



Green Energy
Markets

Small-scale technology certificates Data modelling for 2018 to 2020

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 2018 calendar year, and for the 2019 and 2020 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.

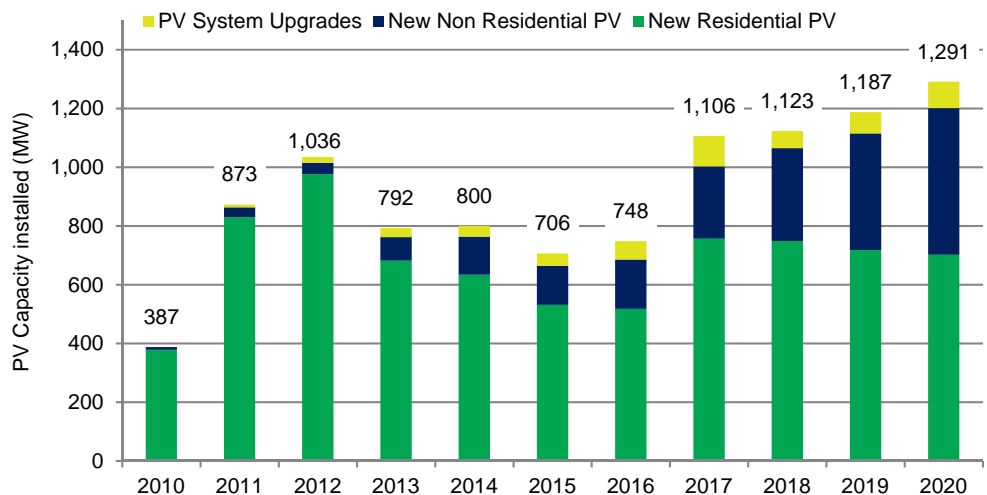
We have segmented the solar market into the following sub-markets to more accurately forecast the level of installations:

- 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

In assessing the developments in the solar market to date and implications for future installations the following considerations are worth noting:

- The dramatic increase in wholesale power prices and heightened media focus on energy security has largely been responsible for the 32% increase in the number of solar PV systems installed in 2017 compared to 2016. Wholesale power prices are expected to continue to increase through 2018 before falling in 2019 and 2020;
- We expect that the level new residential installations will fall over the forecast period as higher levels of saturation are reached and system paybacks increase due to lower wholesale prices and reduced contribution from STCs as deeming reduces;
- The average system size for new residential installations has continued to increase reaching an average of 5.29 kW per system in 2017 compared to 4.65 kW per system in 2016. Due to increases in panel efficiency and increased value for solar exports we expect that average system size will continue to increase, albeit at a more modest rate;
- The number of non-residential (commercial size) PV system installations is expected to continue to increase from 24% of installed PV capacity in 2017 to 41% in 2020;
- The number of SWH systems installed increased by 7% in 2017. The number of installations in new homes is expected to reduce over the forecast period in line with expected falls in new home building. The SWH replacement market is expected to increase modestly largely due to the impact of higher energy prices;

We estimate that 1106 MW of PV was installed in 2017 which is 47% higher than 2016 levels. amounting to 2 per cent higher than 2016 levels. We expect that the capacity installed will continue to increase over the forecast period reaching 1291 MW by 2020. The increase in capacity is largely underpinned by growth in the non-residential market which offsets the expected reduction in the new residential market (refer to chart below).



Over the 2017 calendar year 22.5 million STCs were submitted for creation. Once we allow for STCs that were pending audit a total of 21.8 million STCs were approved by the CER for the year. This amounted to 9.4 million STCs more than the Target of 12.45 million STCs.

We expect that 21.7 million STCs will be submitted for registration in 2018 and we expect this to reduce slightly over the 2019 and 2020 calendar years. The reduction in the deemed period for solar PV is nearly offset by the expected growth in capacity installed.

Summary of results are as follows:

Year of installation	Actual 2015	Actual 2016	Estimate 2017	Forecast 2018	Forecast 2019	Forecast 2020
STCs for systems installed in the year						
Solar PV	14,163	15,119	20,818	19,521	19,057	19,165
SWH	1,797	1,880	2,002	2,023	1,948	1,923
Total	15,960	16,999	22,820	21,544	21,006	21,088
Less STCs submitted following year	1,321	1,918	2,188	2,065	2,014	2,022
Add Previous year installs created	1,409	1,321	1,918	2,188	2,065	2,014
STCs submitted for creation	16,048	16,402	22,551	21,667	21,058	21,081

The key uncertainties in developing the estimates have centred on:

- The level of STCs finally created for the 2017 generation year;
- The likely level of contraction in the new residential solar PV market as high levels of saturation are reached; and
- The level of growth in the commercial PV market.

We have undertaken a sensitivity analysis and have developed a lower-bound estimate for 2018 of 19.5 million and an upper-bound estimated of 23.8 million.

'000 STCs Submitted for Creation	2016	2017	2018	2019	2020
Total Certificates - Base Case	16,402	22,551	21,667	21,058	21,081
Total Certificates - High Case		23,002	23,833	23,163	23,189
Total Certificates - Low Case		22,100	19,500	18,952	18,973

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 2018 calendar year and for the 2019 and 2020 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 agency
- 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 2016 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)
- 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 data)
- changes in the size (kilowatts) and output of photovoltaic systems
- impacts of phasing out of deeming arrangements under the Renewable Energy Target
- any other relevant factor the agency or the supplier 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 2017 and estimate of the level of STC surplus at the end of 2017;
- Forecast the level of solar installations and STCs to be created for 2018, 2019 and 2020.

In estimating the level of STC creation for 2017 we have relied on historical creation figures provided by the CER for the period to 3 January 2018. We have then considered historical creation patterns and lags to estimate the total expected level of creation for systems installed in 2017. We have then cross referenced this with recent weekly creation patterns moderated by feedback received from industry interviews.

For the 2018 to 2020 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.

We have made some changes to the market sectors that we have considered for solar PV in light of additional information being available from mid 2014 on the type of premises that the solar system was installed. This has enabled us to use more accurate data to determine the level of residential and non-residential sales. For each of these sectors we have also had data on whether the system was new or an upgrade or replacement system.

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.

The CER initially provided data for systems claiming certificates up to 12 October 2017 which was used by GEM to develop its initial estimates. Following receipt of updated data (to 3 January 2018) we have revised our estimates to incorporate the more up-to-date data. The updated data that we received from the CER did not include a breakdown by "Property Installation Type" which we had relied on to distinguish between residential and non-residential market sectors. We have pro-rated the most up-to-date data on the basis of the property type segments from the October data. A summary of the data received from the CER by market sector is included as Attachments 9 and 10.

Modelling solar PV certificates

The demand for and installation of solar PV systems in Australia continues to be driven by up-front cost, industry marketing, rising electricity prices, expanded media coverage,

environmental awareness and government incentives such as feed-in tariffs and STCs. System payback periods continue to be a useful proxy for determining the attractiveness of PV and forms the basis of our modelling.

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 a demand curve for each state. These demand curves then forecast the proportion of eligible households which will install systems. Based on these estimates, the solar zone rating and the average system sizes, STC creation is forecast.

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

- The STC price;
- State feed-in tariff rates, eligibility and other factors;
- Export rate,
- System prices; and
- Electricity prices, particularly those variable components that can be avoided.

System prices are based on industry forecasts of equipment prices, installation costs and exchange rates. Changes in the cost of raw materials will be implied in the above. We will assume that current feed-in tariff arrangements or export pricing that is currently in place remains the same for the three year forecast period.

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 were eligible for 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 future electricity and gas prices (including LPG) are also factors that need to be considered.

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 building forecasts (new and total), 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

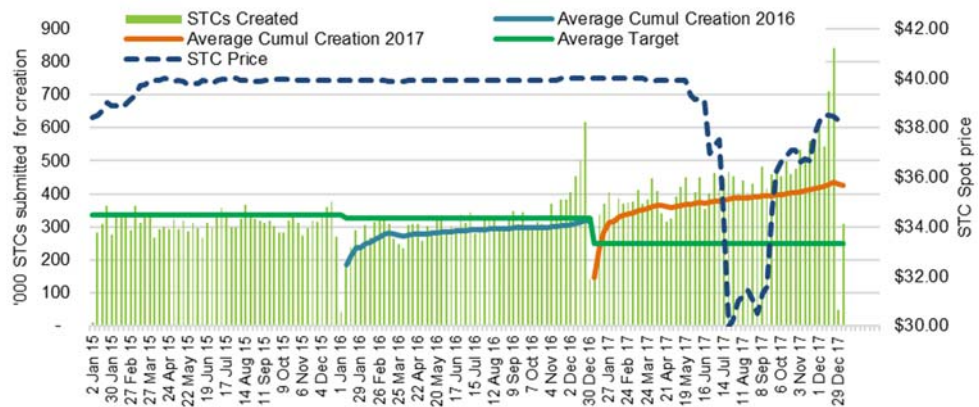
As part of the data modelling exercise we interviewed a range of solar market participants for their views of the solar PV and SWH market over the coming three years. The views of these businesses assisted in the development and refinement of our assumptions.

3. STC Market Overview and Industry Interviews

The level of STC creation surged towards the end of 2016 so that the final level of STC creation for 2016 was just under the 2016 Target. This was quite a surprise as at the middle of 2016 we were tracking more than 10% below the target (refer to Figure 3.1).

The surge in late 2016 can in part be explained by the imminent reduction in the number of years deeming for solar PV from 15 years in 2016 to 14 years for 2017 installations. Solar businesses used the reduced deeming to build urgency into customers' purchasing decisions.

Figure 3.1 STC spot price and weekly STCs submitted for registration

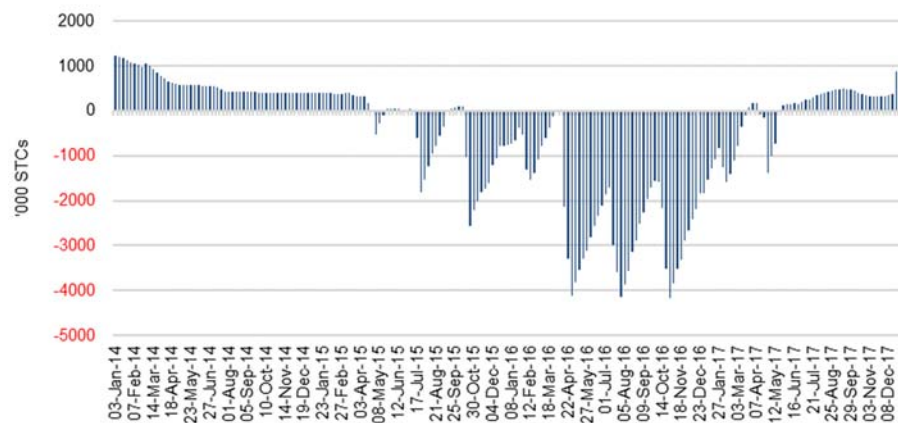


The level of STC creation in 2017 maintained the momentum of late 2016 and did not scale back as was expected. The higher level of STC creation can be largely attributed to:

- Improved attractiveness (significantly reduced paybacks) for solar PV across most states and territories predominantly due to significant increases in wholesale power prices and resultant higher price for electricity exports;
- Heightened media focus on higher energy prices and energy security has resulted in increased consumer interest and demand for solar solutions;
- An increase in the average size of PV system installed, also due in part to higher prices for electricity exports; and
- The late surge in creation over the last few weeks in 2017 can also be explained by the impending reduction in the level of deeming from 14 years to 13 years for systems installed in 2018.

One of the consequences of the continued high level of creation into 2017 was that a significant oversupply was developing and the Clearing House deficit was eliminated just before the 28 July 2017 surrender date. Thus, the spot STC price, which had consistently traded at or just below the \$40 Clearing House Price for several years crashed to \$30 after the July 2017 surrender.

The Clearing House which had been in deficit for a large part of the last two years went into 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 modelling are set out below:

- A modest surge in weekly creation in the lead up to the end of 2017 as solar PV businesses seek to create a level of urgency for customers to sign up prior to the reduction in the level of deeming in 2018. This was not expected to be as prominent as seen in 2016.
- The solar PV industry is starting to experience some capacity constraints with the increase in (i) small-scale solar PV installations claiming STCs (up 48% on 2016 levels) and (ii) strong growth in large-scale solar PV which is also competing for resources. Feedback suggests that there are delays in obtaining certain popular brands of inverters and batteries as well as challenges in securing accredited installers. These system chain issues are being addressed and are not expected to constrain system installs in 2018 and beyond.
- Strong consumer interest off the back of higher power prices, particularly in the commercial sector, however sales take longer to close and the full impact of this increased interest is yet to be seen in the level of certificate creation.
- Panel prices were expected to rise modestly in the last quarter of 2017 due to strong global demand, particularly from China. Prices into 2018 and beyond are expected to ease slightly.
- Continued increase in system size due to increases in export prices (feed-in tariffs) following rise in wholesale power prices.

4. Estimating STC creation for 2017 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 2017 the number of certificates created from the installation of solar systems in 2016.

