



Green Energy
Markets

Small-scale technology certificates Data modelling for 2016 to 2018

Report to the Clean Energy Regulator

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Table of Contents

Executive Summary	5
1. Project Scope	8
2. Methodology and Assumptions	9
3. STC Market Overview	11
4. Solar PV - Market Review	12
5. Solar Water Heater - Market Review	16
6. Solar PV Projections – New Residential	18
7. Solar PV Projections – Non-residential (Commercial)	24
8. Solar PV Projections – Upgrades	28
9. SWH and Air Sourced Heat Pump Projections	29
10. Other small generating units	34
11. Resources	35

Attachments

Attachment 1.	Summary of Results
Attachment 2.	Financial Attractiveness for Residential PV Market
Attachment 3.	Residential PV Systems by State
Attachment 4.	Certificate Creation for Residential PV Market
Attachment 5.	Non-residential PV Installations
Attachment 6.	PV System Upgrades
Attachment 7.	SWH Systems – New Buildings
Attachment 8.	SWH Systems – Replacement Market
Attachment 9.	Solar PV by Segment
Attachment 10.	SWH by Segment
Attachment 11.	Delay in Creation of Certificates

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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 2016 calendar year, and for the 2017 and 2018 calendar years.

Projections have been developed on the basis that current policy settings remain in place. We have assumed that no changes are made to the Small-scale Renewable Energy Scheme (SRES). Specifically, we have assumed that 15 years of output is deemed for solar photovoltaic (PV) systems up to and including 100 kW for the period 2015 to 2016. For systems to be installed in 2017 we have assumed that 14 years of output is deemed and for systems installed in 2018 we have assumed 13 years of deeming. We have assumed that a net STC price of \$38.50 applies (after creation and administration costs) for the 2016 to 2018 period.

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. Our forward estimates exclude solar PV systems above 100 kW in size which will be registered as power stations and not eligible to create STCs.

In determining the level of STCs to be created we have initially forecast the likely level 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 segmented the solar market into the following sub-markets in order to more accurately forecast the level of installations:

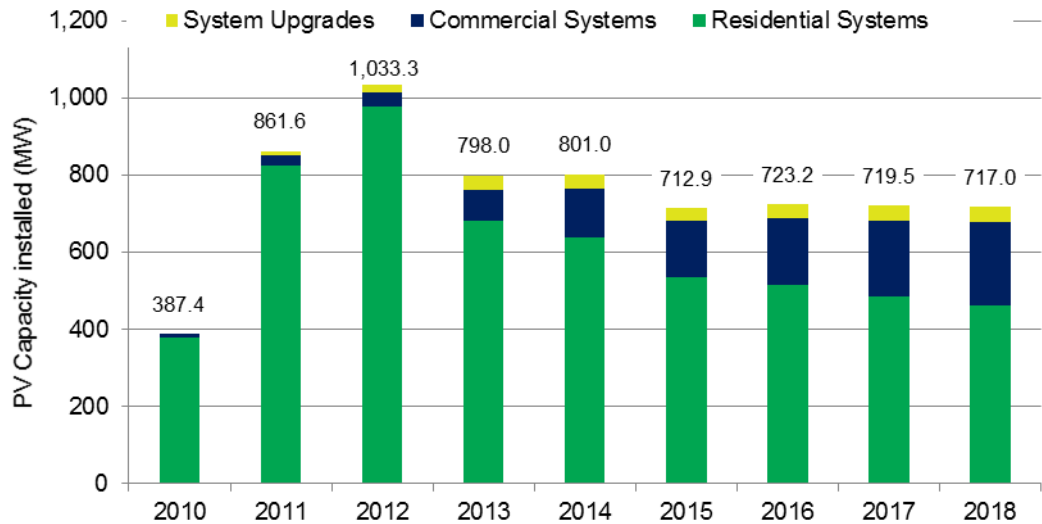
- SGU PV – Residential market
- SGU PV – Non-residential (commercial market)
- SGU PV – Upgrade market
- SWH – New building market
- SWH - Replacement or existing dwelling market

In assessing the solar market to date the following considerations are worth noting:

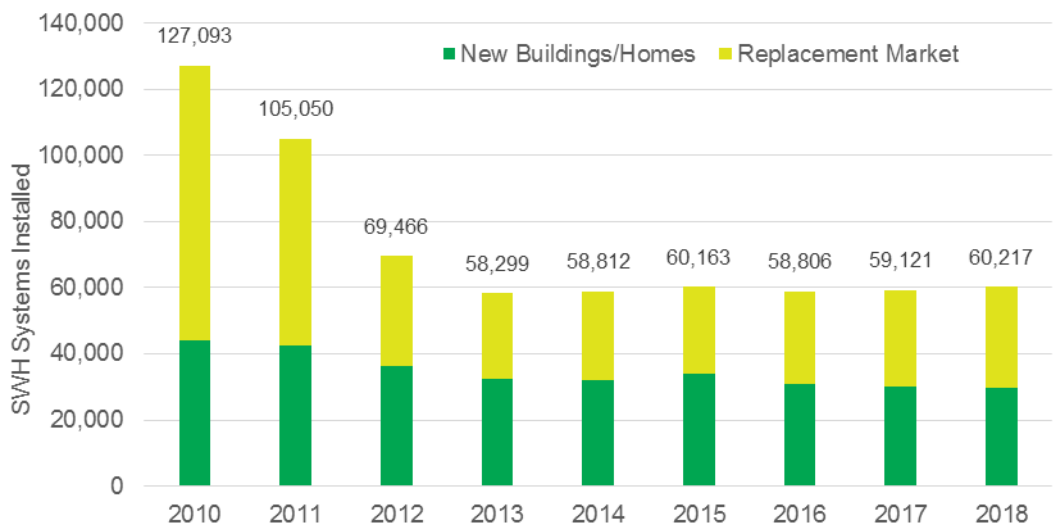
- The number of new residential PV installations continues to fall with 2015 installations being 21 per cent lower than 2014 levels and 64 per cent lower than the peak reached in 2011;
- The average system size for new residential installations has increased to 4.21 kW per system in 2015 and now seems to have plateaued;
- The number of commercial size PV system installations (greater than 10 kW) has continued to increase and accounted for 20 per cent of installed PV capacity in 2015;
- The STC price has been extremely stable over the last few years and has traded at very close to the Clearing House Price of \$40. The Clearing House went into deficit for the first time in April 2015 and remained in deficit for most of the year;
- The number of SWH systems installed in new homes that have created STCs continues to remain reasonably stable, generally following the level of new home installations; and
- The number of SWH systems installed in the replacement market appears to have bottomed in 2014 after falling for a number of years.

Solar PV is expected to continue to dominate STC creation accounting for 89 per cent of certificate creation for systems installed in 2015. Installed solar PV capacity claiming STCs is expected to fall by 11.0 per cent in 2015 to 713 MW. This is 31 per cent lower than the peak reached in 2012 of 1,033 MW.

We expect that 723 MW of PV will be installed in 2016, slightly higher than 2015 levels. Installations are projected to reduce modestly in 2017 and 2018. We expect that the residential PV market will continue to decline, however the loss in residential capacity is expected to be substantially made up by the growing commercial market (refer to chart below).



The SWH market is expected to be fairly flat with 2016 installations falling slightly in 2016 due to reduced level of systems in new homes. We expect a modest increase in SWH installations in 2017 and 2018 due largely by increases in the replacement market.



In STC creation terms we expect that 16.2 million STCs will be submitted for registration in 2015 a reduction of 9.1 per cent from 2014 levels. We expect that 16.3 million STCs will be submitted for registration in 2016 and we expect this to reduce to 15.3 million in 2017 and to 14.3 million in 2018. The fall in creation in 2017 and 2018 is primarily due to the reduction in the deeming period for solar PV.

Year of Creation	2014	2015	2016	2017	2018
STCs for systems installed in the year					
Solar PV	16,002	14,297	14,508	13,474	12,431
SWH	1,788	1,769	1,760	1,770	1,804
Total	17,790	16,066	16,268	15,244	14,235
Less STCs submitted the following year (lag)	1,539	1,420	1,435	1,358	1,284
Add Previous year installs created this year	1,545	1,539	1,420	1,435	1,358
STCs submitted for creation	17,797	16,185	16,254	15,321	14,309

The key uncertainties in developing the estimates have centred on:

- The likely level of contraction in the residential solar PV market as high levels of saturation are reached and as network charges change to reduce the avoidable component of electricity prices; and
- The level of growth in the commercial PV market.

We have undertaken a sensitivity analysis and have developed a lower-bound estimate for 2016 of 15.6 million and an upper-bound estimated of 17.1 million.

Sensitivity Analysis

'000 STCs Submitted for Creation	2014	2015	2016	2017	2018
Total Certificates - Base Case	17,797	16,185	16,254	15,321	14,309
Total Certificates - High Case	17,797	16,185	17,122	16,148	15,087
Total Certificates - Low Case	17,797	16,185	15,562	14,682	13,719

1. Project Scope

The Clean Energy Regulator (CER) has engaged Green Energy Markets Pty Ltd (GEM) to provide a forward estimate of the Small-scale technology certificates (STCs) likely to be created during the 2016 calendar year, and for the 2017 and 2018 calendar years.

Based on its in-depth knowledge of the renewable energy industry and using all the factors that impact the uptake of solar water heaters (SWH), small scale PV, wind and hydro-electricity systems, GEM is to provide a range of qualified projections. These projections will reflect the likely creation of STCs from eligible installations for the calendar year 1 January 2016 to 31 December 2016, and the following two calendar years 2017 and 2018.

Data input into the model to estimate the number of STCs should include (but not be 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.
- State and Commonwealth incentive schemes and any expected changes to these schemes over the timeframe, ie impact of potential change to State policies around Feed in Tariffs.
- Relevant historical legislative changes to the eligibility rules and criteria for SWH and SGUs.
- Existing, and potential changes to, building codes and regulations including energy efficiency measures which impact the uptake of various technologies (particularly relating to hot water systems)
- 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 innovation i.e. due to CEFC loans.
- Repeal of carbon price, changes to electricity prices, network regulatory reform.
- STC price modelling
- Impact of price of STCs on creation rates to the extent to which they are applicable to the modelling; and
- Any other relevant factor

Out of Scope of this consultancy:

- Certificates remaining in the Registry from the previous compliance period (stock of certificates);
- Overhang of STCs from 2015; and
- Large Generation Certificates as defined by the amended legislation.

2. Methodology and Assumptions

GEM has 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 over the 2016 to 2018 period. 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 level 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.

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, 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 three segments, with each treated differently due to different drivers and attributes:

Expansions or system upgrades (systems designated as not being the first system installed at that address from 1 January 2011);

Commercial (or non-residential) systems, defined as those systems with a capacity of greater than 10 kW; and

New residential systems (representing all other systems).

Modelling 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;
- 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 upgrades, expansions and replacements of 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 this segment to determine its relative size and importance.

Modelling non-residential (commercial) PV systems

The number of commercial 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 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 will not be 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 Survey

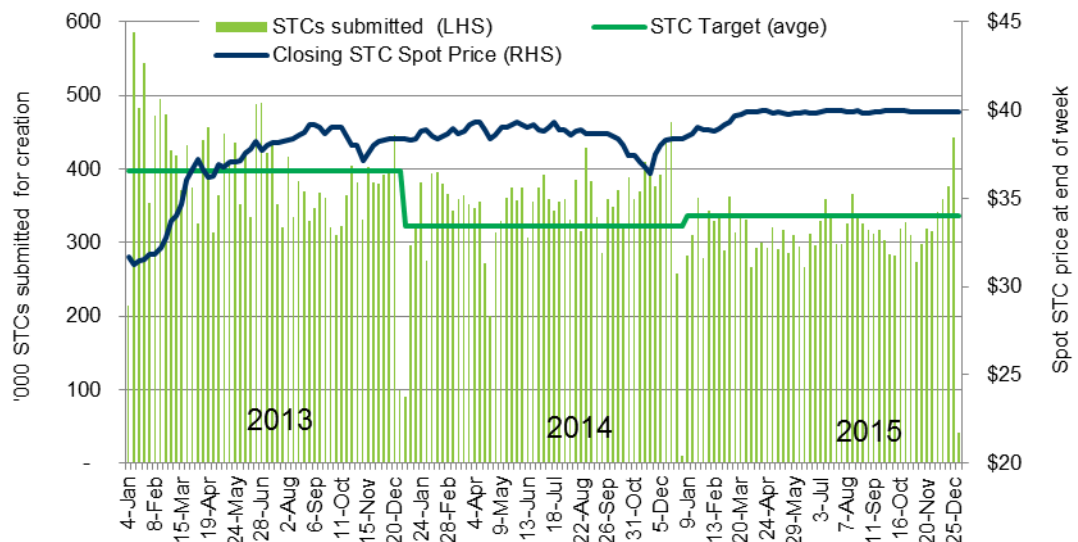
As part of the data modelling exercise we interviewed a number of market participants for their views of the solar PV and SWH market over the coming three years. The views of these businesses assisted in the development and refinement of our assumptions.

3. STC Market Overview

STC market

The level of STC creation over the 2013 to 2015 period has been reasonably stable after several years of considerable volatility. STC creation has been consistently below average target levels in 2015 (Figure 3.1). The spot STC price has been fairly stable for most of 2015 sitting at levels just below the \$40 Clearing House price.

Figure 3.1 STC spot price and weekly STCs submitted for registration



The average STC spot price for 2013 was \$36.76, \$38.56 for 2014 and \$39.72 in 2015. For the purposes of our analysis we have assumed that the average STC price for 2016 is \$39.50 which equates to a net cost after creation and administration costs of \$38.50 and remains at this level for 2016 and 2017.

