791,953	2,281,336		21,073,289	10.83%	12.14%
2018 Installation year			25,524,449	3,048,932	28,573,381	10.67%	11.95%
New Building SWH							
2016 Installation year	780,734	254,127			1,034,861	24.56%	32.55%
2017 Installation year		833,802	227,394		1,061,196	21.43%	27.27%
2018 Installation year			860,350	234,634	1,094,984	21.43%	27.27%
Replacement SWH							
2016 Installation year	770,856	74,241			845,097	8.78%	9.63%
2017 Installation year		798,351	71,478		869,829	8.22%	8.95%
2018 Installation year			820,367	73,449	905,796	8.11%	8.95%
Total SWH							
2016 Installation year	1,551,590	328,368			1,879,958	17.47%	21.16%
2017 Installation year		1,632,153	298,872		1,931,025	15.48%	18.31%
2018 Installation year			1,680,717	308,083	1,988,800	15.49%	18.33%

Following Year Creation as % of STCs created to end Dec			
Installation Year	2016	2017	2018
New Residential PV	8.6%	9.3%	9.3%
New Non-Residential PV	19.7%	20.2%	20.2%
Upgrade PV	11.6%	14.8%	14.8%
New Building SWH	32.5%	27.3%	27.3%
Replacement SWH	9.6%	9.0%	9.0%