We have analysed the level of STCs that have been submitted for creation on a weekly basis by year of installation for the PV residential market (Figure 4.1), the PV non-residential market (Figure 4.2) and the SWH Market (Figure 4.3). The lags in STC creation for systems installed in 2015 and 2016 can be clearly seen. There has been a greater lag for 2016 installations across both PV residential and non-residential market sectors.

Figure 4.1 Weekly STC Creation for residential PV systems by installation year (as at 3 January 2018)

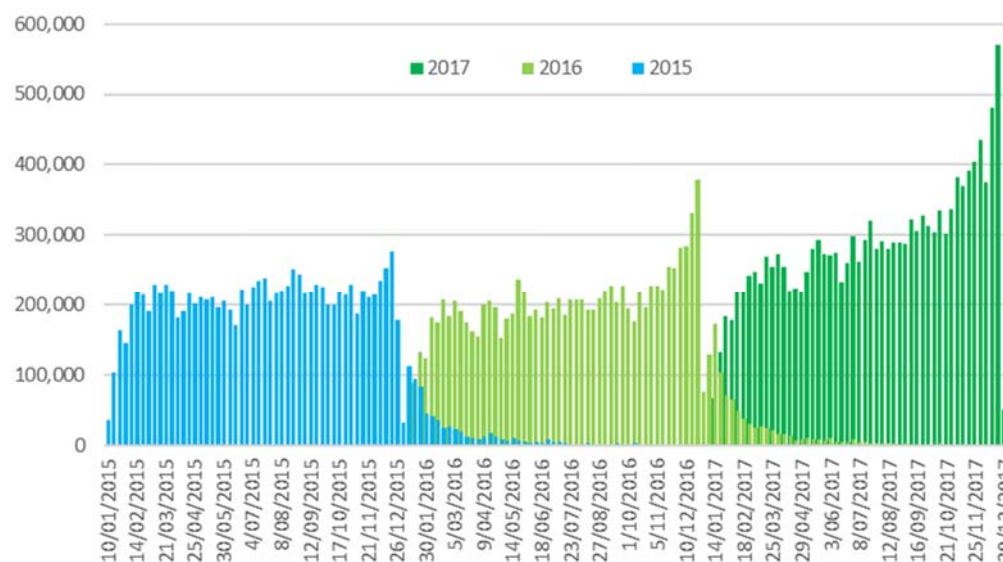


Figure 4.2 Weekly STC Creation for non-residential PV systems by installation year (as at 3 January 2018)

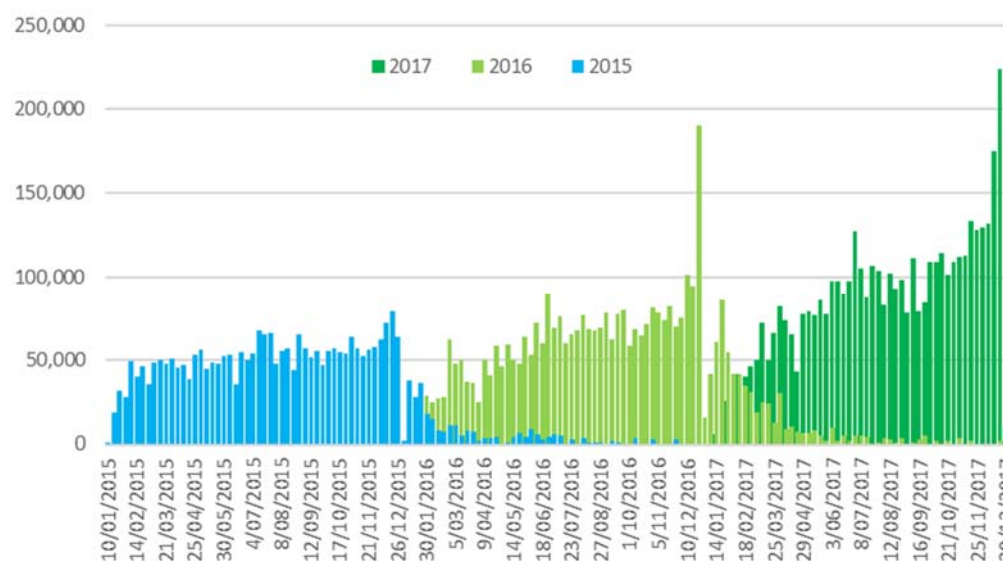
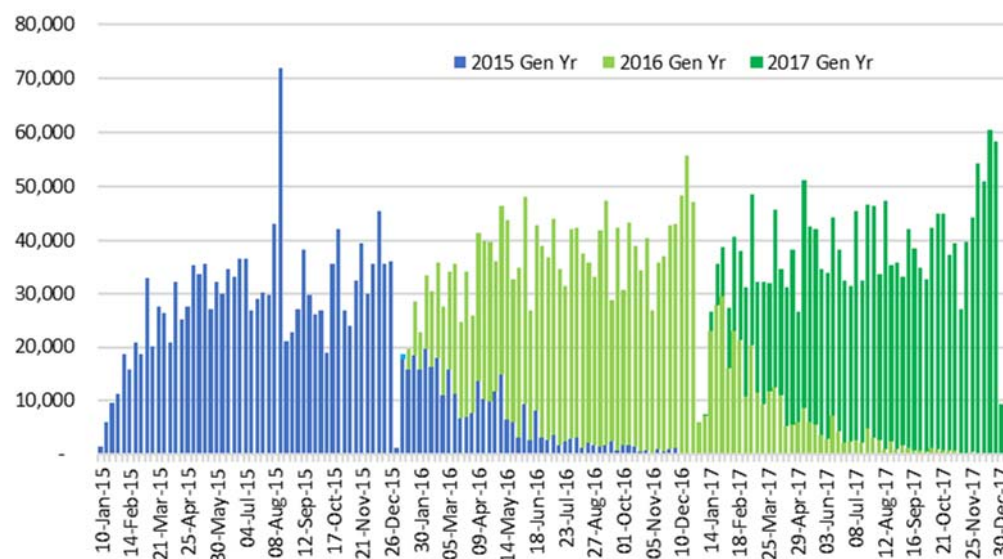


Figure 4.3 Weekly STC Creation for SWH systems by installation year (as at 3 January 2018)

To determine the lag in creation of STCs for systems installed in 2017, ie. the level of STCs expected to be created in 2018 we have used an average of the 2015 and 2016 years lag.

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.

Table 4.1 Proportion of Valid STCs created in year following installation year

000 STCs	Created to 2017	To be created	Total 2017	Propn of Current Yr
Solar PV Residential Market	14,474	1,154	15,628	8.0%
Solar PV Non-Residential Market	4,445	681	5,126	15.3%
Total Solar PV	18,919	1,835	20,754	9.7%
SWH New Building Market	844	263	1,107	31.2%
SWH Replacement Market	806	89	895	11.1%
Total SWH	1,649	352	2,002	21.4%
Total STCs	20,568	2,188	22,756	10.6%

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

Estimating STC surplus for 2017

A total of 22,465,000 STCs were submitted for creation in 2017 (Attachment 11). This comprised 20,489,000 for solar PV and 1,976,000 for SWH.

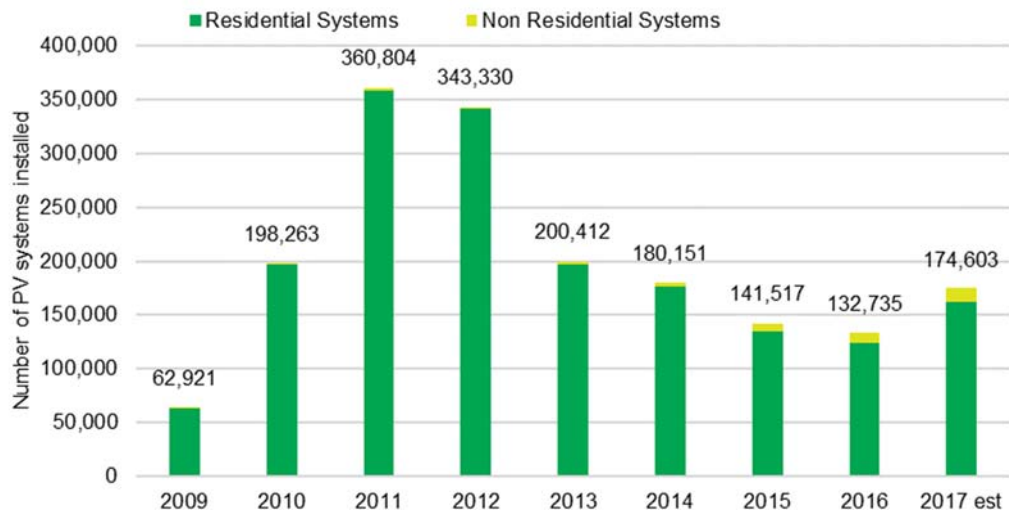
As at 31 December 2017 a total of 1,374,255 STCs were pending audit and had not been approved. The comparable figure for 31 December 2016 was 744,000 STCs. Over the Calendar year 2017 a total of 21,835,000 STCs were approved by the CER.

This amounted to 9.39 million STCs more than the Target of 12.45 million STCs.

5. Solar PV and SWH - Market Review

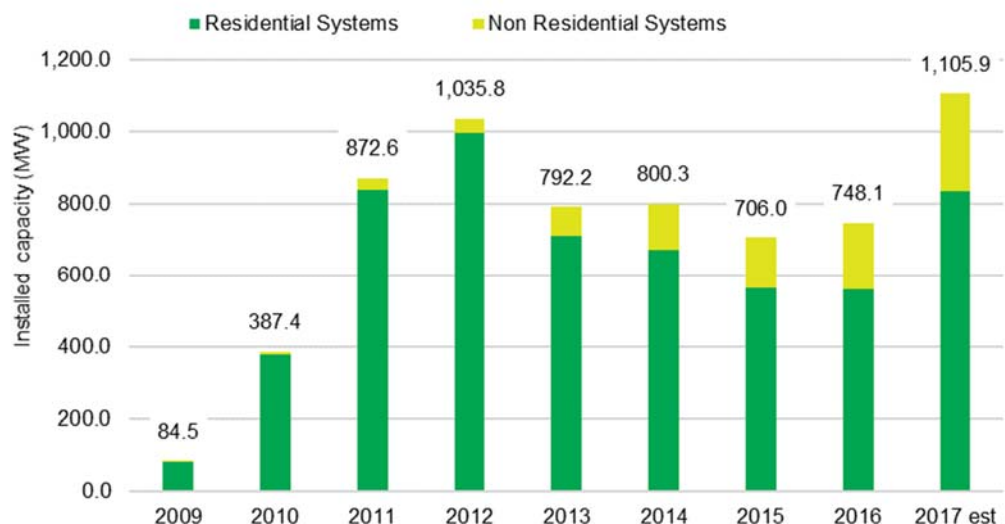
After experiencing declines in the number of system installations over the last few years the number of PV systems installed is expected to increase by 32% to 175,000 in 2017 (Figure 5.1).

Figure 5.1 Number of Solar PV installations claiming Certificates by Segment



The solar PV recovery is even more apparent when we consider that the expected capacity to be installed in 2017 is 1106 MW a 48% increase on 2016 levels (Figure 5.2).

Figure 5.2 Solar PV installed capacity claiming Certificates by Segment

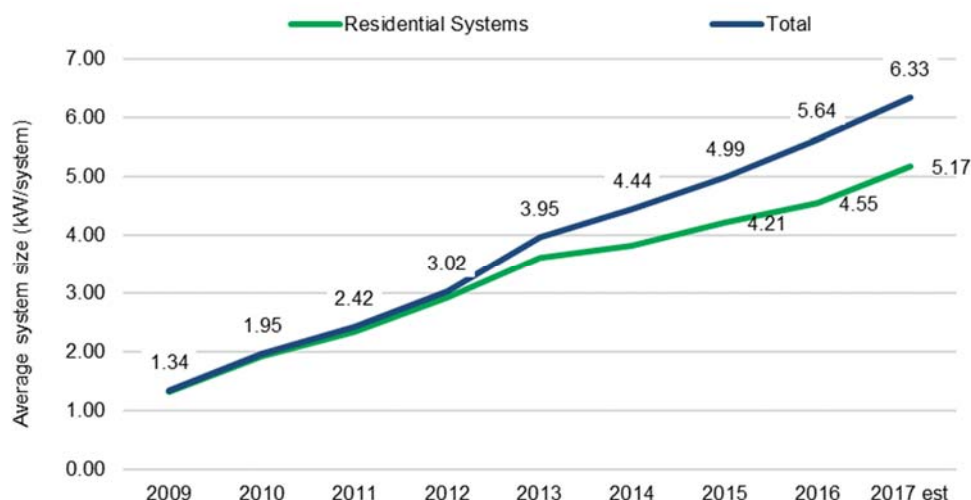


The number of non-residential systems continues to increase and is expected to reach 271 MW in 2017 and account for 25% of capacity installed for the year.