Delay in creation of certificates

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 2016 the number of certificates created from the installation of solar systems in 2015.

We have analysed the time it takes to create STCs for each of the market sectors assessed (refer to Attachment 11). For solar PV systems installed in 2014, 92.9 per cent of STCs were created in 2014 and 7.1 per cent were created in 2015. For SWH systems installed in 2014, 15.3 per cent of STCs were created in 2015. We have assumed that similar profiles apply to solar PV and SWH systems installed in 2015 and beyond.

4. Solar PV - Market Review

The Australian solar PV market has evolved considerably since 2008 when the market amounted to only 20 MW of installations. The Australian market, unlike many international markets is predominantly a residential market with relatively few large installations, though this has started to change in 2015 when several utility scale solar PV installations commenced operation.

The solar PV market grew to a peak of more than 360,000 installations in 2011 supported by attractive state-based feed in tariffs and the Solar Credit Multiplier (refer to Figure 4.1). As these support mechanisms were progressively unwound the number of installations dropped dramatically reaching 180,500 in 2014 and falling further in 2015 to an expected 143,900.

By the end of November 2015 a total of 1.49 million solar PV systems had been installed and claimed certificates accounting for an installed capacity of nearly 4,600 MW.

Figure 4.1 Number of Solar PV installations claiming Certificates by Segment

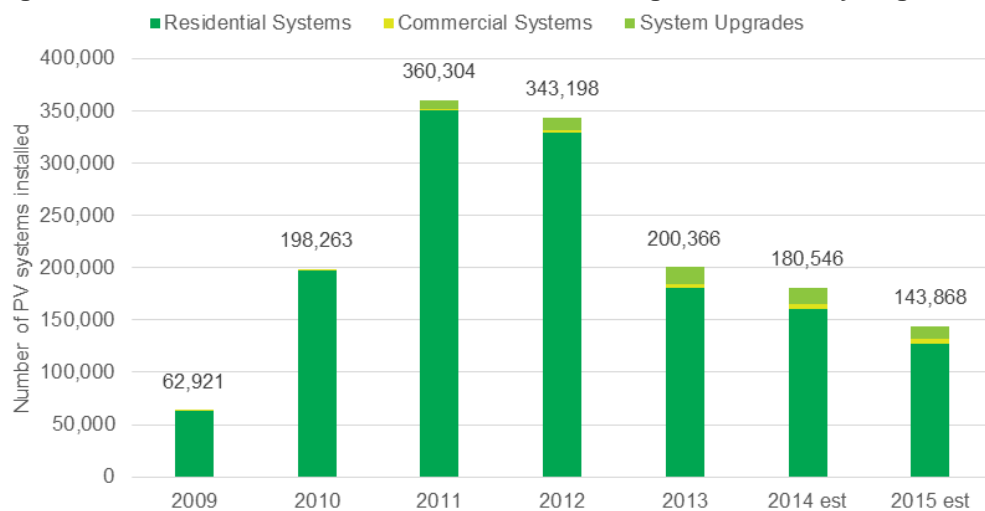
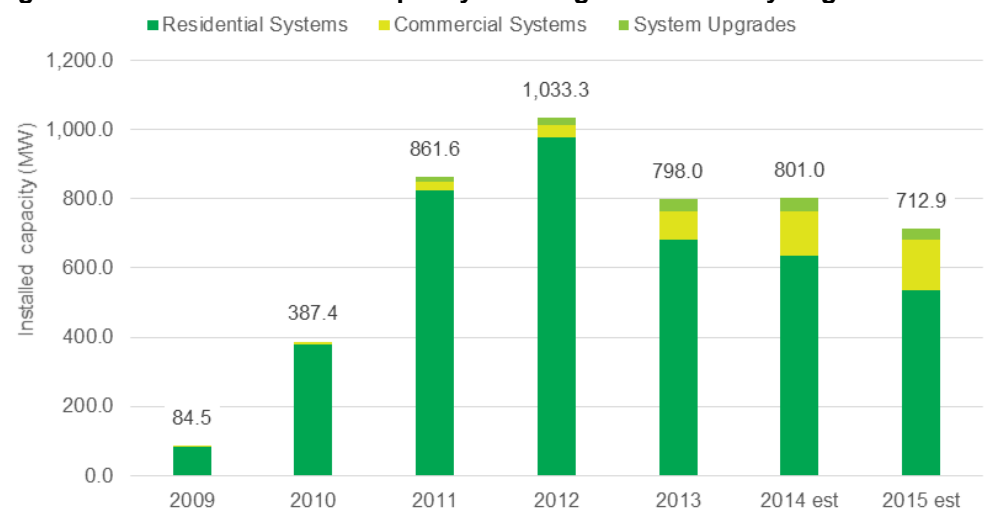


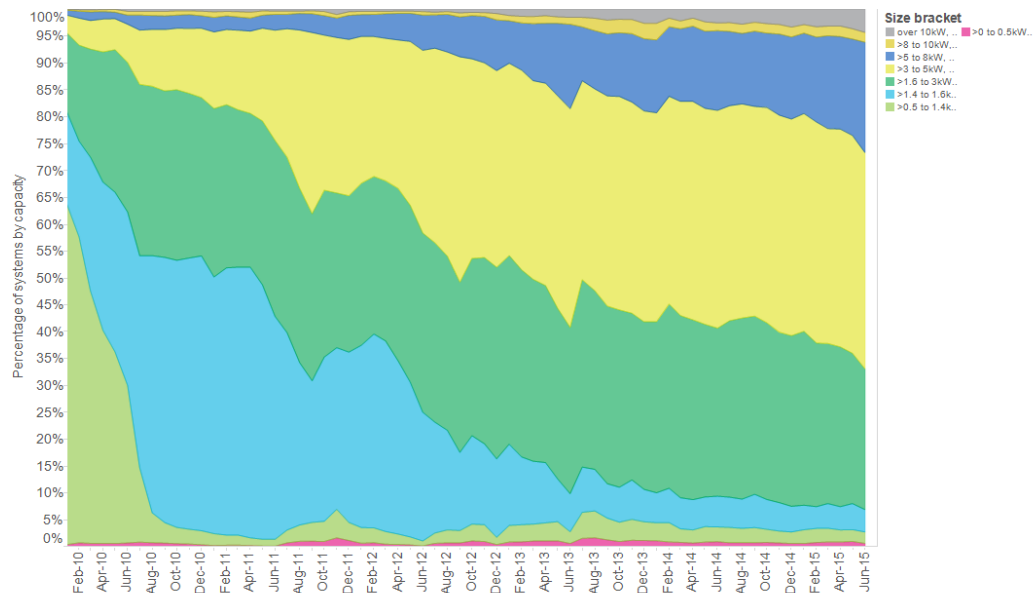
Figure 4.2 Solar PV installed capacity claiming Certificates by Segment



The number of non-residential systems (those that are greater than 10 kW) has increased steadily over the last three years and is expected to reach 146 MW in 2015 and accounts for 20 per cent of capacity installed for the year (Figure 4.2).

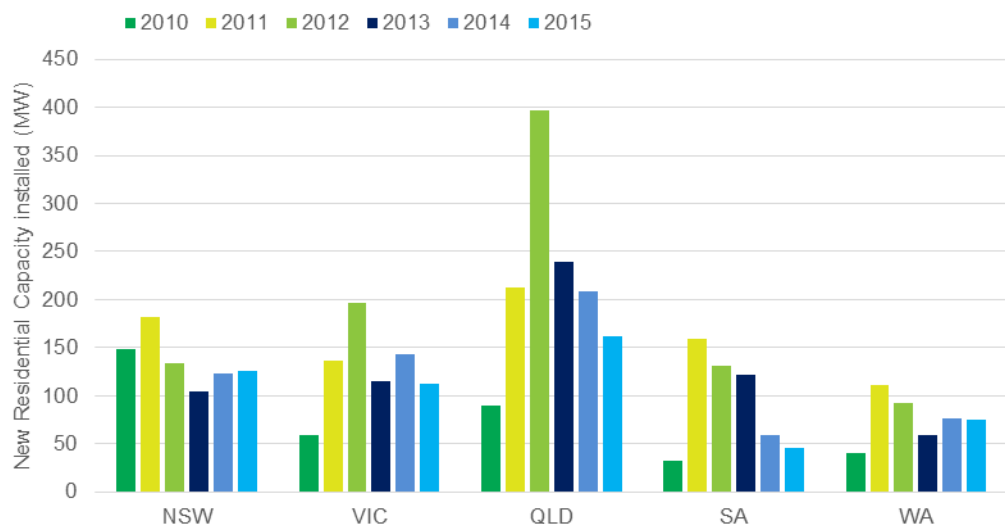
The size of PV systems installed has increased considerably since 2009 as the level of policy support has changed (Figure 4.3).

Figure 4.3 Relative size (kW) of system installations (Australia as a whole)



We have analysed the market by bands of system sizes which clearly shows the trend to much bigger systems. The PV market prior to 2011 was dominated by the availability of the maximum rebate of \$8,000 for 1 kW systems, and the Solar Credits Multiplier cut out after 1.5 kW which resulted in smaller systems being installed.

Figure 4.4 PV system installations (MW) for NSW, Qld, SA, Vic and WA



Queensland continues to remain the largest state market for residential PV in Australia (Figure 4.4). Queensland and South Australia were the last key states to wind back their feed in tariffs and as a result have experienced the largest reductions in installed capacity over the last three years. These states have also achieved installation levels in excess of 38 per cent in the residential market (refer to Section 6). The level of

residential capacity installed in the other key states has largely stabilised over the last three years.

Forecasting Installed PV costs

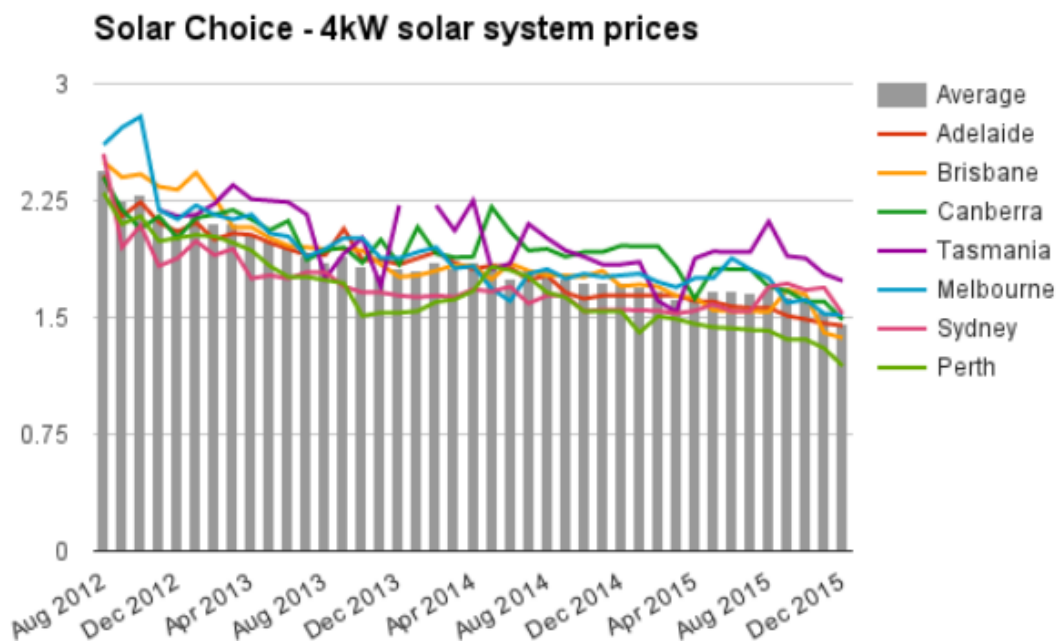
Installed system costs continued to fall through 2015 with continued reduction in hardware costs as well as more intense competition in the local market as the number of installations continued to fall.

With rising saturation levels in the residential market, securing leads and closing sales continues to be difficult and time consuming. The additional time and cost to arrange connection to local distribution networks is also putting additional pressure on margins.

Whilst Australian PV module and balance of system pricing generally follows international trends, there are some differentiating factors that impact on pricing levels in Australia. Unlike most international PV markets, the Australian market has been a predominantly residential market (accounting for more than 80 per cent of installed capacity). As such it has relatively low barriers to entry and has been attractive to international suppliers that may seek to test new products, clear old models or sell Tier 2 or Tier 3 products. This has enabled Australia to achieve attractively low prices for product.

Solar Choice publishes average installed system prices (Figure 4.5) which incorporates the value of STCs and so reflects the net cost to the customer. The Solar Choice analysis shows that net system prices continued to drift lower during 2015. 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 what the broader market is experiencing.