The overall average size of PV systems installed has increased five-fold since 2009 to reach 6.33 kW per system in 2017 (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

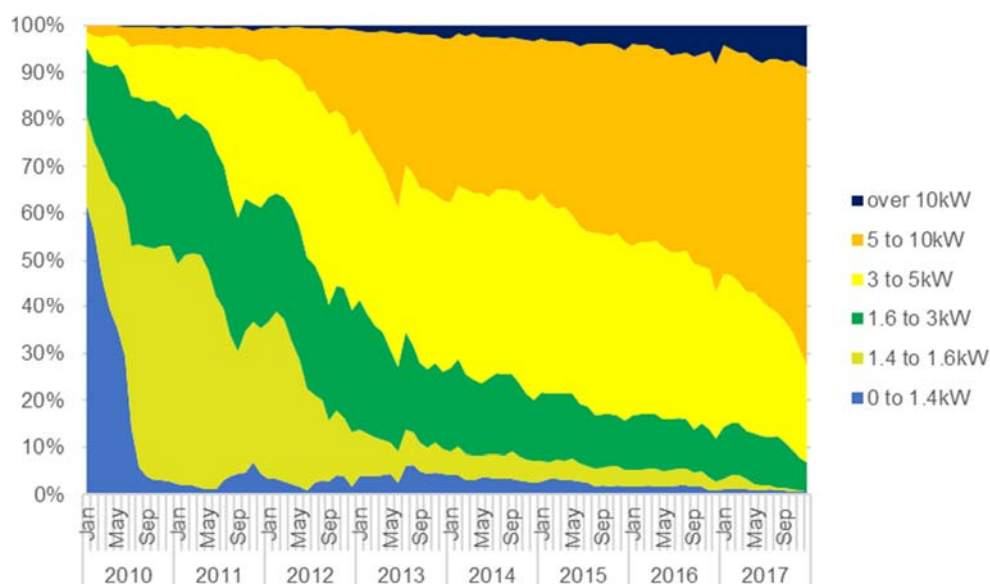
system size for residential installations (including upgrades) has increased markedly over the last 12 months reaching 5.17 kW per system in 2017.

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



The changing nature of Australia's PV market with the move to larger system sizes can best be shown graphically in Figure 5.5. The predominant size of system now being installed in Australia is well in excess of 5 kW.

Figure 5.4 Number of systems installed by capacity bands



We have undertaken some additional analysis on the breakdown of solar PV installations on an urban/rural basis. In assessing the composition of non-residential systems, we were keen to ascertain what proportion of the growth in these systems were due to growing installations on rural farming properties. We have used the methodology used in the Green Energy Trading report for the REC Agents Association on the Postcode and income distribution of solar (April 2014). The Australian Taxation Office (ATO) classifies postcodes into one of six categories that are summarised in Table 5.1.

Solar PV systems installed over the 2015 to 2017 period (based on data as at 12 October 2017) have been allocated to the ATO's urban classifications based on the postcode of

the installation (Table 5.2). Dwellings data is based on the ATO's publication 'Taxation Statistics 2009-2010).

Table 5.1 ATO Urban classification (Report for REC Agents Association, Apr 2014)

ATO Classification		ATO criteria
1	Major urban (Capital city)	Postcodes in capital city urban centres
2	Other Urban (we have used Major urban – Non-Capital City)	Postcodes in urban centres with population greater than 50,000 persons (excluding capital cities)
3	Regional-high urbanisation (we have used Regional – High)	Postcodes in urban centres with population between 10,000 and 50,000 persons
4	Regional-low urbanisation (we have used Regional – Low)	Postcodes in urban centres with population between 3,000 and 10,000 persons
5	Rural	All other postcodes (includes urban centres with population less than 3,000 persons and all other sparsely settled areas)
6	Other	Postcodes listed by Australia Post as valid but not in use, special PO boxes and other special mailing postcodes

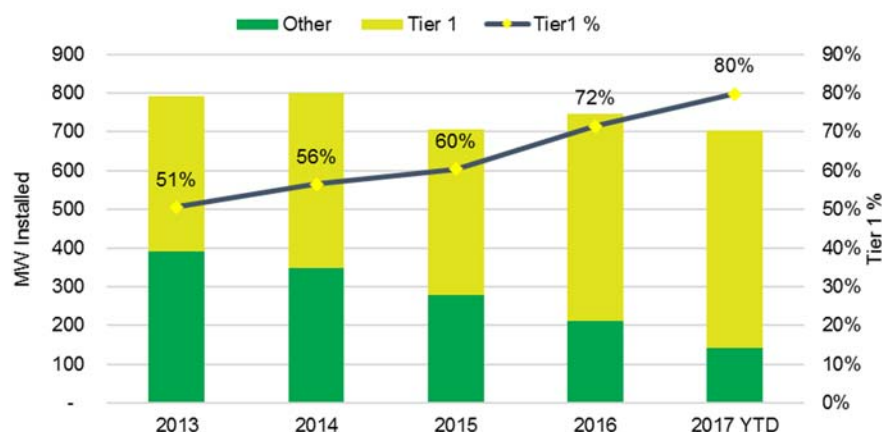
Solar PV installations installed in both residential and non-residential sites are over represented in non-urban areas at approximately twice the rate of urban sites. Of particular interest is that 47% of non-residential installations have been installed outside of major urban areas which would lead us to conclude that a reasonable proportion of these will be on farming properties.

Table 5.2 Solar PV systems installed in 2015 to 2017 by urban classification (data as at 12 October 2017)

	Dwellings	Residential	Non-residential	Total	Residential	Non-residential	Total
		Systems	Systems	Systems	% of sites	% of sites	% of sites
Major urban - Capital City	5,086,911	171,468	4,803	176,271	3.37%	0.09%	3.47%
Major urban - Non-Capital City	1,116,447	44,976	1,339	46,315	4.03%	0.12%	4.15%
Regional - High	1,047,759	50,217	1,753	51,970	4.79%	0.17%	4.96%
Regional - Low	605,360	30,594	1,097	31,691	5.05%	0.18%	5.24%
Rural	1,271,293	78,194	2,497	80,691	6.15%	0.20%	6.35%
	9,127,770	375,449	11,489	386,938	4.11%	0.13%	4.24%

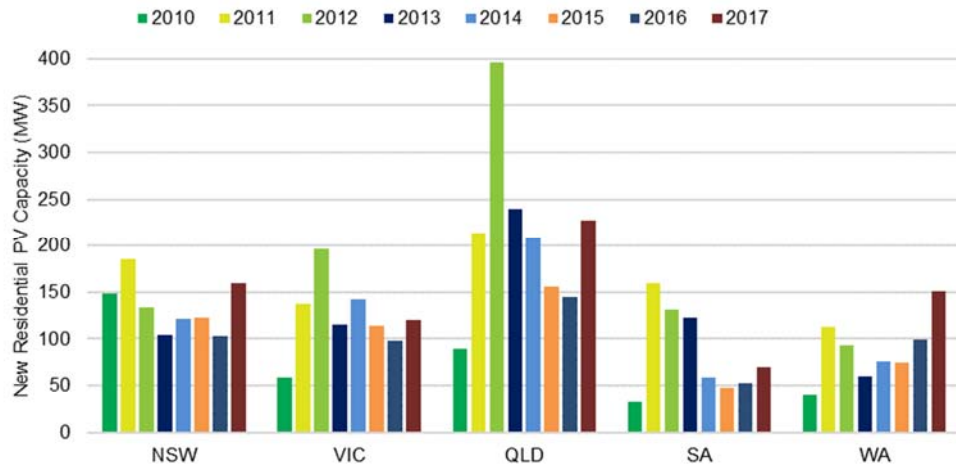
Another interesting feature of the Australian PV market has been the move to better quality systems. The proportion of the market that Tier 1 solar panels represent has been progressively increasing from 51% of the market in 2013 to 80% in 2017.

Figure 5.1 Capacity installed by Tier 1 Panels (data as at 12 October 2017)



Queensland continues to remain the largest state market for residential PV in Australia (Figure 5.6). Queensland and Western Australia have seen significant growth in system installation over 2017, with Victoria and South Australia growing more modestly.

Figure 5.6 New Residential PV system capacity (MW) installed for key states



Forecasting Installed PV costs

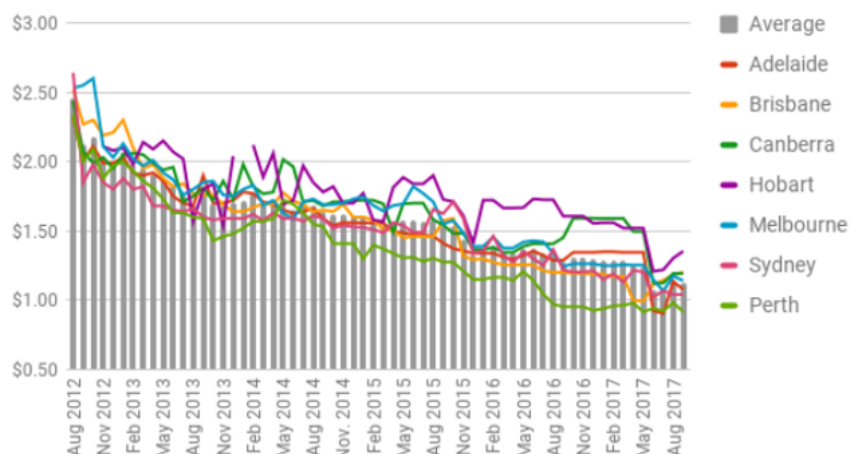
Installed system costs continued to fall through 2017 although industry is expecting a modest increase in costs in the last quarter of 2017 largely due to a tightening in global module and inverter supply due to increased demand from China.

Solar Choice publishes average installed system prices (Figure 5.7) 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 30 June 2017. 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 broader market.

We estimate that the average installed system cost (pre STCs) in 2017 will average \$1.80 per Watt which is slightly lower than the \$1.90 per Watt we had assumed in our analysis last year. We expect that the installed cost (pre STCs) in 2018 and 2019 will remain at this level in nominal terms (Figure 5.8).

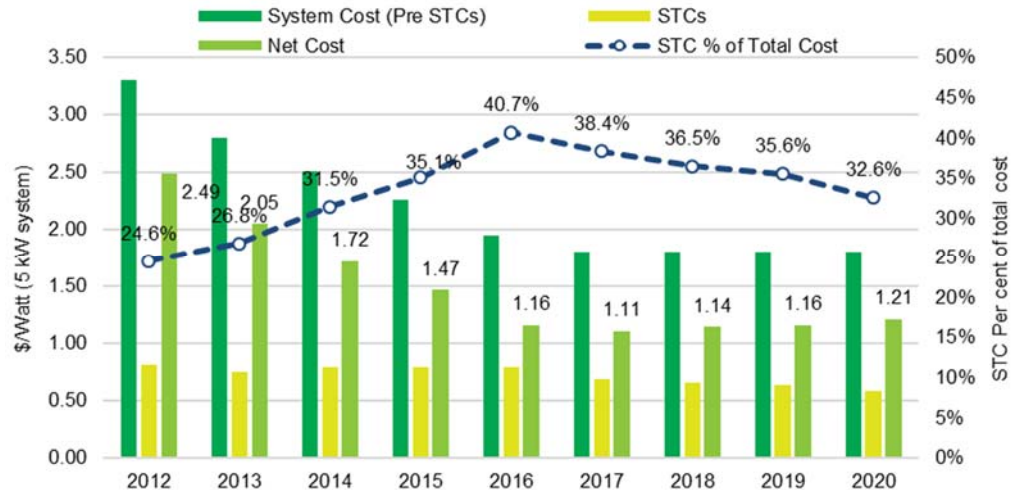
Figure 5.7 Installed system Costs (after STCs) for 5kW system (\$/Watt) (Solar Choice, September 2017)

Solar Choice - 5kW solar system prices



STCs will continue to play an important role in making solar PV attractive to customers even as the years of deeming reduce. The STC price dropped considerably from July 2017 and we expect that it will average \$35.70 in 2017 and \$36.60 in 2018 and then increase to \$38.60 in 2019 as the STC target is adjusted for the surplus of STCs.

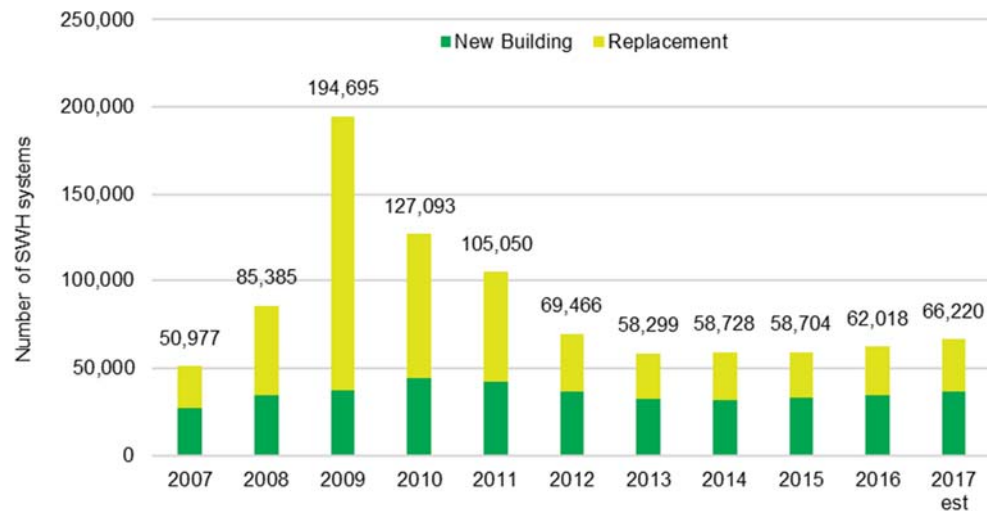
Figure 5.8 Forecast Installed system costs for 5 kW system (\$/Watt)



STCs accounted for just over 38% of the total cost of the system in 2017 and this is expected to drop to 36% in 2018 and then continue to fall as the number of years deeming reduces.

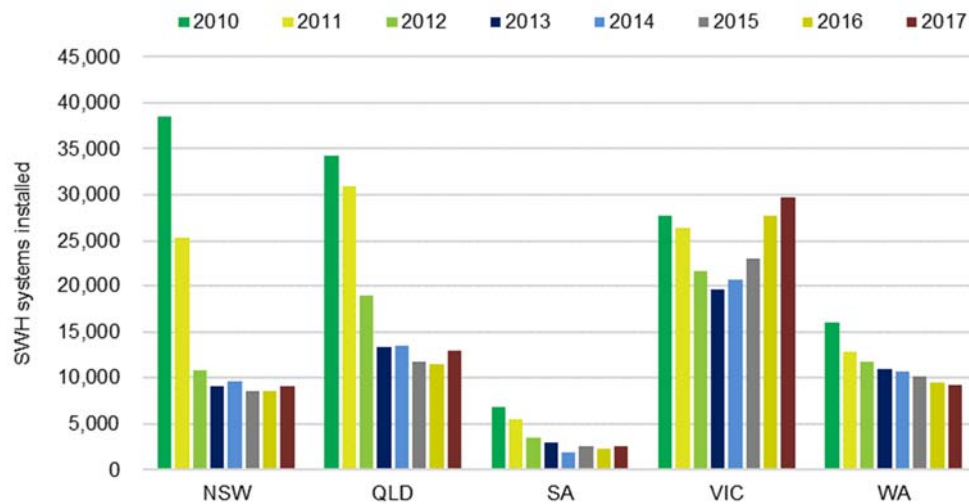
SWH Market

The SWH market can usefully be segmented into the new building and replacement markets (Figure 5.9). The new building market has been relatively stable over the last nine years with the installation level 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 5.9 SWH Systems installed and creating certificates by market segment

The SWH market overall has been very flat over the four years 2016 and then increased by 7% in 2017. Like solar PV the increase in installations can be explained by higher energy prices and increased media attention on energy security. The expected level of STCs to be created from SWH for 2017 installations is 2.0 million.

Installations of SHW systems across all main states (with the exception of Victoria) have been fairly flat over the last three years (Figure 5.10).

Figure 5.10 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 Energy Saving Incentive 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.

6. Solar PV Projections – New Residential

The new residential PV market is the most significant segment in Australia and is expected to account for 68% of PV capacity installed under the small-scale scheme.

Systems are generally sold into this market on the basis of financial attractiveness ie. payback. Our projections for the residential sector for the 2018, 2019 and 2020 calendar years have been made on a state basis and are derived from our payback model, with the resultant payback period feeding into a state demand curve. From the state based demand curves the proportion of eligible owner-occupied households expected to purchase a solar PV system is determined. Then based on this figure and estimates of the average system size, expected certificate creation is determined.

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 \$35.70 (after creation and administration costs) for 2017. We have assumed a price of \$36.60 for 2018 which reflects the value that STCs are currently traded in the forward market. STC prices are expected to increase to \$38.60 in 2019 (and beyond) as the STC surplus gets factored into future STC targets;
- Electricity import replacement price reflecting AEMC projections of the variable component (excludes fixed charges), and increased by between 1.5 to 4 cents per kWh over the 2017/18 period in line with increases in wholesale power prices and then falling over the 2019 and 2020 period in line with AEMC forecasts;
- Average system size of 5 kW;
- Electricity exports of 73% of electricity generated (based on Alternative Technology Association research); and
- Total installed cost of solar PV of \$1.80 per Watt in 2017 and remain at this level in nominal terms for 2018 through to 2020.

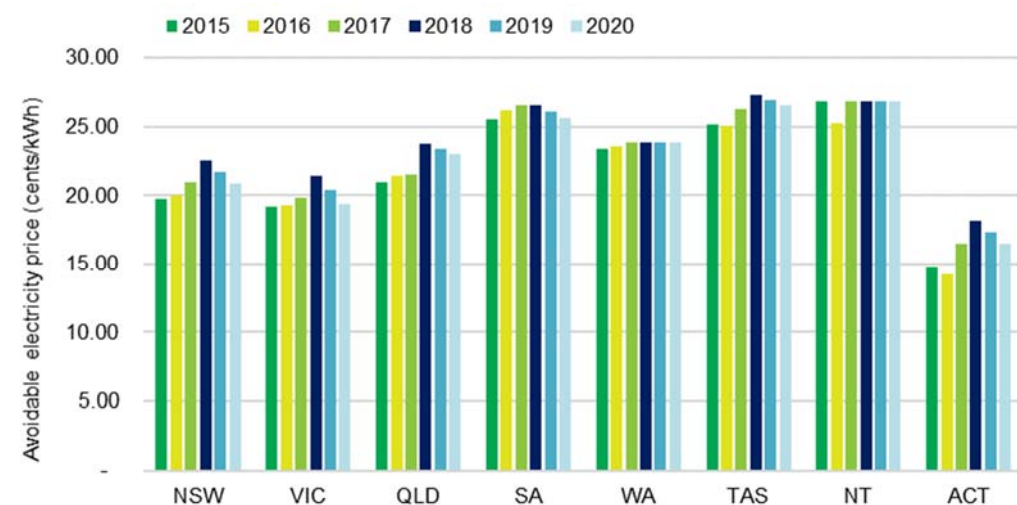
The installed cost and the contribution that STCs make is shown graphically in Figure 5.8 and Attachment 2.

Our electricity price projections have been based on the Australian Energy Market Commission (AEMC) 2016 Residential Electricity Price Trends (December 2016). Our variable pricing assumption (that can be avoided with solar PV) for 2017 is a combination of (i) the competitive pricing structure incorporated in each of the AEMC case studies for a typical four-person family using the “Energy Made Easy” tool and (ii) the standard power offering.

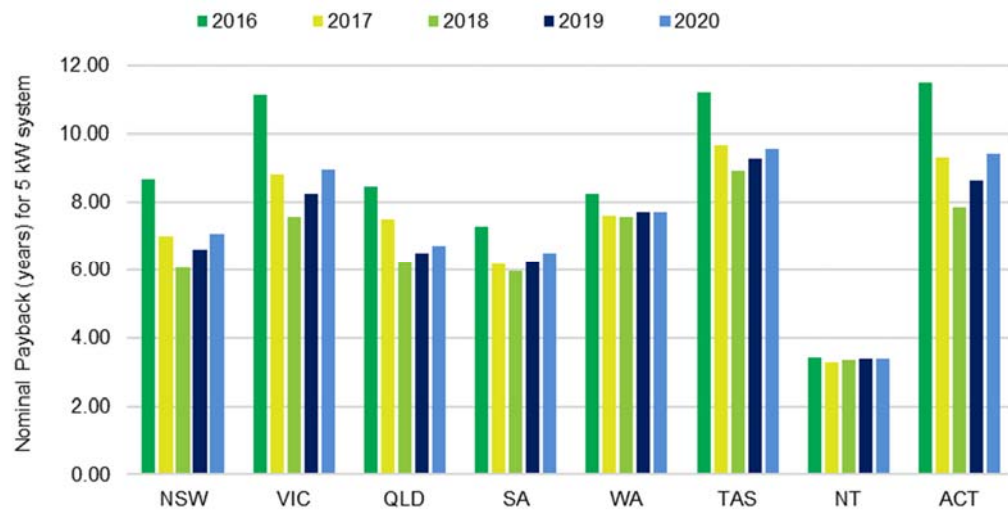
For 2017 we assume an average of 50:50 split between competitive offering and standard offering with the trend towards more households moving to competitive offers over time. We have then made adjustment for the increase in wholesale power prices and have used the observed increased in Cal 2018 power prices as reported by the ASX. As an example, since the last quarter of 2016 the base power price in Victoria has increased by just over \$40 per MWh (4 cents per kWh), refer to Figure 6.1.

Figure 6.1 ASX , Base electricity futures price for 2018

To reflect the increase in the wholesale price compared to our previous report we have added 3.5 cents per kWh for NSW and ACT, 4.0 cents for Victoria, 1.5 cents for Queensland and Tasmania and 2 cents for South Australia. We have phased in the increase with 50% in 2017 and the remaining 50% in 2018. The wholesale electricity price is expected to reduce from 2019 according to the AEMC's December 2017 Electricity Price trends report and we have phased out 50% of the increase in wholesale power prices over the 2019 and 2020 period. The resultant avoidable electricity price by state is summarised in Figure 6.2.

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

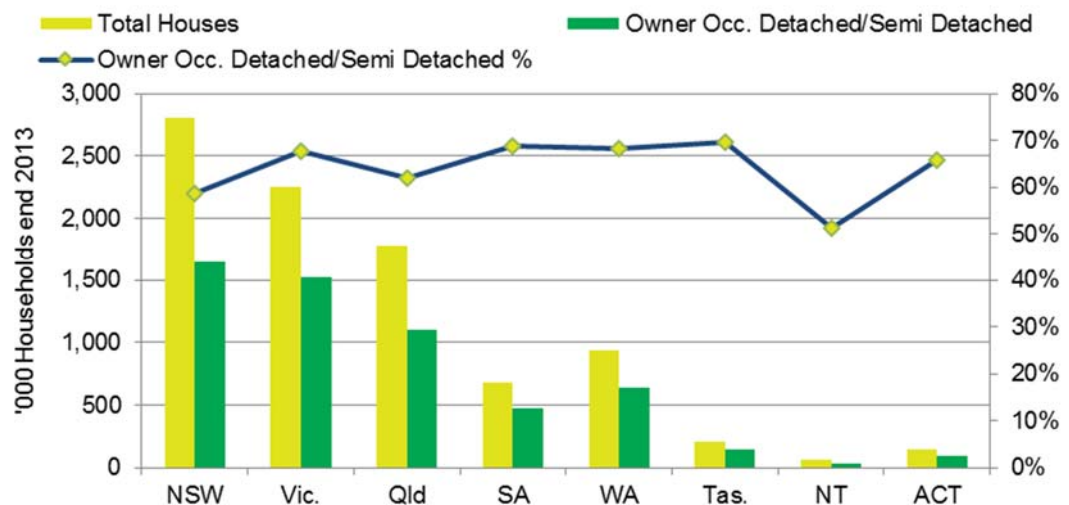
Average system payback are expected to reduce considerably over the next few years as the increase in wholesale prices takes impact (Figure 6.3). Paybacks start to increase from 2019 due to forecast reduction in the wholesale price and increased up-front cost of systems as the contribution from STCs reduces.

Figure 6.3 Simple Payback for 5 kW residential PV system (73% export)

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.

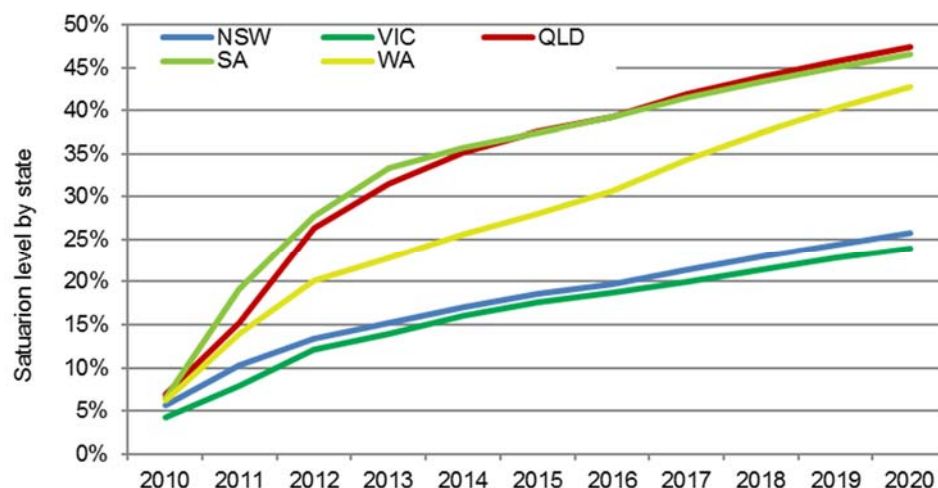
Demand curves have been developed on a state basis based on historical residential system installations. Demand curves are represented as a proportion of owner occupied relevant dwellings (separate and semi-detached houses) for that state (expressed as the average number of systems per month) for a given simple payback level. Based on ABS data we estimate that there were 8.7 million occupied dwellings in Australia at the end of 2013 of which 63.7% (5.6 million) were owner occupied detached or semi-detached (refer to Figure 6.4).

Figure 6.4 Dwellings by state (source: ABS)

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. Over the three years to 2020 the cumulative PV systems installed in each state grows considerably with very high saturation rates achieved in Queensland and South Australia, reaching nearly 50% by 2020.