Figure 4.5 Installed system Costs (after STCs) for 4kW system (\$/Watt) (Solar Choice, 17 December 2015)



The factors that will influence system pricing over the next three years continue to be dominated by:

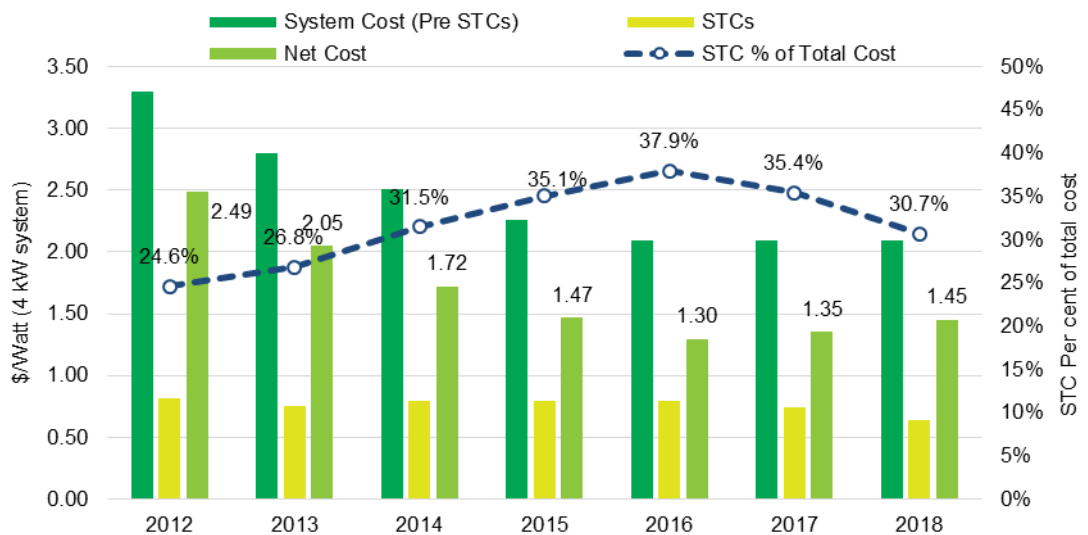
Changes to the AUD/USD exchange rate;

- The continued growth in commercial and project sales will continue to favour more bankable Tier 1 brands and thus, may potentially increase average prices;
- Global supply and demand factors; and
- Continued local consolidation across the supply chain as lower volumes increases pressure on margin requirements and thus could lead to higher average prices.

We estimate that the average installed system cost (pre STCs) in 2015 is \$2.26 per Watt. We expect that the exchange will deteriorate slightly over the forecast period (in line with interest rate differentials) however this will be compensated by lower costs through the PV chain. We expect that the installed cost (pre STCs) in 2016 will drop to \$2.09 per Watt in 2016 and then remain at this level in nominal terms for 2017 and 2018 (Figure 4.6). In real terms installed system costs are expected to reduce slightly.

STCs will play an important role in making solar PV attractive to customers in 2016 and is expected to account for 38 per cent of total system cost compared to 25 per cent in 2012.

Figure 4.6 Forecast Installed system costs for 4 kW system (\$/Watt)



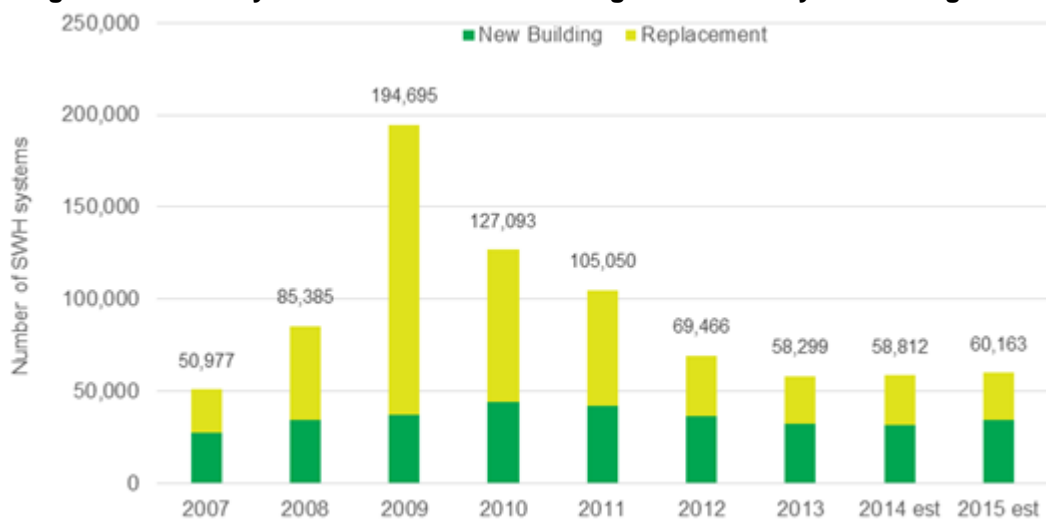
5. Solar Water Heater - Market Review

The Solar Water Heater (SWH) market in Australia has stabilised over the last three years with around 60,000 SWH systems being installed that have claimed certificates. This is less than one-third the peak of 195,000 systems creating certificates in 2009.

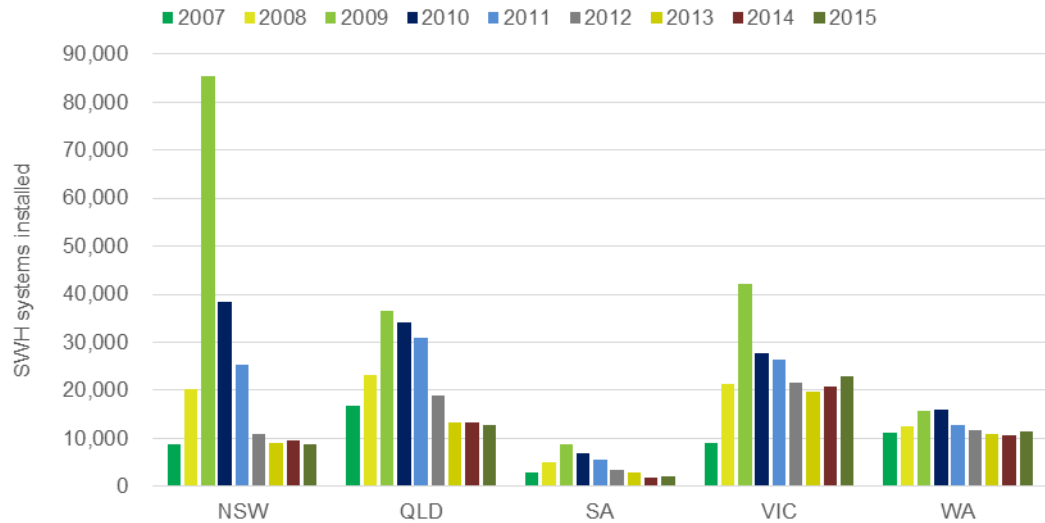
It is important to recognise that not all SWH systems installed create certificates. Industry estimates place the level of non-creation at between 10 to 15 per cent of total systems installed, predominantly related to the new building market.

The SWH market can usefully be segmented into the new building and replacement markets (Figure 5.1). 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 5.1 SWH Systems installed and creating certificates by market segment

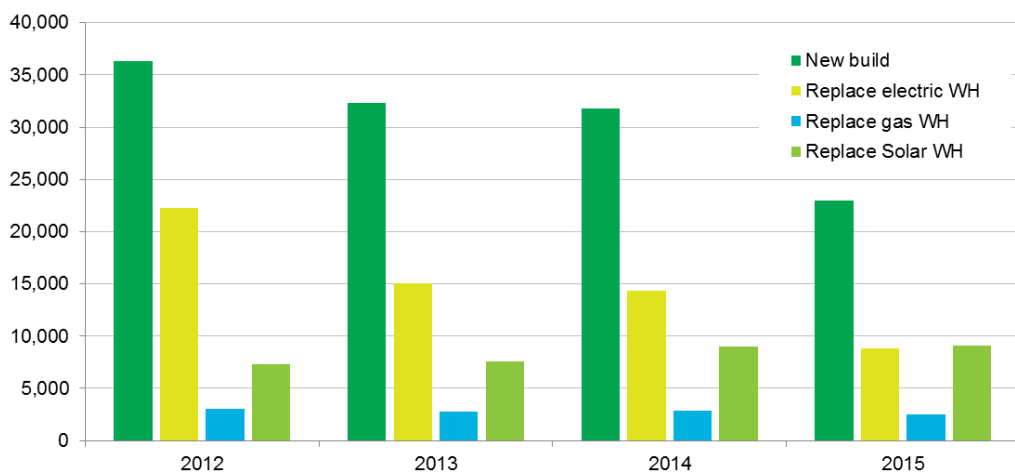


Installations of SHW systems have reduced across all states and territories. The most marked reduction in system installation rates comes from those states with relatively low access to gas and high proportions of electric water heaters (i.e. NSW and Queensland). Commonwealth and state support programs had created significant incentives for residents in these states to replace their electric water heaters. This created significant growth in the replacement market over the 2009-11 period (Figure 5.2). The removal of rebates has had a dramatic impact on the level of SWH systems installed in NSW and Queensland, and to a lesser extent Victoria.

Figure 5.2 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 and strong growth in new homes due to building regulations.

The replacement market can be further segmented into the type of system it is replacing (refer to Figure 5.3). The electric water heater replacement market has dropped markedly over the last few years. Whilst a lot smaller, the market to replace solar water heaters has been reasonably stable and we can expect this sector to grow over time as existing solar water heaters need to be replaced.

Figure 5.3 SWH system installations creating certificates by type replacing

6. Solar PV Projections – New Residential

The new residential PV market is the key segment in Australia and has accounted for 95 per cent of PV capacity installed in 2011 and 2012. The residential sector has historically been specifically targeted through the Solar Credits Multiplier and through state feed-in tariffs. As these policy support measures have been unwound the new residential market share fell to 79 per cent of installed capacity in 2014 and 75 per cent in 2015.

Systems are generally sold into this market on the basis of financial attractiveness ie. payback. Our projections for the residential sector 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. This slightly understates the real payback as electricity prices are generally expected to rise over the forecast period.

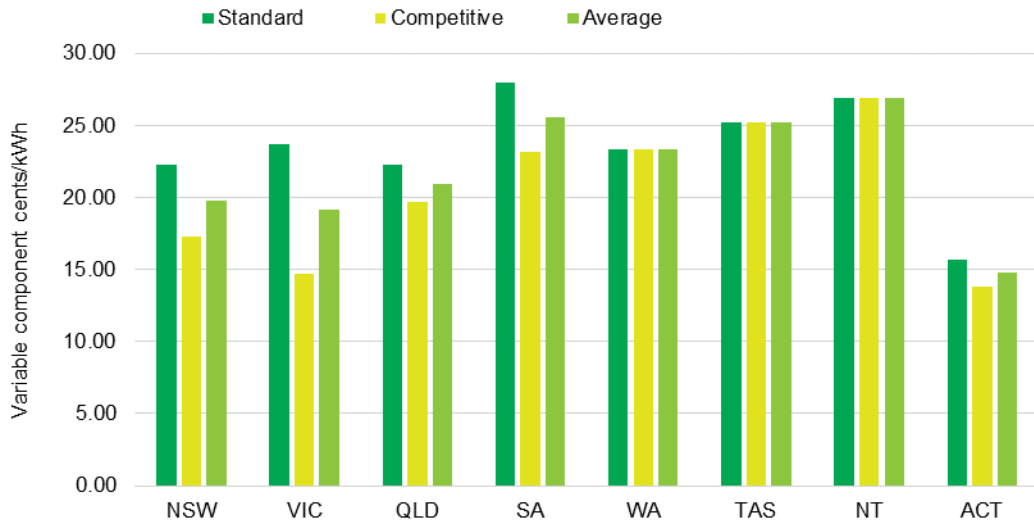
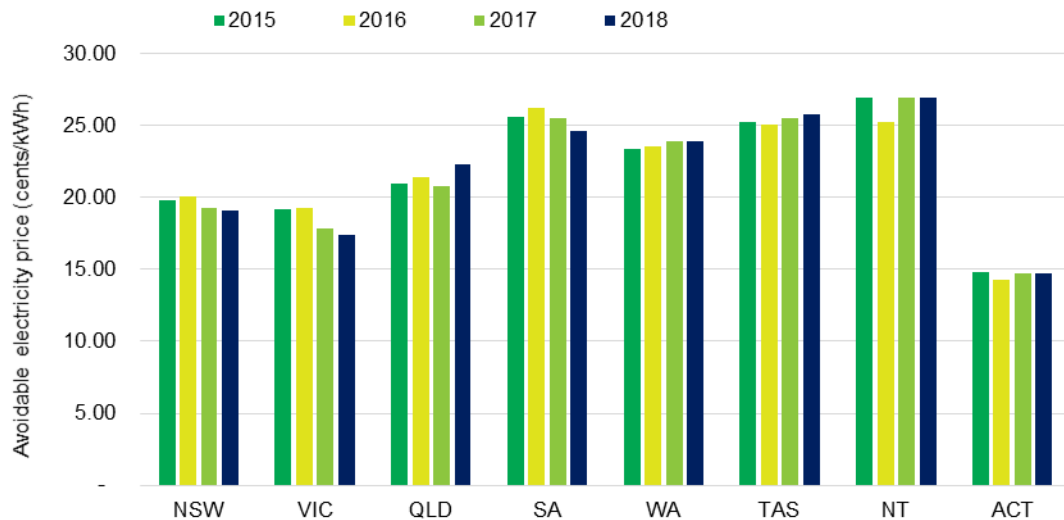
Explicit assumptions used in the model include:

- STC price of \$38.50 (after creation and administration costs) from 2016-2018;
- Export price received reflecting AEMC projections, generally assumed to be 5 cents/kWh in 2015 and increasing in line with changes to competitive market costs;
- Average system size of 4 kW;
- Electricity exports of 50 per cent of electricity generated;
- The structure of retail electricity prices to progressively become less avoidable by solar PV, and represented in the modelling by including only the variable (cents per kWh) component; and
- Total installed cost of solar PV of \$2.09 per Watt in 2016 and remain at this level in nominal terms for 2017 and 2018.