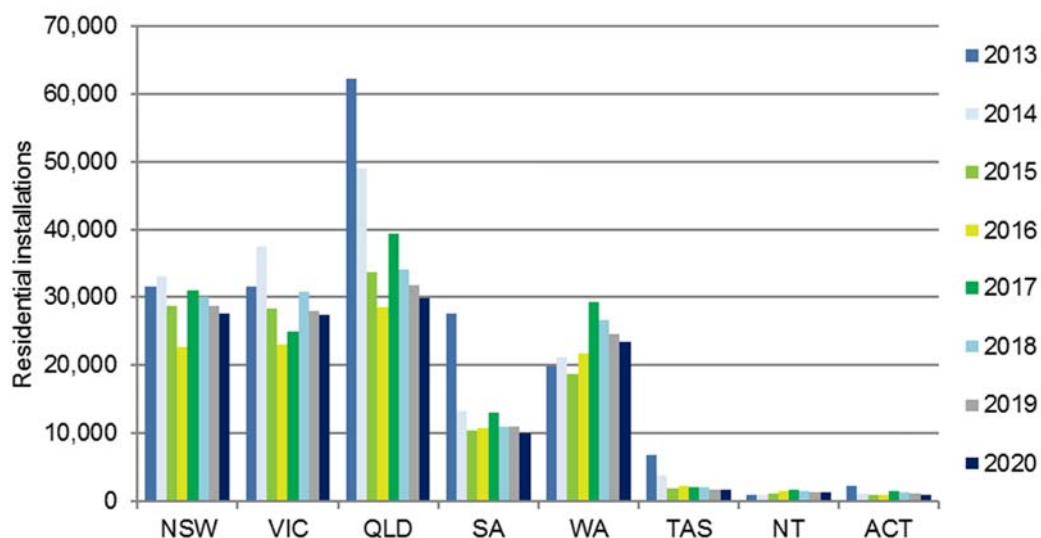
Figure 6.6 Penetration level by state



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 slow reduction in the level of system installation, predominantly driven by increasing levels of saturation. Due to the significant improvement in system attractiveness Victorian installations are expected to increase markedly in 2018.

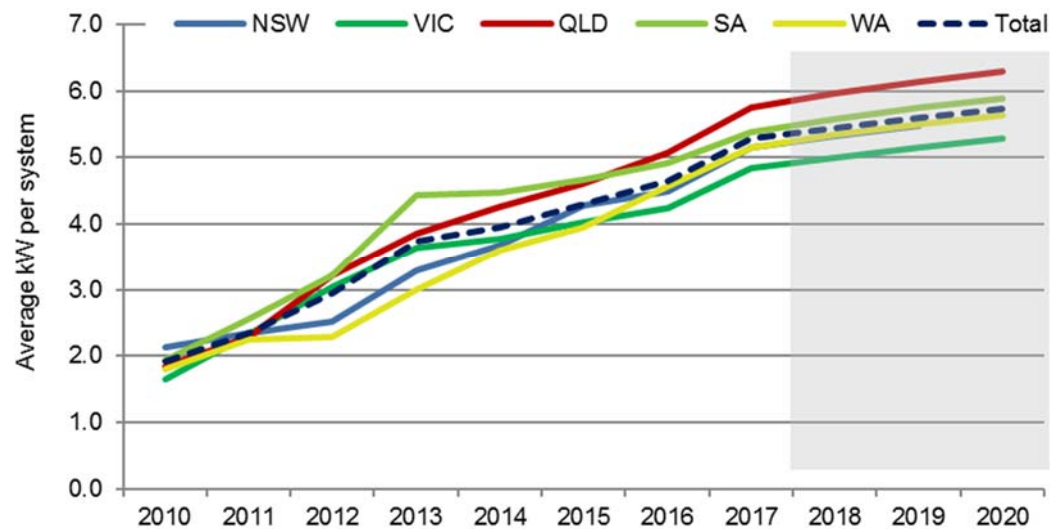
Figure 6.7 Residential PV systems installed by state



Determining the level of certificate creation

The average residential system size installed has continued to increase reaching 5.29 kW per system in 2017 (refer to Attachment 4 for details). All states have seen an increase in system size (refer to Figure 6.7).

Figure 6.7 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 and higher value for exported electricity will support increasing system size. We have assumed that the overall average system size progressively increases from 5.29 kW per system in 2017 to 5.44 kW per system in 2018, 5.60 kW per system in 2019 and 5.74 kW per system in 2020. The increase in system size can also be attributed in part to higher wholesale prices which makes exporting power more attractive.

The total number of systems installed and associated certificates created for new residential systems is detailed in Attachment 4 and summarised in Table 6.1.

Table 6.1 Number of New Residential Systems and Certificate Creation

Year of installation	2015	2016	Estimate 2017	Forecast 2018	Forecast 2019	Forecast 2020
Number of Systems Installed	123,684	111,445	142,902	137,646	128,087	122,249
Avg kW/system	4.30	4.65	5.29	5.44	5.60	5.74
Avg Certificates/kW	20.0	20.1	18.8	17.4	16.1	15.0
MW Installed	531.3	517.7	756.1	748.7	717.8	701.6
Eligible Certificates ('000)	10,632	10,401	14,243	13,010	11,525	10,507

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 this delineation from 2015 when a full years data was available. Prior to 2015 we have continued to use systems less than 10 kW as a proxy for non-residential systems.

Potential Demand

There have been more than 36,000 commercial sized systems installed across Australia to 2017. This is still only a very 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.

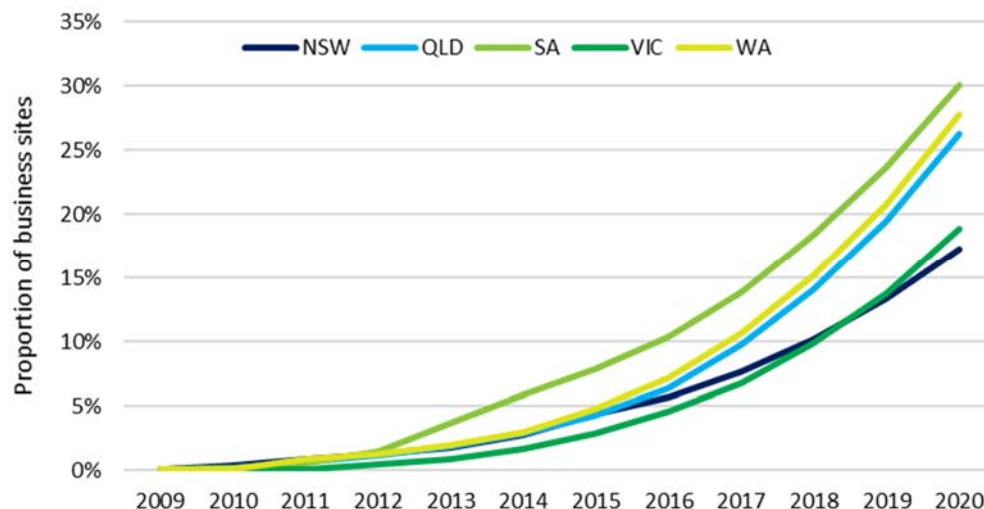
Data is not available by state that represents the above characteristics and we have developed a proxy to assist in assessing market prospects and growth over time. The ABS publishes data on the number of registered businesses (by number of employees) and the Energy Supply Association of Australia (ESAA) publishes data by state on the number of business connections. 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 >1 employee	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 more than 10% market penetration by 2017. Victoria and NSW have quite a bit lower penetration rate with South Australia having 15%.

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

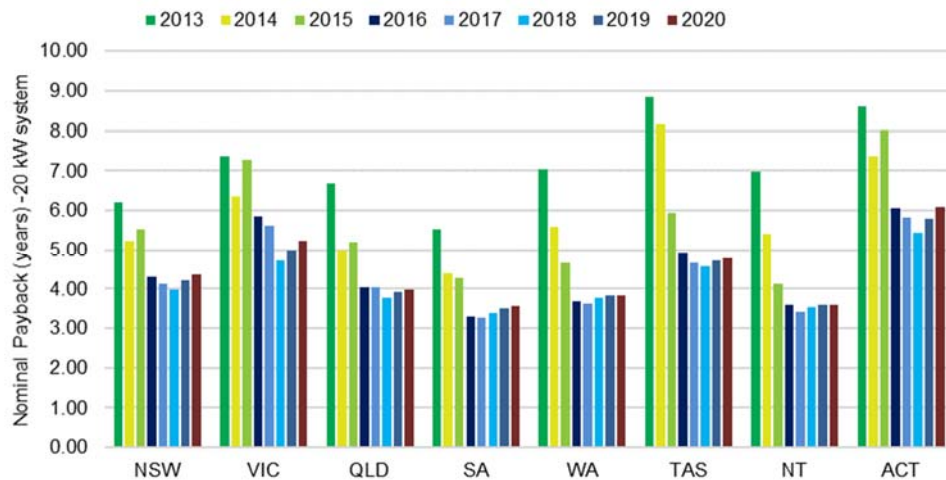
The availability of roof space and owning the site are key requirements for solar PV to be considered by a business customer. It would appear that sites that are outside of the major metropolitan areas of capital cities are more likely to have these characteristics and therefore more likely to be attractive for solar PV. Postcode analysis that we have undertaken (Table 5.2) indicates that 47% on 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 an 11.3 cent per kW feed-in tariff from 1 July 2017).

The increase in the wholesale price of electricity for south eastern Australian states has generally resulted in an improvement in the payback period in 2018 (Table 7.1) although this may be offset by the reduction in STC prices.

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 47% in 2017. 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 28% in 2018 and by 26% in 2019 and 2020.

For the forecast period, we have assumed that the average system size in each state for 2017 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	2015	2016	Estimate 2017	Forecast 2018	Forecast 2019	Forecast 2020
Number of Systems Installed	6,903	8,356	11,890	15,535	19,530	24,565
Avg kW/system	19.17	20.06	20.73	20.35	20.33	20.32
Avg Certificates/kW	20.2	20.5	18.7	17.4	16.0	14.7
MW Installed	132.3	167.7	246.5	316.1	397.1	499.2
Eligible Certificates ('000)	2,674	3,439	4,609	5,489	6,360	7,322

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 2017 being above 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.

Upgrade systems also incorporate replacement systems to 31 December 2017 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 that had created STCs by 12 October 2017 (refer to Table 8.1).

Table 8.1 Replacement and Upgrade STC Creation (as at 12 October 2017)

Installation Year	2015	2016 Part	2017 Part
Replacement System			
Non-Residential	138,499	228,826	181,549
Residential	229,145	387,225	459,847
	367,644	616,051	641,396
Upgrade			
Non-Residential	63,119	147,981	97,838
Residential	426,015	511,960	506,888
	489,134	659,941	604,726
Total	856,778	1,275,992	1,246,122
Replacement %	42.9%	48.3%	51.5%
Replacement- Residential %	62.3%	62.9%	71.7%

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 8.2 and 8.3.

Table 8.2 Residential upgrade systems and certificates

Year of installation	2015	2016	Estimate 2017	Forecast 2018	Forecast 2019	Forecast 2020
Number of Systems Installed	10,221	11,985	18,666	12,151	15,165	18,934
Avg kW/system	3.17	3.69	4.22	3.96	3.96	3.96
Avg Certificates/kW	20.2	20.4	19.0	17.6	16.3	14.9
MW Installed	32.4	44.2	78.8	48.1	60.0	74.9
Eligible Certificates ('000)	655	901	1,501	849	977	1,117

Table 8.3 Non Residential upgrade systems and certificates

Year of installation	2015	2016	Estimate 2017	Forecast 2018	Forecast 2019	Forecast 2020
Number of Systems Installed	709	949	1,145	492	602	739
Avge kW/system	14.04	19.46	21.48	20.27	20.23	20.19
Avge Certificates/kW	20.3	20.5	18.9	17.5	16.1	14.7
MW Installed	10.0	18.5	24.6	10.0	12.2	14.9
Eligible Certificates ('000)	202	378	464	174	196	219

9. SWH and Air Sourced Heat Pump Projections

Overview

We estimate that over 66,000 SWH systems will be installed and create certificates in 2017 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. Higher energy prices throughout 2017 will also have contributed to the 7% increase in SWH systems claiming STCs.

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 expected to fall dramatically in 2018 and 2019 according to the Housing Industry Association (HIA) Economics Group (Table 9.1). The reduction in 2018 of 12.2% is however lower than their August 2016 projection of a reduction of 15.8% which we used in our previous report.

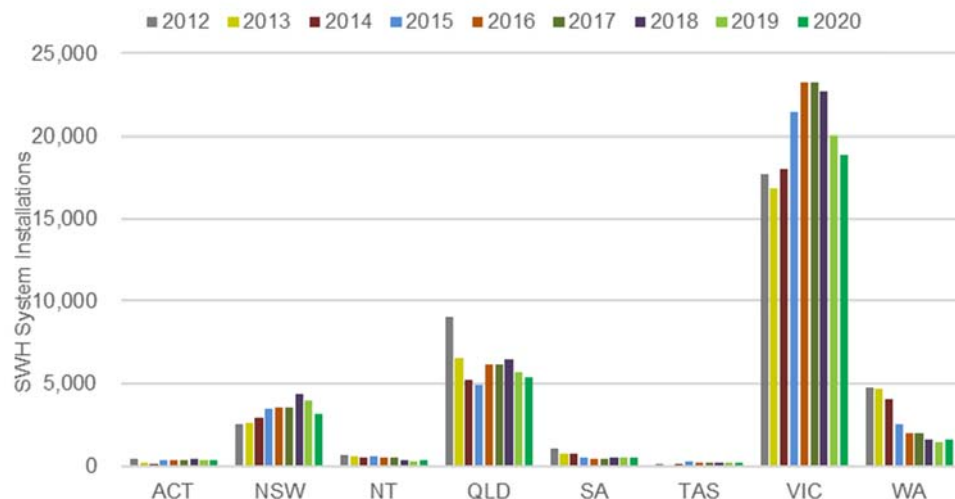
Table 9.1 Housing Industry Association – New Home starts (Mar 2017)

	2012	2013	2014	2015	2016	2017	2018	2019
ACT	4.1%	-17.9%	9.5%	-8.4%	7.8%	6.3%	-16.3%	1.8%
NSW	-7.2%	0.9%	34.0%	13.3%	21.1%	17.9%	-10.8%	-21.7%
NT	6.5%	22.3%	3.8%	-2.3%	-24.8%	-23.4%	-18.2%	5.1%
QLD	-19.2%	1.4%	16.5%	19.3%	18.9%	3.0%	-14.3%	-8.6%
SA	-18.3%	-16.5%	14.8%	16.7%	-11.3%	10.6%	-7.4%	2.2%
TAS	-17.3%	-23.1%	-12.3%	33.5%	16.7%	-22.9%	-2.8%	8.1%
VIC	-9.3%	-4.8%	-9.9%	25.5%	17.0%	-4.8%	-14.1%	-18.2%
WA	-20.6%	1.8%	31.1%	22.7%	-11.5%	-24.3%	-8.4%	7.3%
Total	-12.7%	-2.8%	12.4%	18.9%	11.6%	1.1%	-12.2%	-13.0%

We have used the HIA 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 in 2018 and then fall over the 2019 and 2020 period in line with lower new home starts.

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



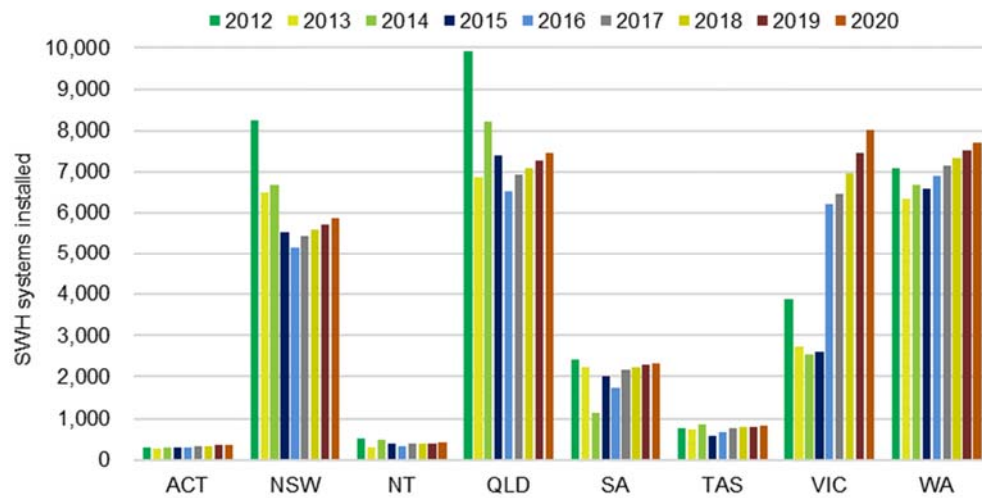
Replacement submarket

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 Energy Savings Scheme which includes SWH as an eligible activity. For example, 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.

We expect the replacement market for SWH to continue to recover through 2018 and beyond, this recovery will be supported by rising electricity and gas prices.

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 2018 to 2020 forecast period will be similar to the average levels achieved over the 2016 to 2017 period.

Table 9.4 Certificate creation from SWH

Year of installation	2015	2016	Estimate 2017	Forecast 2018	Forecast 2019	Forecast 2020
New Buildings						
Number of Systems Installed	33,263	34,182	36,562	36,592	32,590	30,562
Avg Certificates/System	30.4	30.3	30.3	30.2	30.2	30.2
Eligible Certificates ('000)	1,013	1,035	1,107	1,105	985	924
Replacement						
Number of Systems Installed	25,441	27,836	29,658	30,723	31,838	33,008
Avg Certificates/System	30.8	30.4	30.2	29.9	30.3	30.3
Eligible Certificates ('000)	784	845	895	917	963	999
Total						
Number of Systems Installed	58,704	62,018	66,220	67,314	64,428	63,570
Avg Certificates/System	31	30	30	30	30	30
Eligible Certificates ('000)	1,797	1,880	2,002	2,023	1,948	1,923

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 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
- REC Agents Association, Research Notes and Media Releases
- Housing Industry Association, Housing Forecasts – August 2017
- ESAA, Electricity Gas Australia 2014
- Australian Energy Market Commission, Residential Electricity Price Trends report, December 2016 and December 2017

Summary of Results

Base Case

Year of installation	Actual 2015	Actual 2016	Estimate 2017	Forecast 2018	Forecast 2019	Forecast 2020
1. SGUs (PV)						
1.1 New Residential						
Number of Systems Installed	123,684	111,445	142,902	137,646	128,087	122,249
Avg kW/system	4.30	4.65	5.29	5.44	5.60	5.74
Avg Certificates/kW	20.0	20.1	18.8	17.4	16.1	15.0
MW Installed	531.3	517.7	756.1	748.7	717.8	701.6
Eligible Certificates ('000)	10,632	10,401	14,243	13,010	11,525	10,507
1.2 Residential Upgrades						
Number of Systems Installed	10,221	11,985	18,666	12,151	15,165	18,934
Avg kW/system	3.17	3.69	4.22	3.96	3.96	3.96
Avg Certificates/kW	20.2	20.4	19.0	17.6	16.3	14.9
MW Installed	32.4	44.2	78.8	48.1	60.0	74.9
Eligible Certificates ('000)	655	901	1,501	849	977	1,117
1.3 New Non Residential						
Number of Systems Installed	6,903	8,356	11,890	15,535	19,530	24,565
Avg kW/system	19.17	20.06	20.73	20.35	20.33	20.32
Avg Certificates/kW	20.2	20.5	18.7	17.4	16.0	14.7
MW Installed	132.3	167.7	246.5	316.1	397.1	499.2
Eligible Certificates ('000)	2,674	3,439	4,609	5,489	6,360	7,322
1.4 Non Residential Upgrades						
Number of Systems Installed	709	949	1,145	492	602	739
Avg kW/system	14.04	19.46	21.48	20.27	20.23	20.19
Avg Certificates/kW	20.3	20.5	18.9	17.5	16.1	14.7
MW Installed	10.0	18.5	24.6	10.0	12.2	14.9
Eligible Certificates ('000)	202	378	464	174	196	219
Total PV Systems						
Number of Systems Installed	141,517	132,735	174,603	165,824	163,384	166,486
Avg kW/system	40.68	47.85	51.72	50.01	50.13	50.21
Avg Certificates/kW	20.1	20.2	18.8	17.4	16.1	14.8
MW Installed	706.0	748.1	1,105.9	1,122.8	1,187.2	1,290.7
Eligible Certificates ('000)	14,163	15,119	20,818	19,521	19,057	19,165
2. SWH Systems						
2.1 SWH System (New Homes)						
Number of Systems Installed	33,263	34,182	36,562	36,592	32,590	30,562
Avg Certificates/System	30.4	30.3	30.3	30.2	30.2	30.2
Eligible Certificates ('000)	1,013	1,035	1,107	1,105	985	924
2.2 SWH System (Replacement)						
Number of Systems Installed	25,441	27,836	29,658	30,723	31,838	33,008
Avg Certificates/System	30.8	30.4	30.2	29.9	30.3	30.3
Eligible Certificates ('000)	784	845	895	917	963	999

Summary of Results Base Case

Year of installation	Actual 2015	Actual 2016	Estimate 2017	Forecast 2018	Forecast 2019	Forecast 2020
Total SWH Systems						
Number of Systems Installed	58,704	62,018	66,220	67,314	64,428	63,570
Avg Certificate/System	30.6	30.3	30.2	30.0	30.2	30.3
Eligible Certificates ('000)	1,797	1,880	2,002	2,023	1,948	1,923
3. Small Wind/Hydro Systems						
Number of Systems	10	10	10	10	10	10
Avg Certificate/System	26.8	26.8	26.8	26.8	26.8	26.8
Eligible Certificates ('000)	0	0	0	0	0	0
TOTAL Certificates ('000)	15,960	16,999	22,820	21,544	21,006	21,089

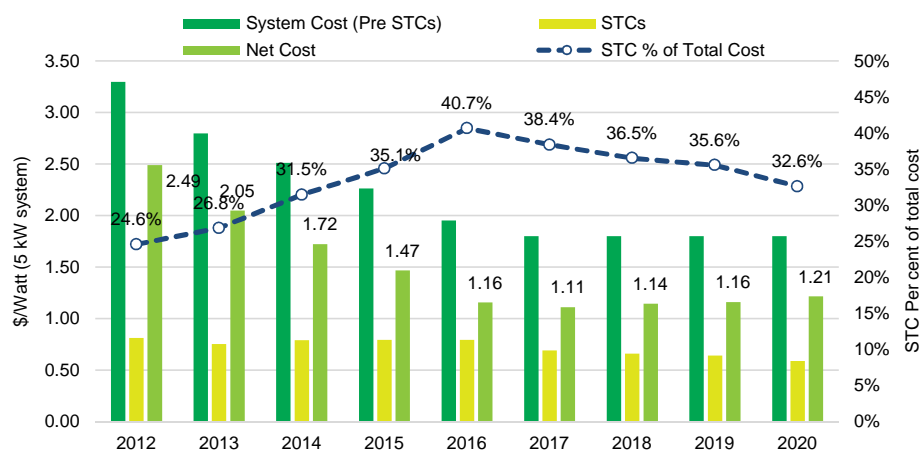
Year of installation	Actual 2015	Actual 2016	Estimate 2017	Forecast 2018	Forecast 2019	Forecast 2020
STCs for systems installed in the year						
Solar PV	14,163	15,119	20,818	19,521	19,057	19,165
SWH	1,797	1,880	2,002	2,023	1,948	1,923
Total	15,960	16,999	22,820	21,544	21,006	21,088
Less STCs submitted following year	1,321	1,918	2,188	2,065	2,014	2,022
Add Previous year installs created	1,409	1,321	1,918	2,188	2,065	2,014
STCs submitted for creation	16,048	16,402	22,551	21,667	21,058	21,081

Attachment 2

Residential PV Systems

PV Financial Attractiveness

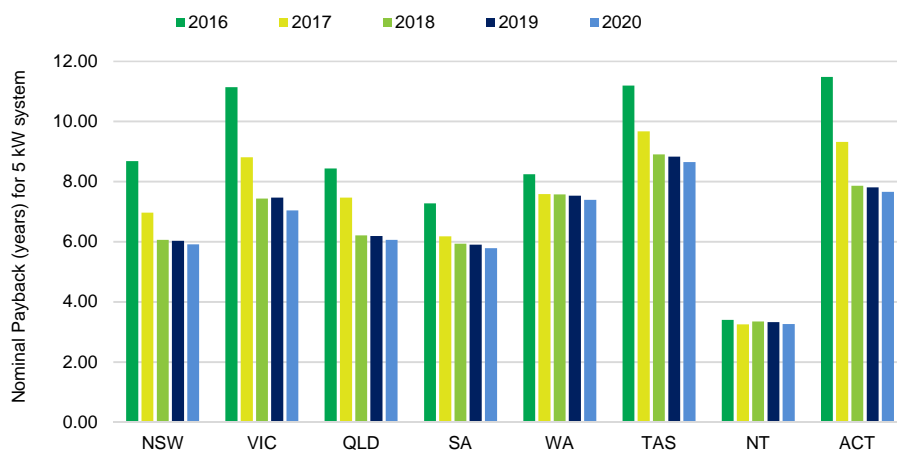
Projected Installed cost of solar PV



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

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
2016	8.68	11.14	8.44	7.28	8.25	11.19	3.40	11.48
2017	6.97	8.80	7.47	6.17	7.59	9.67	3.25	9.32
2018	6.06	7.44	6.21	5.93	7.57	8.90	3.34	7.86
2019	6.03	7.47	6.18	5.90	7.54	8.83	3.33	7.81
2020	5.92	7.04	6.06	5.79	7.39	8.65	3.26	7.66
2021	5.80	6.67	5.94	5.67	7.24	8.48	3.20	7.51