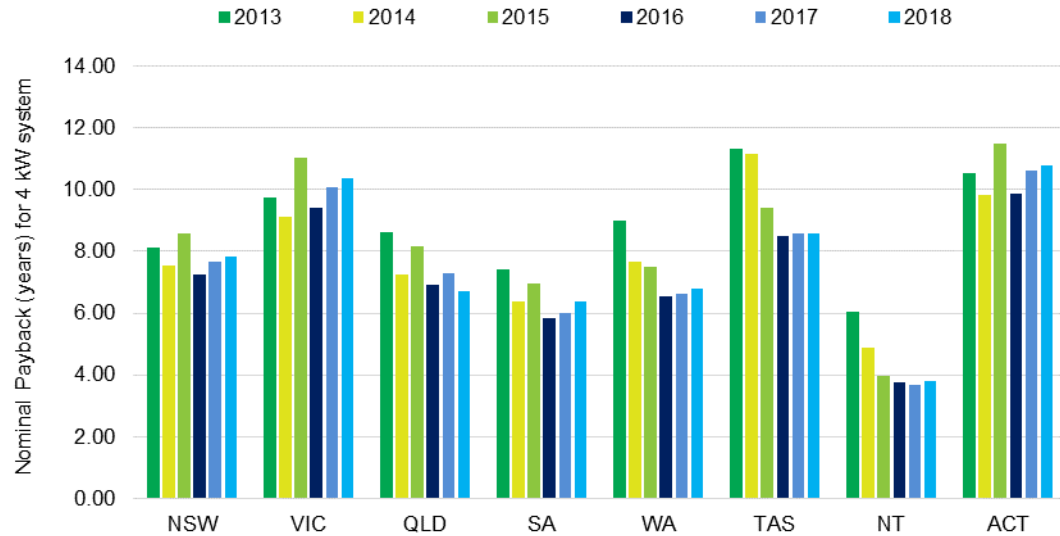
The installed cost and the contribution that STCs make is shown graphically in Figure 4.6 and Attachment 2.

Our electricity price projections have been based on the Australian Energy Market Commission (AEMC) 2015 Residential Electricity Price Trends (December 2015). Our variable pricing assumption (that can be avoided with solar PV) for 2015 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 (refer to Figure 6.1).

For 2015 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 (refer to Figure 6.2).

Figure 6.1 Avoidable electricity prices by state in 2015**Figure 6.2 Avoidable electricity price (variable cents per kWh component)**

Average system payback across all states is expected to reduce slightly in 2016 due largely to a drop in average installed PV costs (Figure 6.3). Paybacks are then expected to generally increase in 2017 and 2018 due to a lower value for generated electricity as fixed electricity charges rise and variable charges reduce.

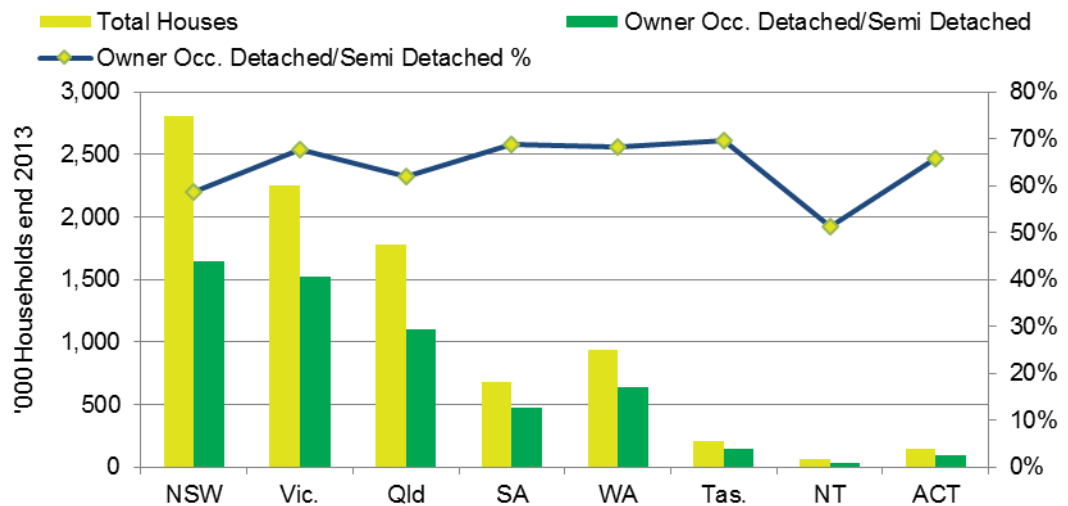
Figure 6.3 Simple Payback for residential PV system (4 kW)

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 expenditure for a system.

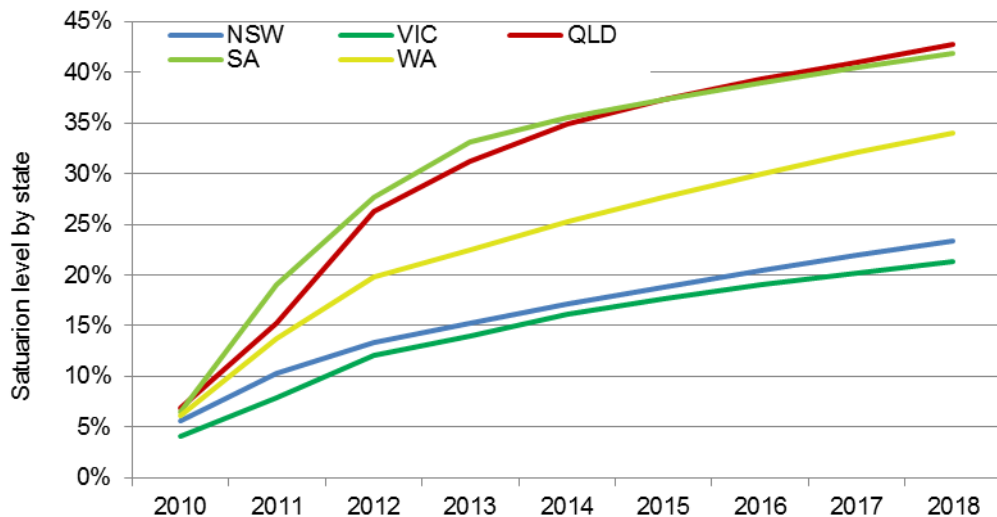
There are now a number of financiers that have been providing finance solutions to the residential market. It is not clear what proportion of residential solar installations are financed this way and we believe the market share to be fairly low at present. Industry feedback suggests that greater headway is being made in the commercial market where larger installations can justify the transactions costs.

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 per cent (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 take into account of 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 2018 the cumulative PV systems installed in each state grows considerably with very high saturation rates achieved in Queensland and South Australia, reaching over 40 per cent by 2016.

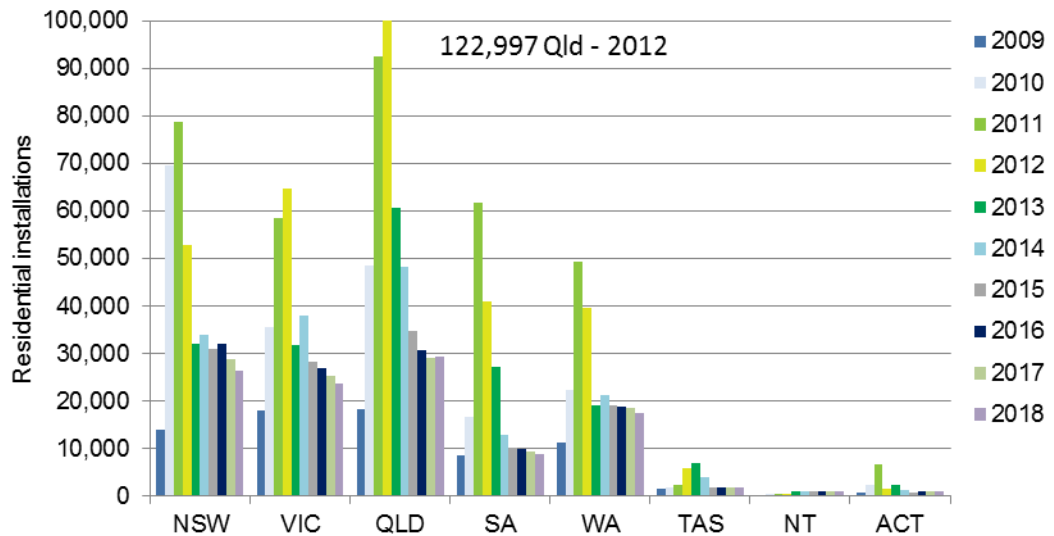
Figure 6.5 Saturation level by state

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

Projected system installations and saturation levels for each state is included in Attachment 3. The data is shown diagrammatically as Figure 6.6. The level of residential system installations across all states has reduced markedly from the peak in 2011. Solar PV installations across most states and territories were not receiving any additional support (other than through STCs) in 2014. As a result the level of installations in 2014 represents a reasonable base level for forecasting future years.

Queensland is expected to remain the leading state for solar PV installations into the foreseeable future. Together with South Australia, Queensland has reached saturation rates above 38 per cent by the end of 2015.

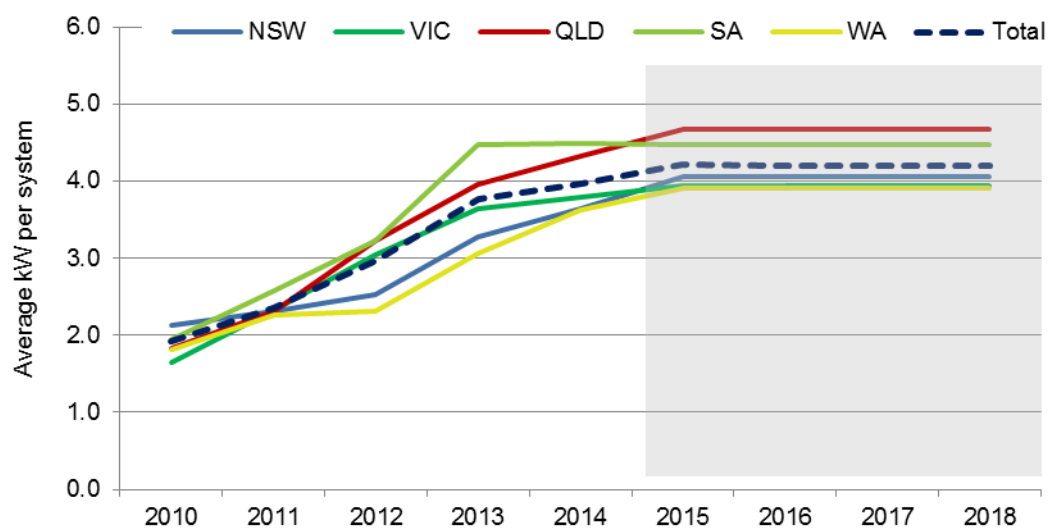
Figure 6.6 Residential PV systems installed by state



Determining the level of certificate creation

The average residential system size installed has increased significantly over the last four years from 1.9 kW per system in 2010 to 4.2 kW per system in 2015 (refer to Attachment 4 for details). All states have seen an increase in system size through 2015 (refer to Figure 6.7). Queensland and South Australia have continued to maintain the largest system sizes even though their attractive feed-in tariffs have been removed.

Figure 6.7 Average system size installed for NSW, Qld, SA, Vic and WA



We believe that we have seen the end of the growth in average system size and assume that the average system sizes achieved in 2015 will be maintained through the forecast period.

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

		Estimate	Estimate	Forecast	Forecast	Forecast
Year of installation	2013	2014	2015	2016	2017	2018
Number of Systems Installed	180,767	160,309	127,114	122,322	115,092	109,405
Avge kW/system	3.77	3.97	4.21	4.20	4.20	4.20
Avge Certificates/kW	20.6	19.9	20.0	20.0	18.7	17.4
MW Installed	681.7	636.3	535.7	513.8	483.5	460.8
Eligible Certificates ('000)	14,039	12,673	10,720	10,282	9,029	7,996

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

The commercial or non-residential sector has become more important as the residential solar market has declined. We have generally segmented the commercial market into those systems where the installed capacity of the system is greater than 10 kW. This is a proxy for commercial systems and while in some ways is an arbitrary delineation; it does generally reflect industry conventions.

Installed capacity for 2015 is estimated to be 146 MW which is a 13.2 per cent increase on 2014 levels. The commercial sector accounted for 20.5 per cent of total installed small-scale solar PV in 2015 compared to 16.1 per cent in 2014.

We have analysed the level of installations by size range to achieve a better understanding of the underlying level of activity (Table 7.1).

Table 7.1 Commercial PV systems by sub-segment

	2011	2012	2013	2014	2015
Number of Systems					
>10 to 30 kW	1,735	1,786	2,884	3,595	4,177
>30 to 50 kW	87	172	282	504	617
>50 to 100 kW	7	39	224	498	562
Total	1,829	1,997	3,390	4,598	5,356
Installed Capacity (kW)					
>10 to 30 kW	22,363	27,662	51,370	67,772	74,280
>30 to 50 kW	2,885	6,046	10,425	19,571	23,816
>50 to 100 kW	493	3,056	18,542	41,485	47,716
Total	25,741	36,764	80,336	128,828	145,813
Average System Size (kW)					
>10 to 30 kW	12.9	15.5	17.8	18.9	17.8
>30 to 50 kW	33.2	35.2	37.0	38.8	38.6
>50 to 100 kW	70.4	78.4	82.8	83.2	84.9
Total	14.1	18.4	23.7	28.0	27.2

Potential Demand

There have been nearly 18,000 commercial sized systems installed across Australia to 2015. There appears to be considerable scope to grow this sector with apparently only modest market penetration achieved to date. 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.

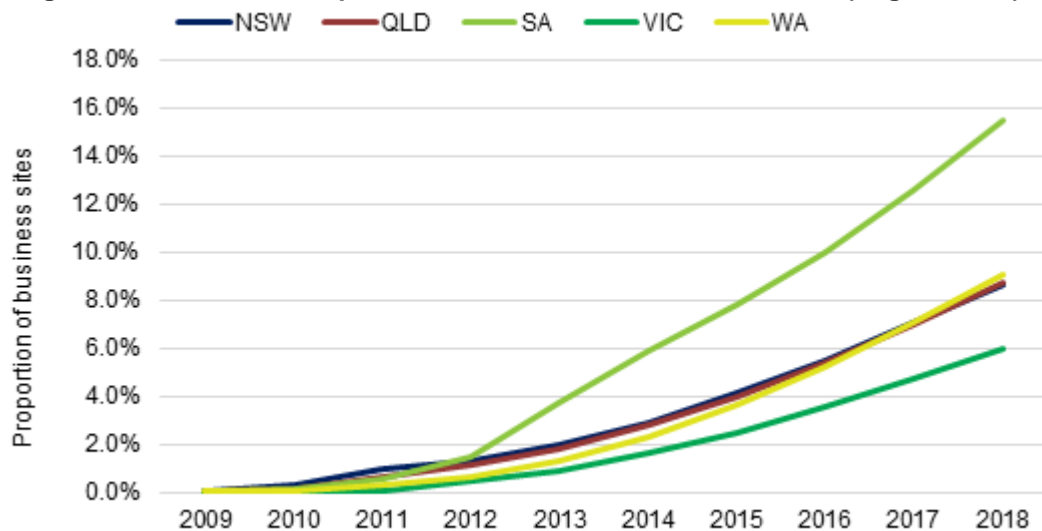
Data is not available by state that represents the above characteristics and we have developed a proxy to assist in assessing market prospects. The ABS publishes data on the number of registered businesses (by number of employees) and the Energy Supply Association of Australia (ESAA) publishes data by state on the number of business connections. This information is summarised by state in Table 7.3.

Table 7.3 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 per cent 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 8.1. NSW and Queensland have achieved 4 per cent market saturation in 2015, Victoria and WA have quite a bit lower saturation rate with South Australia having more than 8 per cent.

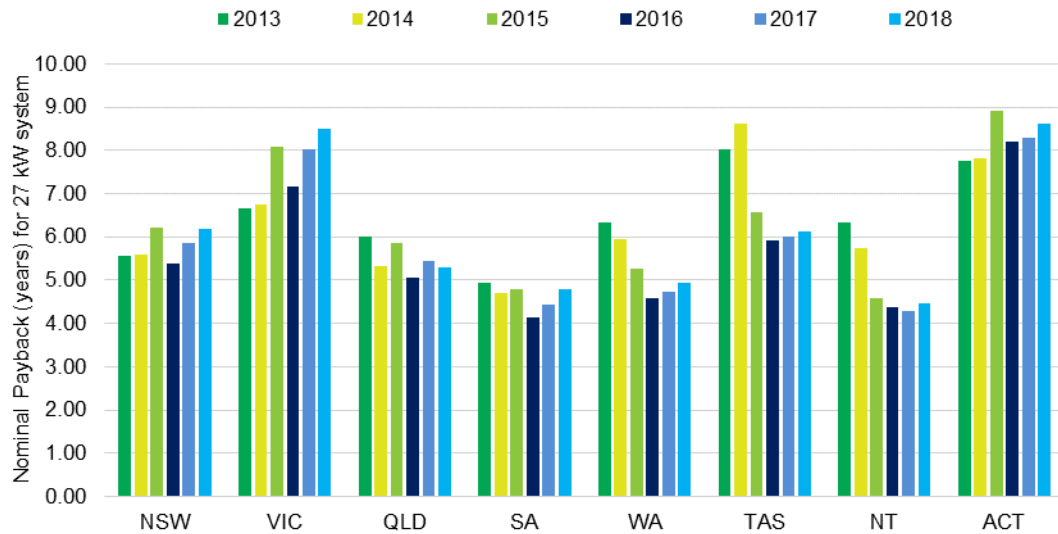
Figure 7.1 Estimated Proportion of Business Sites with Solar PV (larger states)

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.

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 (27kW) is shown diagrammatically in Figure 7.2.

Paybacks are assumed to increase across all states over the forecast period as the level of non-avoidable electricity charges increase. System paybacks typically range from 5 years to more than 8 years over the projection period. This amounts to an internal rate of return of 11 to 20 per cent.

Figure 7.2 Simple payback for a 27 kW Solar PV System

Assumptions used in the payback analysis are consistent with the assumptions used for residential systems only with a lower export proportion (20 per cent of power is assumed to be exported) and the value of the electricity exported is generally assumed to be zero.

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.

In developing projections for 2016 to 2018 we have considered the following factors:

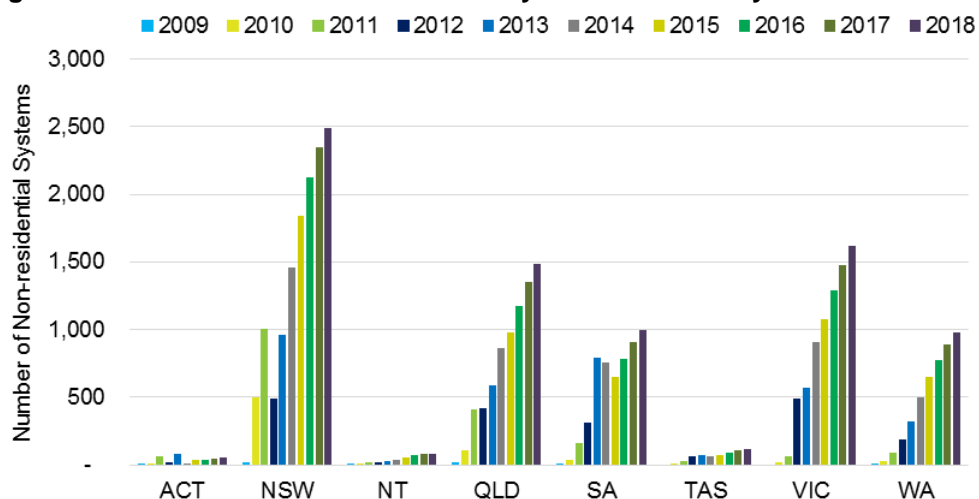
- With the fall in electricity demand there is a movement by network business and retailers to restructure electricity charges so that they are less avoidable by the customer. This means that higher standing charges and demand based charges are lower variable (cents per kWh) charges;
- Selling PV to commercial customers is a more complex and more involved sales process; and
- Economic uncertainty still prevails with concerns of a stagnant economy reducing the inclination of many businesses to invest.

Countering the above negative factors are:

- PV retailers' increasing need to sell commercial PV to offset a contracting market for residential systems;
- Increasing experience and competence of the solar industry in delivering commercial PV with businesses starting to build a pipeline of potential projects; and
- Financing solutions are progressively being made available to customers to assist with up-front capital cost.

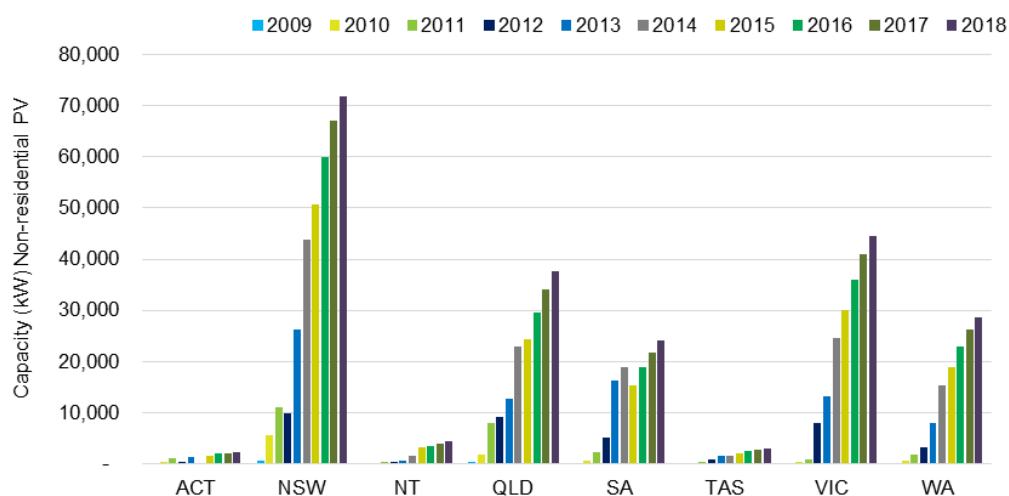
We assume that the underlying level of commercial PV installations continues to increase but at more modest levels than experienced in the past. We assume that the number of systems installed increases by 18.4 per cent in 2016, 13.5 per cent in each of 2016 and 8.5 per cent in 2018.

Figure 7.3 Number of Non-residential PV Systems installed by state



We have assumed that the average system size by state in 2015 will be maintained through the forecast period.

Figure 7.4 Installed Non-residential PV Capacity by State



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 7.5.

Table 7.5 Commercial System Installations and Certificates (all states)

Year of installation	2013	Estimate 2014	Estimate 2015	Forecast 2016	Forecast 2017	Forecast 2018
Number of Systems Installed	3,390	4,598	5,356	6,344	7,198	7,811
Avg kW/system	23.70	28.02	27.22	27.67	27.68	27.70
Avg Certificates/kW	20.3	20.2	20.2	20.2	18.9	17.5
MW Installed	80.3	128.8	145.8	175.5	199.3	216.4
Eligible Certificates ('000)	1,631	2,605	2,946	3,546	3,756	3,787

8. Solar PV Projections – Upgrades

With rising saturation rates in the new residential market solar resellers and installers are increasingly targeting their existing customers to upgrade their systems. This market can best be characterised as consumers that may have installed a smaller system than their available roof space and electricity demand might otherwise support. This is likely to have been done due to cost considerations. As system prices have fallen and power prices have continued to rise, it has become more attractive for consumers to upgrade their system.

The average size of system installed has trebled over the last four years from 1.3 kW per system in 2009 to more than 4 kW per system in 2015 (refer to Attachment 9). The \$8000 rebate for 1 kW systems applying in 2009 and the initial 5 times solar credits multiplier applying up to 1.5kW have acted to keep systems smaller up to mid-2011. As a result there are many smaller systems that have been installed that are capable of being upgraded.

A number of solar retailers have also been selling systems with larger inverters that are capable of being upgraded. Whilst historically this sector has been relatively small (3.7 per cent of capacity in 2013) we expect that this market will continue to grow over the next few years. There is however a constraining factor, with some customers unlikely to expand if they were on an attractive feed-in tariff that they might lose.

The data provided by the CER identified those systems that were not the first system installed on the site. We have assumed that from 1 January 2011, any system so identified and did not receive the solar credits multiplier was an upgrade system.

In 2015, 11,400 upgrade systems are expected to be installed, a 27 per cent reduction on 2014 levels. We have assumed that the level of installations for this sector increases by 8 to 9 per cent per annum so as to approach the 2014 level of installations by 2018 (refer to Table 8.1).

We have assumed that the average system size by state achieved over the 2014 and 2015 period will be maintained through the forecast period. The total number of systems installed and associated certificates created for the upgrade PV market is detailed in Attachment 6 and summarised in Table 8.1.

Table 8.1 Residential upgrade systems and certificates

		Estimate	Estimate	Forecast	Forecast	Forecast
Year of installation	2013	2014	2015	2016	2017	2018
Number of Systems Installed	16,209	15,639	11,398	12,324	13,413	14,599
Avge kW/system	2.22	2.30	2.76	2.74	2.73	2.72
Avge Certificates/kW	20.2	20.2	20.1	20.1	18.8	16.3
MW Installed	35.9	35.9	31.4	33.8	36.7	39.8
Eligible Certificates ('000)	725	724	631	680	689	648

9. SWH and Air Sourced Heat Pump Projections

Overview

We estimate that 60,163 SWH systems will be installed in 2015 that will create STCs. This is a modest 2.3 per cent increase on the 58,812 systems installed in 2014. We expect to see a continued recovery in the replacement market in 2016, which will nearly offset a reduction in the new building market. We expect that 2016 installations will reduce to 58,806 systems a 2.3 per cent reduction on 2015 levels.

Beyond 2016 we expect continued modest growth as gas prices continue to increase and as the residential solar PV markets reduces creating less competition for customers discretionary expenditure. We expect that 59,121 systems will be installed in 2017 and 60,217 systems installed in 2018.

Overall Solar Water Heater market drivers

Water heaters can be characterised as essential appliances and may subject to regulations which will possibly limit consumer choices. As such, solar water heaters are subject to very different drivers than solar PV systems.

The market for water heater systems can be segmented into three distinct sub-markets:

- installations of water heater systems at new dwellings
- replacement of water heater systems at existing dwellings
- installation of water heater systems of commercial size (both at new buildings and replacement at existing buildings)

For the purposes of our analysis, we have combined Solar Water Heaters (SWH) with Air-Sourced Heat Pumps (ASHP) into one category. We refer to this category simply as Solar Water Heaters (SWH). ASHPs have accounted for approximately 15 per cent of total hot water STCs over the last two years.

ASHPs with capacity greater than 425L have not been eligible to create certificates since June 2010. Most systems with a capacity of more than 425L will be commercial systems, and since this system size is no longer able to create certificates, the quantity of commercial sized SWH systems has declined markedly. The number of commercial sized SWH systems that have created STCs over the last three years has been negligible. At this stage we envisage that the sector will remain a relatively insignificant component of the broader SWH market, therefore we have not forecast this market separately.

The most important drivers influencing choice of water heaters – electric, gas (storage or instantaneous) or solar (including heat pumps), include:

- building regulations
- comparative capital costs of the technologies
- access to reticulated gas
- financial incentives – rebates and REC/STCs
- consumer perceptions of energy prices i.e. electricity, natural gas and LPG

The drivers above play out differently in each of the two market segments. For example, the most important driver influencing the choice of water heating system in the replacement market is the type of water that is currently in place.