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
Data for 2012									
Total 2012 systems	52,937	64,769	123,257	41,022	40,734	6,000	475	1,472	330,666
Cumulative installations	219,288	180,533	285,274	129,442	125,580	12,048	1,734	11,534	965,433
Owner occupied dwelling at year	1,631	1,493	1,083	466	622	146	35	92	5,569
Proportion of Owner Occupied Dw	13.4%	12.1%	26.3%	27.8%	20.2%	8.2%	5.0%	12.5%	17.3%
Data for 2013									
Average number of systems insta	2,627	2,633	5,185	2,298	1,649	573	81	189	15,235
Annulised installations	31,518	31,598	62,220	27,579	19,787	6,878	976	2,267	182,823
Cumulative installations	250,806	212,131	347,494	157,021	145,367	18,926	2,710	13,801	1,148,256
Owner occupied dwelling at year	1,647	1,522	1,104	471	635	148	35	94	5,656
Proportion of Owner Occupied Dw	15.2%	13.9%	31.5%	33.3%	22.9%	12.8%	7.8%	14.7%	20.3%
Data for 2014									
Average number of systems insta	2,752	3,129	4,096	1,100	1,763	317	80	98	13,333
Annulised installations	33,022	37,545	49,146	13,194	21,158	3,804	954	1,177	160,000
Cumulative installations	283,828	249,676	396,640	170,215	166,525	22,730	3,664	14,978	1,308,256
Owner occupied dwelling at year	1,663	1,550	1,126	476	649	149	35	95	5,743
Proportion of Owner Occupied Dw	17.1%	16.1%	35.2%	35.7%	25.7%	15.3%	10.4%	15.7%	22.8%
Estimates for 2015									
Average number of systems insta	2,390	2,358	2,817	858	1,561	153	90	81	10,307
Annulised installations	28,677	28,293	33,800	10,291	18,733	1,830	1,084	976	123,684
Cumulative installations	312,505	277,969	430,440	180,506	185,258	24,560	4,748	15,954	1,431,940
Owner occupied dwelling at year	1,680	1,578	1,147	481	662	150	35	97	5,830
Proportion of Owner Occupied Dw	18.6%	17.6%	37.5%	37.5%	28.0%	16.4%	13.4%	16.4%	24.6%
Estimates for 2016									
Average number of systems insta	1,883	1,930	2,377	893	1,819	189	128	71	9,289
Annulised installations	22,594	23,156	28,521	10,718	21,823	2,272	1,532	849	111,464
Cumulative installations	335,098	301,125	458,962	191,223	207,081	26,832	6,279	16,803	1,543,405
Owner occupied dwelling at year	1,696	1,606	1,169	486	675	151	36	99	5,917
Proportion of Owner Occupied Dw	19.8%	18.7%	39.3%	39.3%	30.7%	17.8%	17.6%	17.0%	26.1%
Projections for 2017									
Average number of systems insta	1,975	2,089	1,784	691	1,597	152	95	81	8,464
Annulised installations	29,021	24,474	38,634	11,851	29,864	2,026	1,686	1,379	138,936
Cumulative installations	364,119	325,600	497,596	203,074	236,945	28,858	7,965	18,182	1,682,340
Owner occupied dwelling at year	1,712	1,634	1,190	492	688	152	36	100	6,003
Proportion of Owner Occupied Dw	21.3%	19.9%	41.8%	41.3%	34.4%	19.0%	22.1%	18.2%	28.0%
Projections for 2018									
Average number of systems insta	2,437	2,569	2,758	919	2,219	174	128	103	17,969
Annulised installations	29,246	30,828	33,098	11,033	26,632	2,093	1,533	1,230	135,693
Cumulative installations	393,365	356,428	530,695	214,107	263,578	30,951	9,498	19,412	1,818,033
Owner occupied dwelling at year	1,728	1,663	1,211	497	701	153	36	102	6,089
Proportion of Owner Occupied Dw	22.8%	21.4%	43.8%	43.1%	37.6%	20.2%	26.2%	19.1%	29.9%
Projections for 2019									
Average number of systems insta	2,358	2,449	2,598	892	2,108	155	120	99	13,929
Annulised installations	28,294	29,390	31,177	10,701	25,293	1,863	1,439	1,190	129,347
Cumulative installations	421,659	385,817	561,872	224,808	288,871	32,815	10,936	20,603	1,947,381
Owner occupied dwelling at year	1,745	1,691	1,233	502	714	154	37	103	6,175
Proportion of Owner Occupied Dw	24.2%	22.8%	45.6%	44.8%	40.4%	21.3%	29.9%	20.0%	31.5%

Solar PV Residential Systems by State

	2	3	4	5	6	7	8	9	
	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Projections for 2020									
Average number of systems installed	2,277	2,373	2,461	857	2,009	151	114	95	10,289
Annulised installations	27,325	28,476	29,532	10,281	24,112	1,810	1,366	1,146	124,047
Cumulative installations	448,984	414,294	591,404	235,089	312,982	34,625	12,302	21,748	2,071,427
Owner occupied dwelling at year end	1,761	1,719	1,254	507	727	155	37	105	6,261
Proportion of Owner Occupied Dwellings	25.5%	24.1%	47.2%	46.4%	43.0%	22.3%	33.4%	20.8%	33.1%
Saturation rates									
	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
2010	5.6%	4.2%	6.9%	6.5%	6.2%	2.7%	2.9%	4.1%	5.5%
2011	10.3%	7.9%	15.3%	19.2%	13.9%	4.2%	3.7%	11.1%	11.6%
2012	13.4%	12.1%	26.3%	27.8%	20.2%	8.2%	5.0%	12.5%	17.3%
2013	15.2%	13.9%	31.5%	33.3%	22.9%	12.8%	7.8%	14.7%	20.3%
2014	17.1%	16.1%	35.2%	35.7%	25.7%	15.3%	10.4%	15.7%	22.8%
2015	18.6%	17.6%	37.5%	37.5%	28.0%	16.4%	13.4%	16.4%	24.6%
2016	19.8%	18.7%	39.3%	39.3%	30.7%	17.8%	17.6%	17.0%	26.1%
2017	21.3%	19.9%	41.8%	41.3%	34.4%	19.0%	22.1%	18.2%	28.0%
2018	22.8%	21.4%	43.8%	43.1%	37.6%	20.2%	26.2%	19.1%	29.9%
2019	24.2%	22.8%	45.6%	44.8%	40.4%	21.3%	29.9%	20.0%	31.5%
2020	25.5%	24.1%	47.2%	46.4%	43.0%	22.3%	33.4%	20.8%	33.1%
Systems installed									
	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
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	22,594	23,156	28,521	10,718	21,823	2,272	1,532	849	111,464
2017	29,021	24,474	38,634	11,851	29,864	2,026	1,686	1,379	138,936
2018	29,246	30,828	33,098	11,033	26,632	2,093	1,533	1,230	135,693
2019	28,294	29,390	31,177	10,701	25,293	1,863	1,439	1,190	129,347
2020	27,325	28,476	29,532	10,281	24,112	1,810	1,366	1,146	124,047

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	22,594	23,156	28,521	10,718	21,823	2,272	1,532	849	111,464
2017	29,021	24,474	38,634	11,851	29,864	2,026	1,686	1,379	138,936
2018	29,246	30,828	33,098	11,033	26,632	2,093	1,533	1,230	135,693
2019	28,294	29,390	31,177	10,701	25,293	1,863	1,439	1,190	129,347
2020	27,325	28,476	29,532	10,281	24,112	1,810	1,366	1,146	124,047
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	5.06	4.64	5.58	5.30	5.04	4.68	5.60	5.51	5.15
2018	5.24	4.80	5.78	5.48	5.21	4.85	5.80	5.70	5.29
2019	5.39	4.94	5.95	5.64	5.37	4.99	5.97	5.87	5.45
2020	5.53	5.07	6.10	5.79	5.50	5.12	6.12	6.02	5.58
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	102.2	98.2	144.4	52.5	99.4	8.9	7.4	4.4	517.5
2017	146.8	113.5	215.7	62.8	150.4	9.5	9.4	7.6	715.7
2018	153.1	148.0	191.3	60.5	138.8	10.1	8.9	7.0	717.7
2019	152.6	145.3	185.6	60.4	135.8	9.3	8.6	7.0	704.6
2020	151.1	144.3	180.2	59.5	132.7	9.3	8.4	6.9	692.3
2016 Avge Zone Rating	1.378	1.191	1.377	1.370	1.374	1.176	1.540	1.372	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	20.5	20.6	17.6	23.2	20.6	20.0
2016	20.7	17.9	20.6	20.5	20.6	17.6	23.1	20.6	20.1
2017	19.3	16.7	19.3	19.2	19.2	16.5	21.6	19.2	18.8
2018	17.9	15.5	17.9	17.8	17.9	15.3	20.0	17.8	17.4
2019	16.5	14.3	16.5	16.4	16.5	14.1	18.5	16.5	16.0
2020	15.4	13.3	15.4	15.3	15.4	13.2	17.3	15.4	15.0
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	2,533	2,031	3,216	986	1,527	130	119	90	10,632
2016	2,114	1,753	2,982	1,079	2,049	158	171	91	10,397
2017	2,833	1,893	4,157	1,203	2,893	156	204	146	13,485
2018	2,744	2,291	3,423	1,077	2,480	155	178	125	12,472
2019	2,524	2,077	3,065	993	2,239	131	159	115	11,303
2020	2,332	1,925	2,778	913	2,042	122	144	106	10,361

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

Residential PV Upgrades

Attachment 5

		2015	2016	2017	2018	2019	2020
Systems							
	ACT	41	71	132	93	117	146
	NSW	2,175	4,454	8,898	5,019	6,274	7,843
	NT	30	36	68	46	58	72
	QLD	4,334	3,871	5,001	3,726	4,658	5,822
	SA	994	946	1,136	626	751	902
	TAS	96	106	113	79	99	124
	VIC	1,399	1,383	1,761	1,350	1,756	2,282
	WA	1,152	1,121	1,558	1,209	1,451	1,741
		10,221	11,989	18,668	12,150	15,163	18,931
kw/System							
	ACT	3.11	5.29	4.38	4.83	4.83	4.83
	NSW	3.39	3.52	3.75	3.64	3.64	3.64
	NT	3.89	3.19	2.62	2.91	2.91	2.91
	QLD	2.95	3.99	4.69	4.34	4.34	4.34
	SA	4.40	4.21	4.60	4.41	4.41	4.41
	TAS	3.83	3.99	4.14	4.07	4.07	4.07
	VIC	3.42	3.48	3.76	3.62	3.62	3.62
	WA	2.20	3.04	3.60	3.32	3.32	3.32
		3.17	3.69	4.05	3.87	3.87	3.87
Installed capacity (kW)							
	ACT	127	377	580	451	564	705
	NSW	7,371	15,686	33,391	18,256	22,820	28,526
	NT	117	115	179	135	168	210
	QLD	12,766	15,455	23,459	16,178	20,223	25,278
	SA	4,371	3,985	5,229	2,760	3,312	3,975
	TAS	368	424	468	322	402	503
	VIC	4,786	4,816	6,619	4,889	6,356	8,263
	WA	2,531	3,406	5,609	4,012	4,814	5,777
		32,437	44,265	75,535	47,003	58,660	73,236
					-37.8%	24.8%	24.8%
Certificates/kW							
	ACT	20.58	20.64	19.24	17.87	16.49	15.12
	NSW	20.81	20.83	19.31	17.93	16.55	15.17
	NT	23.60	23.35	21.69	20.15	18.60	17.05
	QLD	20.59	20.62	19.27	17.89	16.52	15.14
	SA	20.53	20.57	19.24	17.86	16.49	15.12
	TAS	17.64	17.63	16.44	15.27	14.10	12.92
	VIC	17.85	17.95	16.75	15.55	14.36	13.16
	WA	20.51	20.55	19.21	17.84	16.47	15.09
		20.20	20.37	19.05	17.65	16.28	14.92
Valid RECs created							
	ACT	2,623	7,774	11,157	8,064	9,304	10,661
	NSW	153,402	326,770	644,903	327,408	377,778	432,871
	NT	2,754	2,693	3,892	2,712	3,129	3,586
	QLD	262,812	318,748	452,026	289,466	334,000	382,708
	SA	89,712	81,971	100,598	49,307	54,617	60,078
	TAS	6,493	7,480	7,699	4,914	5,670	6,496
	VIC	85,453	86,450	110,863	76,039	91,247	108,736
	WA	51,911	69,995	107,750	71,564	79,270	87,197
		655,160	901,883	1,438,888	829,473	955,015	1,092,334
			37.7%	59.5%	-42.4%	15.1%	14.4%