SWH systems are a mature technology with well-established sales and distribution channels. SWH system costs are forecast to remain relatively stable over the next 3 years. There is little upside to the STC price over and above the current price, therefore

the installed cost (net cost to the customer) is expected to remain steady in the short-term.

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 that create certificates is between 10 to 15 per cent 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 per cent.

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 by more than 11.5 per cent in 2016 according to the Housing Industry Association (HIA) Economics Group (Table 9.1).

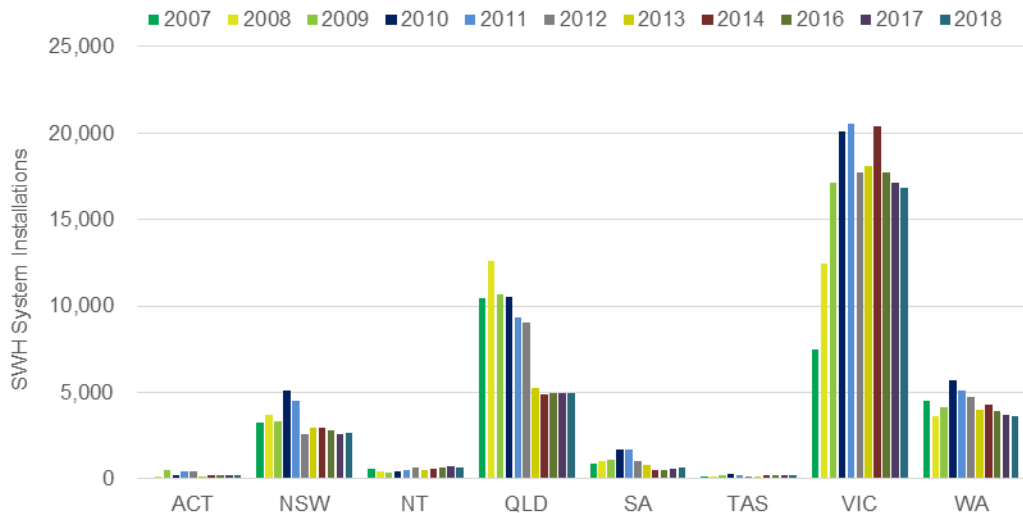
Table 9.1 Housing Industry Association – New Home starts

% Change	2011	2012	2013	2014	2015	2016	2017	2018
ACT	4.0%	-17.9%	9.5%	-8.3%	-12.1%	-8.9%	9.8%	-6.3%
NSW	-5.6%	3.9%	28.0%	11.7%	18.8%	-10.7%	-11.3%	1.4%
NT	7.1%	22.4%	5.0%	-3.4%	-14.7%	-1.2%	11.3%	-9.0%
QLD	-18.3%	-207.7%	14.7%	17.9%	11.8%	-3.0%	-2.1%	-2.8%
SA	-18.5%	-16.5%	14.9%	13.4%	-9.1%	-3.5%	5.9%	5.5%
TAS	-100.0%	-22.6%	-14.0%	32.9%	9.1%	-14.5%	-1.3%	-2.2%
VIC	-9.8%	-4.2%	-10.5%	26.2%	10.7%	-18.1%	-5.9%	-4.1%
WA	-100.0%	2.0%	30.1%	22.8%	-11.4%	-14.4%	-8.8%	-2.9%
Total	-12.4%	-1.9%	10.5%	18.2%	7.5%	-11.5%	-5.8%	-1.7%

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 experience a slight reduction in 2015 to 30,653.

The level of SWH systems creating certificates is summarised in Figure 9.1. Victoria which has the most progressive new building regulations accounted for more than half of SWH certificates created from new homes in 2014 and 2015.

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). We have assumed that the previously announced phase-out of EWH does not proceed and has no impact over the forecast period. The exception being South Australia where regulations are in place for some building types and where gas is available.

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 \$700 to \$1200 that helps drive extra SWH system installations in Victoria.

There are three sub-sectors to consider with regard to the replacement market. These are:

- Replace Gas Water Heater
- Replaced Electric Heater
- Replaced Solar Water Heater

A breakdown by state of the sources for heating water by household in 2011 is summarised in Table 9.2 below.

Table 9.2 Sources of energy for heating water, 2011 (per cent of total households)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
Mains Electricity	64.0%	28.2%	74.9%	45.0%	26.3%	92.2%	54.3%	52.3%	52.3%
Mains gas	26.4%	66.0%	7.3%	48.6%	50.7%	0.0%	0.0%	42.5%	36.1%
LPG/bottled gas	2.8%	1.8%	8.1%	3.0%	6.4%	2.1%	0.0%	0.0%	4.0%
Solar	6.8%	3.8%	10.5%	6.6%	20.8%	2.6%	45.8%	5.5%	8.5%
Other	2.3%	3.2%	1.7%	1.0%	2.3%	0.0%	1.8%	0.0%	2.3%

Source: ABS, Environmental Issues: Energy Use and Conservation, Mar 2011

The replacement SWH market has been driven by the replacement of electric resistance water heaters. In a situation where an electric resistance water heater is due to be replaced, whether the property has access to reticulated gas has traditionally influenced the type of water heater system chosen as a replacement. Therefore, access to reticulated gas is a good predictor of the potential size of a SWH market. In Table 9.3 below we show the share of houses with access to reticulated gas. Residents in New South Wales and Queensland have limited access to reticulated gas; therefore we can expect larger growth of SWH installations in these states.

Table 9.3 Per cent of households with mains gas

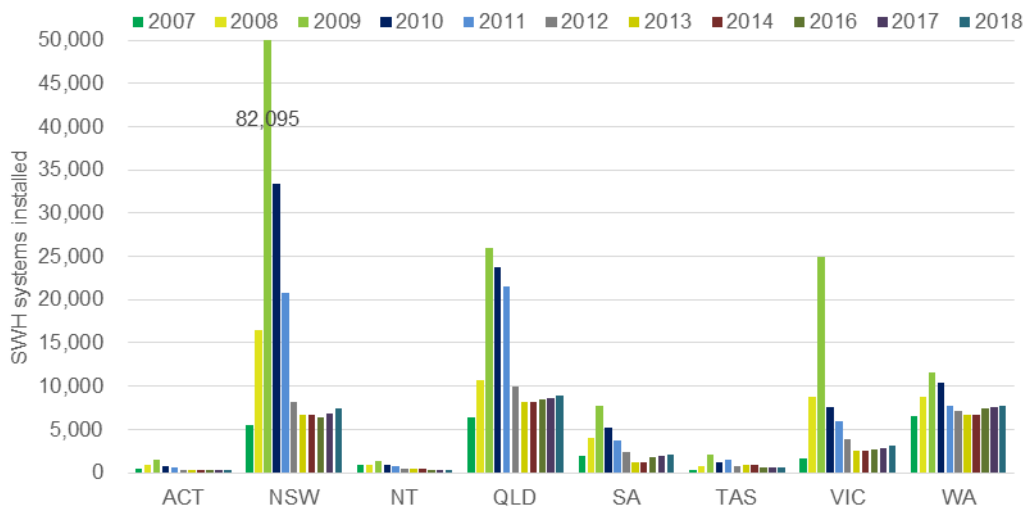
	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
Capital City	47.7	91.0	18.6	75.2	83.9	6.2			62.6
Balance of State	25.3	57.5	5.0	13.7	24.5	3.1			23.4
Overall	38.9	81.6	10.9	58.4	68.3	4.4	2.9	74.6	47.9

Source: ABS, Environmental Issues: Energy Use and Conservation, Mar 2011

The market for replacing water heaters with SWH increased in most states and territories during 2014 with Victoria and SA notable with significant declines.

We expect the replacement market for SWH to continue to recover through 2016 and beyond, this recovery will be driven by a fast rising gas prices and a slowdown in PV sales reducing competition to SWH for discretionary household expenditure. Recovery will be hindered somewhat due to uncertainty over the future economic outlook.

We expect the number of SWH systems installed in existing homes to increase in 2016 to increase by 6.9 per cent to 27,834 systems. We expect to see further growth in replacement SWH system installations in 2017 and 2018 of 4 to 5 per cent.

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 for the 2016 to 2018 forecast period will be similar to the average levels achieved over the 2014 to 2015 period.

We forecast the total number of certificates created by SWH systems to be installed in 2014 at 1.79 million. We forecast this to increase by 3.6 per cent in 2015 to 1.85 million.

Table 9.4 Certificate creation from SWH

	Estimate	Estimate	Forecast	Forecast	Forecast	
Year of installation	2013	2014	2015	2016	2017	2018
New Buildings						
Number of Systems Installed	32,316	31,852	34,121	30,971	30,051	29,841
Avgc Certificates/System	29.0	30.2	29.3	29.8	29.8	29.8
Eligible Certificates ('000)	938	961	1,001	923	895	890
Replacement						
Number of Systems Installed	25,983	26,960	26,042	27,834	29,070	30,376
Avgc Certificates/System	31.0	30.7	29.5	30.1	30.1	30.1
Eligible Certificates ('000)	804	827	768	837	875	914
Total						
Number of Systems Installed	58,299	58,812	60,163	58,806	59,121	60,217
Avgc Certificates/System	30	30	29	30	30	30
Eligible Certificates ('000)	1,743	1,788	1,769	1,760	1,770	1,804

10. Other small generating units

Wind and Hydro SGUs remain an extremely small part of STC creation. A total of 10 installations created STCs in 2014 for a total of 376 certificates.

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 – July 2015
- ESAA, Electricity Gas Australia 2014
- Australian Energy Market Commission, Residential Electricity Price Trends report, December 2015

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Summary of Results

Base Case

Year of installation	Actual 2010	Actual 2011	Actual 2012	Actual 2013	Estimate 2014	Estimate 2015	Forecast 2016	Forecast 2017	Forecast 2018
1. SGUs (PV)									
1.1 New Residential	Base Case								
Number of Systems Installed	197,562	349,935	329,013	180,767	160,309	127,114	122,322	115,092	109,405
Avg kW/system	1.91	2.36	2.97	3.77	3.97	4.21	4.20	4.20	4.20
Avg Certificates/kW	67.8	63.5	35.5	20.6	19.9	20.0	20.0	18.7	17.4
MW Installed	378.0	824.2	975.8	681.7	636.3	535.7	513.8	483.5	460.8
Eligible Certificates ('000)	25,637	52,325	34,670	14,039	12,673	10,720	10,282	9,029	7,996
1.2 Non Residential	Base Case								
Number of Systems Installed	701	1,829	1,997	3,390	4,598	5,356	6,344	7,198	7,811
Avg kW/system	13.46	14.07	18.41	23.70	28.02	27.22	27.67	27.68	27.70
Avg Certificates/kW	22.9	29.1	27.5	20.3	20.2	20.2	20.2	18.9	17.5
MW Installed	9.4	25.7	36.8	80.3	128.8	145.8	175.5	199.3	216.4
Eligible Certificates ('000)	216	749	1,012	1,631	2,605	2,946	3,546	3,756	3,787
1.3 Residential System Upgrades									
Number of Systems Installed		8,540	12,188	16,209	15,639	11,398	12,324	13,413	14,599
Avg kW/system		1.37	1.70	2.22	2.30	2.76	2.74	2.73	2.72
Avg Certificates/kW		19.8	20.1	20.2	20.2	20.1	20.1	18.8	16.3
MW Installed		11.7	20.7	35.9	35.9	31.4	33.8	36.7	39.8
Eligible Certificates ('000)		232	415	725	724	631	680	689	648
Total PV Systems									
Number of Systems Installed	198,263	360,304	343,198	200,366	180,546	143,868	140,990	135,703	131,815
Avg kW/system	1.95	2.39	3.01	3.98	4.44	4.96	5.13	5.30	5.44
Avg Certificates/kW	66.7	61.9	34.9	20.5	20.0	20.1	20.1	18.7	17.3
MW Installed	387.4	861.6	1,033.3	798.0	801.0	712.9	723.2	719.5	717.0
Eligible Certificates ('000)	25,853	53,305	36,097	16,395	16,002	14,297	14,508	13,474	12,431
2. SWH Systems									
2.1 SWH System (New Homes)									
Number of Systems Installed	44,049	42,330	36,339	32,316	31,852	34,121	30,971	30,051	29,841
Avg Certificates/System	29.9	28.3	27.1	29.0	30.2	29.3	29.8	29.8	29.8
Eligible Certificates ('000)	1,317	1,198	986	938	961	1,001	923	895	890
2.2 SWH System (Replacement)									
Number of Systems Installed	83,044	62,720	33,127	25,983	26,960	26,042	27,834	29,070	30,376
Avg Certificates/System	35.6	30.7	30.3	31.0	30.7	29.5	30.1	30.1	30.1
Eligible Certificates ('000)	2,957	1,923	1,005	804	827	768	837	875	914
Total SWH Systems									
Number of Systems Installed	127,093	105,050	69,466	58,299	58,812	60,163	58,806	59,121	60,217
Avg Certificates/System	33.6	29.7	28.7	29.9	30.4	29.4	29.9	29.9	30.0
Eligible Certificates ('000)	4,274	3,121	1,991	1,743	1,788	1,769	1,760	1,770	1,804

Summary of Results

Base Case

Year of installation	Actual 2010	Actual 2011	Actual 2012	Actual 2013	Estimate 2014	Estimate 2015	Forecast 2016	Forecast 2017	Forecast 2018
3. Small Wind/Hydro Systems									
Number of Systems	140	65	11	5	10	11	11	11	11
Avg Certificates/System	99.7	90.0	45.0	66.2	37.6	24.4	24.4	24.4	24.4
Eligible Certificates ('000)	14	6	0	0	0	0	0	0	0
TOTAL Certificates ('000)	30,142	56,433	38,088	18,138	17,790	16,066	16,268	15,244	14,235

Calculating STCs to be created for the year

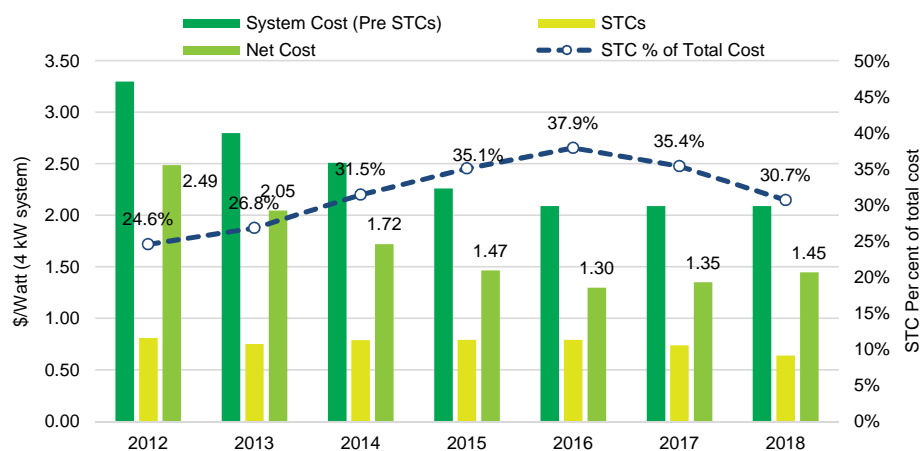
Year of Creation	2014	2015	2016	2017	2018
STCs for systems installed in the year					
Solar PV	16,002	14,297	14,508	13,474	12,431
SWH	1,788	1,769	1,760	1,770	1,804
Total	17,790	16,066	16,268	15,244	14,235
Less STCs submitted the following year (lag)	1,539	1,420	1,435	1,358	1,284
Add Previous year installs created this year	1,545	1,539	1,420	1,435	1,358
STCs submitted for creation	17,797	16,185	16,254	15,321	14,309

Attachment 2

Residential PV Systems

PV Financial Attractiveness

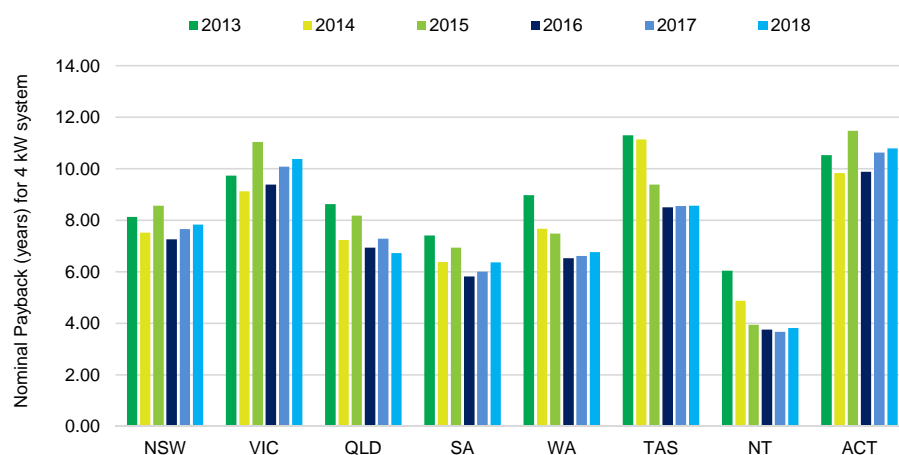
Projected Installed cost of solar PV



Average Nominal Payback (assuming 4 kW system)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
2013	8.13	9.73	8.63	7.42	8.98	11.30	6.04	10.53
2014	7.52	9.13	7.24	6.38	7.68	11.14	4.88	9.83
2015	8.57	11.04	8.18	6.95	7.48	9.39	3.94	11.48
2016	7.26	9.39	6.94	5.82	6.53	8.51	3.76	9.88
2017	7.66	10.09	7.29	6.01	6.62	8.56	3.68	10.63
2018	7.83	10.38	6.72	6.37	6.77	8.57	3.82	10.80

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
Cumulative grid systems installed	165,776	115,370	161,454	87,958	83,823	5,998	1,245	10,019	631,643
<i>Market share</i>	<i>26.2%</i>	<i>18.3%</i>	<i>25.6%</i>	<i>13.9%</i>	<i>13.3%</i>	<i>0.9%</i>	<i>0.2%</i>	<i>1.6%</i>	<i>100.0%</i>
Owner Occupied Dwellings end 2016	1,615	1,465	1,062	461	609	145	34	91	5,482
Proportion of Owner Occupied Dwellings	10.3%	7.9%	15.2%	19.1%	13.8%	4.1%	3.6%	11.0%	11.5%
Estimates for 2012									
Total 2012 systems	52,863	64,811	122,997	40,855	39,629	5,942	458	1,458	329,013
Cumulative installations	218,639	180,181	284,451	128,813	123,452	11,940	1,703	11,477	960,656
Owner occupied dwelling at year end	1,631	1,493	1,083	466	622	146	35	92	5,569
Proportion of Owner Occupied Dwellings	13.4%	12.1%	26.3%	27.7%	19.8%	8.2%	4.9%	12.4%	17.3%
Estimates for 2013									
Average number of systems installed	2,667	2,638	5,051	2,272	1,594	570	81	191	15,064
Annulised installations	32,007	31,657	60,609	27,258	19,132	6,836	971	2,297	180,767
Cumulative installations	250,646	211,838	345,060	156,071	142,584	18,776	2,674	13,774	1,141,423
Owner occupied dwelling at year end	1,647	1,522	1,104	471	635	148	35	94	5,656
Proportion of Owner Occupied Dwellings	15.2%	13.9%	31.2%	33.1%	22.4%	12.7%	7.7%	14.7%	20.2%
Estimates for 2014									
Average number of systems installed	2,833	3,156	4,023	1,084	1,762	326	76	100	13,359
Annulised installations	33,991	37,872	48,278	13,003	21,146	3,911	915	1,194	160,309
Cumulative installations	284,636	249,710	393,338	169,073	163,731	22,687	3,588	14,968	1,301,732
Owner occupied dwelling at year end	1,663	1,550	1,126	476	649	149	35	95	5,743
Proportion of Owner Occupied Dwellings	17.1%	16.1%	34.9%	35.5%	25.2%	15.3%	10.2%	15.7%	22.7%
Estimates for 2015									
Average number of systems installed	2,578	2,364	2,891	857	1,595	145	96	68	10,593
Annulised installations	30,931	28,373	34,692	10,278	19,141	1,738	1,147	815	127,114
Cumulative installations	315,568	278,083	428,030	179,352	182,871	24,425	4,735	15,783	1,428,847
Owner occupied dwelling at year end	1,680	1,578	1,147	481	662	150	35	97	5,830
Proportion of Owner Occupied Dwellings	18.8%	17.6%	37.3%	37.3%	27.6%	16.3%	13.4%	16.3%	24.5%
Projections for 2016									
Average number of systems installed	2,664	2,245	2,561	826	1,580	148	83	87	10,194
Annulised installations	31,962	26,944	30,732	9,913	18,956	1,778	997	1,040	122,322
Cumulative installations	347,530	305,027	458,762	189,265	201,827	26,202	5,732	16,824	1,551,169
Owner occupied dwelling at year end	1,696	1,606	1,169	486	675	151	36	99	5,917
Proportion of Owner Occupied Dwellings	20.5%	19.0%	39.3%	38.9%	29.9%	17.4%	16.1%	17.1%	26.2%
Projections for 2017									
Average number of systems installed	2,393	2,118	2,424	793	1,555	147	80	80	9,591
Annulised installations	28,719	25,417	29,091	9,515	18,659	1,765	963	964	115,092
Cumulative installations	376,249	330,444	487,853	198,779	220,486	27,967	6,695	17,788	1,666,261
Owner occupied dwelling at year end	1,712	1,634	1,190	492	688	152	36	100	6,003
Proportion of Owner Occupied Dwellings	22.0%	20.2%	41.0%	40.4%	32.1%	18.4%	18.6%	17.8%	27.8%
Projections for 2018									
Average number of systems installed	2,196	1,967	2,454	744	1,455	146	78	77	22,018
Annulised installations	26,350	23,601	29,451	8,929	17,456	1,751	942	925	109,405
Cumulative installations	402,599	354,046	517,304	207,709	237,942	29,719	7,637	18,713	1,775,667
Owner occupied dwelling at year end	1,728	1,663	1,211	497	701	153	36	102	6,089
Proportion of Owner Occupied Dwellings	23.3%	21.3%	42.7%	41.8%	33.9%	19.4%	21.1%	18.4%	29.2%

Solar PV Residential Systems by State

	2	3	4	5	6	7	8	9	
Summary by State									
	NSW	VIC	QLD	SA	WA	Tas	NT	ACT	Total
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%	15.2%	19.1%	13.8%	4.1%	3.6%	11.0%	11.5%
2012	13.4%	12.1%	26.3%	27.7%	19.8%	8.2%	4.9%	12.4%	17.3%
2013	15.2%	13.9%	31.2%	33.1%	22.4%	12.7%	7.7%	14.7%	20.2%
2014	17.1%	16.1%	34.9%	35.5%	25.2%	15.3%	10.2%	15.7%	22.7%
2015	18.8%	17.6%	37.3%	37.3%	27.6%	16.3%	13.4%	16.3%	24.5%
2016	20.5%	19.0%	39.3%	38.9%	29.9%	17.4%	16.1%	17.1%	26.2%
2017	22.0%	20.2%	41.0%	40.4%	32.1%	18.4%	18.6%	17.8%	27.8%
2018	23.3%	21.3%	42.7%	41.8%	33.9%	19.4%	21.1%	18.4%	29.2%
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	78,583	58,556	92,405	61,750	49,212	2,352	354	6,723	349,935
2012	52,863	64,811	122,997	40,855	39,629	5,942	458	1,458	329,013
2013	32,007	31,657	60,609	27,258	19,132	6,836	971	2,297	180,767
2014	33,991	37,872	48,278	13,003	21,146	3,911	915	1,194	160,309
2015	30,931	28,373	34,692	10,278	19,141	1,738	1,147	815	127,114
2016	31,962	26,944	30,732	9,913	18,956	1,778	997	1,040	122,322
2017	28,719	25,417	29,091	9,515	18,659	1,765	963	964	115,092
2018	26,350	23,601	29,451	8,929	17,456	1,751	942	925	109,405

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	78,583	58,556	92,405	61,750	49,212	2,352	354	6,723	349,935
2012	52,863	64,811	122,997	40,855	39,629	5,942	458	1,458	329,013
2013	32,007	31,657	60,609	27,258	19,132	6,836	971	2,297	180,767
2014	33,991	37,872	48,278	13,003	21,146	3,911	915	1,194	160,309
2015	30,931	28,373	34,692	10,278	19,141	1,738	1,147	815	127,114
2016	31,962	26,944	30,732	9,913	18,956	1,778	997	1,040	122,322
2017	28,719	25,417	29,091	9,515	18,659	1,765	963	964	115,092
2018	26,350	23,601	29,451	8,929	17,456	1,751	942	925	109,405
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	2.31	2.33	2.31	2.57	2.27	2.25	2.49	2.38	2.36
2012	2.52	3.04	3.23	3.22	2.32	3.10	3.55	3.08	2.97
2013	3.27	3.64	3.95	4.47	3.05	4.10	4.37	4.03	3.77
2014	3.64	3.79	4.32	4.49	3.63	4.28	4.63	3.79	3.97
2015	4.06	3.94	4.67	4.47	3.91	3.93	4.60	4.31	4.21
2016	4.06	3.94	4.67	4.47	3.91	3.93	4.60	4.31	4.20
2017	4.06	3.94	4.67	4.47	3.91	3.93	4.60	4.31	4.20
2018	4.06	3.94	4.67	4.47	3.91	3.93	4.60	4.31	4.20
Installed Capacity (MW)									
2010	148.6	58.6	89.2	32.5	40.3	2.9	1.1	4.8	378.0
2011	181.9	136.7	213.0	158.9	111.5	5.3	0.9	16.0	824.2
2012	133.3	197.1	397.4	131.6	91.9	18.4	1.6	4.5	975.8
2013	104.8	115.4	239.7	122.0	58.4	28.1	4.2	9.3	681.7
2014	123.6	143.4	208.7	58.3	76.7	16.8	4.2	4.5	636.3
2015	125.4	111.9	161.9	45.9	74.9	6.8	5.3	3.5	535.7
2016	129.6	106.3	143.4	44.3	74.1	7.0	4.6	4.5	513.8
2017	116.5	100.3	135.8	42.5	73.0	6.9	4.4	4.2	483.5
2018	106.9	93.1	137.4	39.9	68.3	6.9	4.3	4.0	460.8
2015 Zone Rating	1.374	1.186	1.377	1.369	1.373	1.176	1.550	1.372	1.334
Average Certificates/kW installed									
2010	70.1	56.1	74.0	66.5	66.2	38.7	74.2	65.0	67.8
2011	70.9	55.8	65.7	56.9	65.5	55.8	72.0	68.9	63.5
2012	39.7	31.5	34.9	35.7	42.0	29.9	37.6	36.6	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	20.6	20.5	20.6	17.6	23.3	20.6	19.9
2015	20.6	17.8	20.6	20.5	20.6	17.6	23.3	20.6	20.0
2016	20.6	17.8	20.6	20.5	20.6	17.6	23.3	20.6	20.0
2017	19.2	16.6	19.3	19.2	19.2	16.5	21.7	19.2	18.7
2018	17.9	15.4	17.9	17.8	17.8	15.3	20.2	17.8	17.4
Calculated Certificates ('000) ##									
2010	10,410	3,291	6,600	2,157	2,666	113	84	315	25,637
2011	12,888	7,627	14,002	9,040	7,309	295	63	1,101	52,325
2012	5,286	6,200	13,856	4,695	3,856	552	61	164	34,670
2013	2,252	2,106	5,108	2,533	1,240	507	100	193	14,039
2014	2,548	2,550	4,310	1,197	1,580	296	99	93	12,673
2015	2,586	1,991	3,343	943	1,541	120	123	72	10,720
2016	2,672	1,890	2,962	910	1,526	123	107	92	10,282
2017	2,241	1,664	2,617	815	1,402	114	96	80	9,029
2018	1,909	1,435	2,460	710	1,218	105	87	71	7,996