New Non Residential PV installations

Attachment 5

		2015	2016	2017	2018	2019	2020
Systems							
	ACT	41	71	87	113	142	177
	NSW	2,419	2,171	3,471	4,513	5,641	7,051
	NT	75	168	156	202	253	316
	QLD	1,192	1,791	2,977	3,871	4,838	6,048
	SA	702	821	1,206	1,507	1,809	2,170
	TAS	88	99	141	183	229	286
	VIC	1,540	2,072	2,877	3,884	5,049	6,564
	WA	846	1,185	1,795	2,334	2,917	3,646
		6,903	8,378	12,710	16,607	20,877	26,259
kw/System							
	ACT	34.91	29.01	21.82	25.41	25.41	25.41
	NSW	18.00	20.14	16.93	18.53	18.53	18.53
	NT	41.04	28.70	31.94	30.32	30.32	30.32
	QLD	18.52	19.04	18.58	18.81	18.81	18.81
	SA	18.31	22.57	23.94	23.25	23.25	23.25
	TAS	19.99	24.31	23.28	23.80	23.80	23.80
	VIC	18.80	18.80	21.18	19.99	19.99	19.99
	WA	22.05	20.20	19.56	19.88	19.88	19.88
		19.17	20.12	19.60	19.80	19.79	19.78
Installed capacity (kW)							
	ACT	1,431	2,073	1,900	2,877	3,596	4,495
	NSW	43,533	43,724	58,762	83,639	104,549	130,686
	NT	3,078	4,825	4,974	6,139	7,674	9,592
	QLD	22,072	34,101	55,316	72,814	91,017	113,771
	SA	12,854	18,538	28,859	35,046	42,056	50,467
	TAS	1,759	2,398	3,274	4,351	5,439	6,799
	VIC	28,952	38,954	60,925	77,627	100,915	131,189
	WA	18,653	23,925	35,108	46,386	57,982	72,478
		132,331	168,537	249,119	328,879	413,227	519,477
			27.4%	47.8%	32.0%	25.6%	25.7%
Certificates/kW							
	ACT	20.72	20.71	19.33	17.95	16.57	15.18
	NSW	20.77	20.80	19.39	18.00	16.62	15.23
	NT	23.23	23.22	21.66	20.11	18.57	17.02
	QLD	20.77	20.78	19.40	18.01	16.63	15.24
	SA	20.69	20.60	19.28	17.90	16.53	15.15
	TAS	17.74	17.75	16.57	15.38	14.20	13.02
	VIC	18.18	18.24	16.94	15.73	14.52	13.31
	WA	20.75	20.62	19.32	17.94	16.56	15.18
		20.21	20.18	18.78	17.45	16.10	14.74
Valid RECs created							
	ACT	29,646	42,933	36,719	51,626	59,569	68,256
	NSW	904,251	909,650	1,139,376	1,505,903	1,737,580	1,990,977
	NT	71,494	112,022	107,747	123,480	142,477	163,255
	QLD	458,368	708,716	1,073,089	1,311,627	1,513,416	1,734,123
	SA	265,927	381,935	556,431	627,466	695,039	764,543
	TAS	31,211	42,573	54,247	66,939	77,237	88,501
	VIC	526,343	710,638	1,032,125	1,221,129	1,465,355	1,746,215
	WA	387,026	493,375	678,394	832,286	960,330	1,100,378
		2,674,266	3,401,842	4,678,127	5,740,457	6,651,004	7,656,248
			27.2%	37.5%	22.7%	15.9%	15.1%

Non Residential Upgrade PV installations

Attachment 5

		2015	2016	2017	2018	2019	2020
Systems							
	ACT	8	9	4	4	4	5
	NSW	207	285	245	102	123	147
	NT	8	12	5	3	4	5
	QLD	181	257	226	84	101	121
	SA	96	125	75	27	31	36
	TAS	6	11	10	0	0	0
	VIC	137	163	175	99	128	167
	WA	66	86	81	34	40	48
		709	949	820	352	431	528
kw/System							
	ACT	23.20	13.83	17.16	15.49	15.49	15.49
	NSW	13.69	18.66	29.61	24.14	24.14	24.14
	NT	42.91	32.09	42.51	37.30	37.30	37.30
	QLD	11.66	21.77	26.24	24.00	24.00	24.00
	SA	15.20	21.85	31.22	26.53	26.53	26.53
	TAS	6.32	8.03	30.26	19.15	19.15	19.15
	VIC	15.26	17.12	29.88	23.50	23.50	23.50
	WA	13.47	16.60	37.92	27.26	27.26	27.26
		14.04	19.47	29.74	24.44	24.41	24.38
Installed capacity (kW)							
	ACT	186	125	69	56	67	81
	NSW	2,835	5,314	7,247	2,465	2,958	3,549
	NT	343	386	213	121	145	174
	QLD	2,110	5,588	5,920	2,011	2,413	2,895
	SA	1,459	2,739	2,348	714	821	944
	TAS	38	89	304	3	4	5
	VIC	2,091	2,799	5,215	2,316	3,011	3,914
	WA	889	1,432	3,081	916	1,099	1,318
		9,952	18,471	24,396	8,601	10,517	12,880
			85.6%	32.1%	-64.7%	22.3%	22.5%
Certificates/kW							
	ACT	20.71	20.70	19.30	17.92	16.54	15.16
	NSW	20.84	20.79	19.50	18.10	16.71	15.32
	NT	23.45	23.82	21.74	20.18	18.63	17.08
	QLD	20.73	20.77	19.44	18.05	16.67	15.28
	SA	20.66	20.61	19.38	18.00	16.61	15.23
	TAS	17.71	17.72	16.56	15.38	14.20	13.01
	VIC	17.96	18.55	16.96	15.75	14.54	13.33
	WA	20.83	20.69	19.32	17.94	16.56	15.18
		20.26	20.46	18.89	17.46	16.08	14.71
Valid RECs created							
	ACT	3,844	2,583	1,328	1,008	1,116	1,228
	NSW	59,064	110,491	141,293	44,622	49,427	54,370
	NT	8,050	9,199	4,634	2,434	2,696	2,965
	QLD	43,749	116,084	115,106	36,301	40,210	44,232
	SA	30,159	56,441	45,512	12,845	13,635	14,374
	TAS	671	1,570	5,026	49	54	60
	VIC	37,558	51,909	88,457	36,483	43,779	52,171
	WA	18,523	29,623	59,521	16,426	18,195	20,015
		201,618	377,900	460,877	150,167	169,114	189,413
			87.4%	22.0%	-67.4%	12.6%	12.0%

SWH Systems - New Buildings

Attachment 7

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
SWH systems installed														
ACT	39	113	507	236	422	432	190	135	266	376	124	135	116	121
NSW	3,276	3,675	3,361	5,098	4,522	2,579	2,646	2,946	3,076	3,442	3,201	3,853	3,535	2,855
NT	548	410	346	436	522	653	578	525	655	585	463	366	308	332
QLD	10,414	12,631	10,652	10,497	9,359	9,042	6,529	5,219	4,419	4,907	5,844	6,166	5,436	5,102
SA	903	1,023	1,126	1,669	1,677	1,060	765	801	546	555	385	435	414	433
TAS	113	172	177	266	192	137	83	111	208	279	237	188	188	208
VIC	7,480	12,449	17,124	20,119	20,559	17,726	16,873	18,058	20,490	21,552	20,217	19,751	17,452	14,708
WA	4,535	3,606	4,123	5,728	5,077	4,710	4,652	4,000	3,603	2,553	2,115	1,653	1,555	1,708
Total	27,308	34,079	37,416	44,049	42,330	36,339	32,316	31,795	33,263	34,249	32,584	32,547	29,005	25,467
SWH certificates created														
ACT	1,111	3,641	18,125	7,501	13,138	12,503	6,071	4,684	9,304	12,593	6,714	4,519	3,894	4,061
NSW	100,171	130,824	131,981	172,125	145,841	83,654	87,769	97,782	98,380	110,125	101,289	122,613	112,485	90,847
NT	16,672	13,851	10,468	13,429	13,929	18,070	15,734	15,266	19,750	17,586	14,543	11,243	9,480	10,196
QLD	330,947	418,149	374,016	339,788	275,585	259,317	198,795	171,276	145,694	152,572	189,941	196,054	172,855	162,241
SA	28,075	36,438	38,281	54,845	51,074	29,642	22,678	25,088	17,466	17,155	12,332	13,694	13,023	13,641
TAS	3,301	8,056	11,377	8,115	4,994	3,889	2,401	3,429	6,115	8,387	7,026	5,626	5,609	6,206
VIC	184,040	325,693	457,839	533,397	531,095	434,730	461,636	511,680	589,200	629,199	629,063	595,588	526,276	443,525
WA	150,930	121,986	142,995	188,152	162,535	144,164	143,109	131,865	126,916	91,622	75,850	59,306	55,815	61,281
Total	815,247	1,058,638	1,185,082	1,317,352	1,198,191	985,969	938,193	961,070	1,012,825	1,039,239	1,036,759	1,008,642	899,438	791,998
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	54.2	33.5	33.5	33.5
NSW	30.6	35.6	39.3	33.8	32.3	32.4	33.2	33.2	32.0	32.0	31.6	31.8	31.8	31.8
NT	30.4	33.8	30.3	30.8	26.7	27.7	27.2	29.1	30.2	30.0	31.4	30.7	30.7	30.7
QLD	31.8	33.1	35.1	32.4	29.4	28.7	30.4	32.8	33.0	31.1	32.5	31.8	31.8	31.8
SA	31.1	35.6	34.0	32.9	30.5	28.0	29.6	31.3	32.0	30.9	32.0	31.5	31.5	31.5
TAS	29.2	46.8	64.3	30.5	26.0	28.4	28.9	30.9	29.4	30.0	29.7	29.9	29.9	29.9
VIC	24.6	26.2	26.7	26.5	25.8	24.5	27.4	28.3	28.8	29.2	31.1	30.2	30.2	30.2
WA	33.3	33.8	34.7	32.8	32.0	30.6	30.8	33.0	35.2	35.9	35.9	35.9	35.9	35.9
Total	29.9	31.1	31.7	29.9	28.3	27.1	29.0	30.2	30.4	30.3	31.8	31.0	31.0	31.1

SWH Systems - Replacement Market

Attachment 8

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
SWH systems installed														
ACT	414	888	1,467	724	616	302	263	316	306	304	294	301	309	317
NSW	5,489	16,528	82,095	33,427	20,809	8,231	6,499	6,695	5,536	5,172	4,963	5,087	5,214	5,344
NT	866	826	1,385	867	745	518	306	501	408	340	425	435	446	457
QLD	6,416	10,699	26,007	23,765	21,578	9,931	6,881	8,214	7,386	6,578	6,704	6,872	7,044	7,220
SA	1,966	4,080	7,668	5,143	3,767	2,413	2,218	1,129	2,011	1,738	2,082	2,134	2,187	2,242
TAS	237	734	2,092	1,167	1,533	762	744	851	595	674	692	709	727	745
VIC	1,677	8,759	24,996	7,614	5,887	3,868	2,735	2,555	2,597	6,238	6,139	6,599	7,094	7,626
WA	6,604	8,792	11,569	10,337	7,785	7,102	6,337	6,672	6,602	6,936	7,108	7,286	7,468	7,655
Total	23,669	51,306	157,279	83,044	62,720	33,127	25,983	26,933	25,441	27,980	28,406	29,423	30,489	31,606
SWH certificates created														
ACT	12,141	28,397	50,169	22,897	19,099	9,354	8,345	10,163	10,135	9,572	10,479	10,741	10,366	10,625
NSW	170,768	713,696	3,021,137	1,167,325	662,471	262,431	210,361	212,620	173,598	159,040	161,606	165,646	165,055	169,181
NT	26,915	26,505	65,827	31,740	20,807	14,673	8,781	13,514	11,362	9,746	12,935	13,258	13,183	13,512
QLD	191,928	346,445	1,045,900	793,279	666,758	309,804	217,464	256,632	231,221	204,644	213,545	218,884	221,747	227,291
SA	60,666	133,496	321,816	170,271	109,047	68,624	64,718	34,607	59,195	51,558	63,728	65,321	65,917	67,565
TAS	6,653	58,209	143,895	61,940	40,289	22,502	23,303	25,070	18,256	20,551	22,360	22,919	22,835	23,405
VIC	47,899	578,923	1,652,280	398,889	184,229	118,345	85,835	79,966	83,416	189,835	187,956	192,654	216,553	232,794
WA	184,539	287,502	385,193	310,613	220,545	198,832	185,532	194,235	196,657	205,313	222,397	227,957	227,353	233,037
Total	701,509	2,173,173	6,686,217	2,956,954	1,923,245	1,004,565	804,339	826,807	783,840	850,259	895,005	917,380	943,008	977,411
Certificates per SWH System														
ACT	29.3	32.0	34.2	31.6	31.0	31.0	31.7	32.2	33.1	31.5	35.6	35.6	33.6	33.6
NSW	31.1	43.2	36.8	34.9	31.8	31.9	32.4	31.8	31.4	30.7	32.6	32.6	31.7	31.7
NT	31.1	32.1	47.5	36.6	27.9	28.3	28.7	27.0	27.8	28.6	30.5	30.5	29.5	29.5
QLD	29.9	32.4	40.2	33.4	30.9	31.2	31.6	31.2	31.3	31.1	31.9	31.9	31.5	31.5
SA	30.9	32.7	42.0	33.1	28.9	28.4	29.2	30.7	29.4	29.7	30.6	30.6	30.1	30.1
TAS	28.1	79.3	68.8	53.1	26.3	29.5	31.3	29.5	30.7	30.5	32.3	32.3	31.4	31.4
VIC	28.6	66.1	66.1	52.4	31.3	30.6	31.4	31.3	32.1	30.4	30.6	29.2	30.5	30.5
WA	27.9	32.7	33.3	30.0	28.3	28.0	29.3	29.1	29.8	29.6	31.3	31.3	30.4	30.4
Total	29.6	42.4	42.5	35.6	30.7	30.3	31.0	30.7	30.8	30.4	31.5	31.2	30.9	30.9