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

Non Residential PV installations

Attachment 5

Includes systems installed that are greater than 10 kW

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Number of Systems										
ACT	1	12	63	21	82	9	32	39	44	49
NSW	22	494	1,004	493	956	1,459	1,836	2,124	2,351	2,485
NT	3	9	19	20	26	38	58	67	76	82
QLD	21	106	408	420	585	862	976	1,172	1,349	1,486
SA	8	35	159	315	788	754	653	785	903	994
TAS	-	2	23	59	71	64	75	91	106	117
VIC	-	16	60	486	565	911	1,079	1,290	1,478	1,620
WA	11	27	93	183	317	500	647	776	891	978
	66	701	1,829	1,997	3,390	4,598	5,356	6,344	7,198	7,811
Installed Capacity (kW)										
ACT	30	261	1,115	429	1,410	211	1,676	1,964	2,146	2,327
NSW	530	5,555	11,105	9,817	26,324	43,865	50,726	59,979	67,153	71,857
NT	43	121	453	301	718	1,586	3,104	3,553	4,006	4,308
QLD	334	1,906	7,860	9,101	12,774	22,810	24,246	29,621	34,130	37,636
SA	154	693	2,232	5,052	16,227	18,945	15,248	18,940	21,830	24,057
TAS	-	37	297	841	1,670	1,587	1,923	2,426	2,810	3,102
VIC	-	285	963	8,083	13,218	24,469	30,052	36,036	40,905	44,444
WA	200	581	1,715	3,140	7,995	15,355	18,838	23,030	26,284	28,659
Australia	1,290	9,439	25,741	36,764	80,336	128,828	145,813	175,549	199,264	216,390
Growth rate:				42.8%	118.5%	60.4%	13.2%	20.4%	13.5%	8.6%
kw/System										
ACT	29.70	21.78	17.69	20.41	17.19	23.41	51.59	50.36	48.76	47.50
NSW	24.07	11.25	11.06	19.91	27.54	30.06	27.63	28.24	28.56	28.92
NT	14.32	13.42	23.86	15.04	27.63	41.63	53.74	53.02	52.71	52.53
QLD	15.89	17.99	19.26	21.67	21.84	26.45	24.85	25.27	25.30	25.33
SA	19.24	19.81	14.04	16.04	20.59	25.12	23.34	24.13	24.18	24.20
TAS		18.27	12.91	14.26	23.52	24.72	25.78	26.66	26.51	26.51
VIC		17.79	16.06	16.63	23.39	26.87	27.85	27.94	27.68	27.43
WA	18.21	21.51	18.44	17.16	25.22	30.69	29.10	29.68	29.50	29.30
	19.55	13.46	14.07	18.41	23.70	28.02	27.22	27.67	27.68	27.70
Certificates per kW										
ACT	24.92	26.42	26.36	21.65	20.77	20.71	20.72	20.72	19.34	17.96
NSW	22.43	31.29	30.99	22.98	20.90	20.75	20.75	20.75	19.37	17.99
NT	27.70	28.94	26.82	26.80	23.34	23.34	23.33	23.33	21.78	20.22
QLD	24.13	26.83	24.96	22.50	20.83	20.81	20.80	20.80	19.42	18.03
SA	21.05	26.38	26.44	23.26	20.55	20.65	20.65	20.65	19.27	17.89
TAS		20.66	23.67	19.77	17.83	17.75	17.75	17.75	16.57	15.39
VIC		21.45	21.45	19.62	18.30	18.28	18.29	18.29	17.07	15.85
WA	22.22	24.07	23.21	22.34	20.43	20.33	20.32	20.32	18.97	17.61
	22.91	29.08	27.52	22.05	20.30	20.22	20.20	20.20	18.85	17.50
Certificates Created										
ACT	740	6,904	29,380	9,277	29,273	4,374	34,722	40,691	41,492	41,790
NSW	11,879	173,833	344,139	225,576	550,129	910,290	1,052,681	1,244,692	1,300,664	1,292,371
NT	1,190	3,495	12,160	8,062	16,765	37,022	72,399	82,895	87,238	87,116
QLD	8,055	51,156	196,159	204,814	266,046	474,569	504,403	616,243	662,730	678,594
SA	3,239	18,285	59,021	117,512	333,546	391,146	314,803	391,038	420,661	430,452
TAS		755	7,030	16,632	29,782	28,166	34,142	43,079	46,555	47,727
VIC		6,106	20,664	158,598	241,913	447,180	549,702	659,160	698,341	704,563
WA	4,451	13,980	39,799	70,165	163,354	312,113	382,713	467,995	498,517	504,730
	29,554	274,514	708,352	810,636	1,630,808	2,604,860	2,945,564	3,545,793	3,756,198	3,787,343

PV System Upgrades

Attachment 6

Includes systems less than 10kW where a previous system had claimed certificates at that address

Installation year		2011	2012	2013	2014	2015	2016	2017	2018
State									
Installed capacity	ACT	141	109	110	71	145	160	175	193
	NSW	1,229	1,126	4,872	4,872	4,501	4,726	5,200	5,720
	NT	21	119	275	275	56	61	68	75
	QLD	3,090	11,489	17,683	17,683	14,111	15,523	17,075	18,782
	SA	2,224	1,277	5,298	5,298	5,500	5,775	6,064	6,365
	TAS	136	720	670	670	225	248	273	285
	VIC	2,319	2,201	3,869	3,869	4,591	4,820	5,060	5,313
	WA	2,539	3,643	3,162	3,162	2,284	2,513	2,765	3,041
		11,700	20,682	35,940	35,901	31,414	33,826	36,679	39,775
Valid RECs created	ACT	2,885	2,233	2,260	1,452	2,990	3,297	3,357	3,212
	NSW	25,033	23,096	100,731	100,731	93,057	97,704	100,333	95,660
	NT	483	2,769	6,341	6,341	1,298	1,410	1,468	1,404
	QLD	62,792	234,952	362,343	362,343	289,166	318,085	326,563	311,323
	SA	45,078	26,048	108,819	108,819	112,952	118,608	116,236	105,746
	TAS	2,380	12,639	11,782	11,782	3,957	4,352	4,473	4,055
	VIC	41,321	39,221	68,289	68,289	81,024	85,067	83,347	75,841
	WA	51,861	74,311	64,644	64,644	46,696	51,385	52,751	50,286
		231,833	415,269	725,210	724,402	631,140	679,907	688,526	647,527
Systems									
	ACT	74	43	32	22	40	44	48	53
	NSW	626	579	1,021	1,837	1,539	1,616	1,778	1,956
	NT	13	23	27	74	24	26	29	32
	QLD	2,442	6,815	9,992	8,754	5,810	6,391	7,030	7,733
	SA	1,634	675	1,136	1,435	1,295	1,360	1,428	1,499
	TAS	88	347	749	244	72	79	87	91
	VIC	1,589	901	1,105	1,371	1,435	1,507	1,582	1,661
	WA	2,074	2,805	2,147	1,902	1,182	1,301	1,431	1,574
		8,540	12,188	16,209	15,639	11,398	12,324	13,413	14,599
kw/System									
	ACT	1.91	2.53	3.43	3.20	3.64	3.64	3.64	3.64
	NSW	1.96	1.94	4.77	2.65	2.92	2.92	2.92	2.92
	NT	1.60	5.17	10.17	3.70	2.35	2.35	2.35	2.35
	QLD	1.27	1.69	1.77	2.02	2.43	2.43	2.43	2.43
	SA	1.36	1.89	4.66	3.69	4.25	4.25	4.25	4.25
	TAS	1.55	2.07	0.90	2.75	3.13	3.13	3.13	3.13
	VIC	1.46	2.44	3.50	2.82	3.20	3.20	3.20	3.20
	WA	1.22	1.30	1.47	1.66	1.93	1.93	1.93	1.93
		1.37	1.70	2.22	2.30	2.76	2.74	2.73	2.72
RECs/kW									
	ACT	20.4	20.5	20.6	20.6	20.6	20.6	19.2	16.6
	NSW	20.4	20.5	20.7	20.7	20.7	20.7	19.3	16.7
	NT	23.2	23.3	23.1	23.1	23.1	23.1	21.5	18.7
	QLD	20.3	20.5	20.5	20.5	20.5	20.5	19.1	16.6
	SA	20.3	20.4	20.5	20.5	20.5	20.5	19.2	16.6
	TAS	17.5	17.6	17.6	17.6	17.6	17.6	16.4	14.2
	VIC	17.8	17.8	17.6	17.6	17.6	17.6	16.5	14.3
	WA	20.4	20.4	20.4	20.4	20.4	20.4	19.1	16.5
		19.81	20.08	20.18	20.18	20.09	20.10	18.77	16.28

SWH Systems - New Buildings

Attachment 7

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SWH systems installed												
ACT	39	113	507	236	422	432	190	135	190	182	205	197
NSW	3,276	3,675	3,361	5,098	4,522	2,579	2,646	2,945	2,975	2,805	2,558	2,658
NT	548	410	346	436	522	653	578	526	601	623	709	663
QLD	10,414	12,631	10,652	10,497	9,359	9,042	6,529	5,224	4,869	4,966	4,986	4,971
SA	903	1,023	1,126	1,669	1,677	1,060	765	802	532	540	586	633
TAS	113	172	177	266	192	137	83	111	231	209	212	213
VIC	7,480	12,449	17,124	20,119	20,559	17,726	16,873	18,106	20,397	17,725	17,122	16,849
WA	4,535	3,606	4,123	5,728	5,077	4,710	4,652	4,004	4,326	3,919	3,672	3,658
Total	27,308	34,079	37,416	44,049	42,330	36,339	32,316	31,852	34,121	30,971	30,051	29,841
SWH certificates created												
ACT	1,111	3,641	18,125	7,501	13,138	12,503	6,071	4,689	6,562	6,318	7,095	6,825
NSW	100,171	130,824	131,981	172,125	145,841	83,654	87,769	97,279	90,227	88,869	81,049	84,210
NT	16,672	13,851	10,468	13,429	13,929	18,070	15,734	15,196	16,441	17,545	19,966	18,669
QLD	330,947	418,149	374,016	339,788	275,585	259,317	198,795	171,340	156,360	161,185	161,829	161,344
SA	28,075	36,438	38,281	54,845	51,074	29,642	22,678	25,117	16,848	17,013	18,442	19,918
TAS	3,301	8,056	11,377	8,115	4,994	3,889	2,401	3,420	6,499	6,162	6,236	6,255
VIC	184,040	325,693	457,839	533,397	531,095	434,730	461,636	511,579	559,368	493,460	476,682	469,055
WA	150,930	121,986	142,995	188,152	162,535	144,164	143,109	131,912	149,104	132,112	123,789	123,293
Total	815,247	1,058,638	1,185,082	1,317,352	1,198,191	985,969	938,193	960,532	1,001,409	922,663	895,088	889,568
Certificates per SWH System												
ACT	28.5	32.2	35.7	31.8	31.1	28.9	32.0	34.7	34.6	34.6	34.6	34.6
NSW	30.6	35.6	39.3	33.8	32.3	32.4	33.2	33.0	30.3	31.7	31.7	31.7
NT	30.4	33.8	30.3	30.8	26.7	27.7	27.2	28.9	27.4	28.1	28.1	28.1
QLD	31.8	33.1	35.1	32.4	29.4	28.7	30.4	32.8	32.1	32.5	32.5	32.5
SA	31.1	35.6	34.0	32.9	30.5	28.0	29.6	31.3	31.6	31.5	31.5	31.5
TAS	29.2	46.8	64.3	30.5	26.0	28.4	28.9	30.8	28.1	29.4	29.4	29.4
VIC	24.6	26.2	26.7	26.5	25.8	24.5	27.4	28.3	27.4	27.8	27.8	27.8
WA	33.3	33.8	34.7	32.8	32.0	30.6	30.8	32.9	34.5	33.7	33.7	33.7
Total	29.9	31.1	31.7	29.9	28.3	27.1	29.0	30.2	29.3	29.8	29.8	29.8

SWH Systems - Replacement Market**Attachment 8**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SWH systems installed												
ACT	414	888	1,467	724	616	302	263	315	289	303	311	319
NSW	5,489	16,528	82,095	33,427	20,809	8,231	6,499	6,701	5,785	6,363	6,840	7,353
NT	866	826	1,385	867	745	518	306	501	322	338	346	355
QLD	6,416	10,699	26,007	23,765	21,578	9,931	6,881	8,223	8,015	8,416	8,626	8,842
SA	1,966	4,080	7,668	5,143	3,767	2,413	2,218	1,130	1,614	1,775	1,908	2,051
TAS	237	734	2,092	1,167	1,533	762	744	852	585	615	630	646
VIC	1,677	8,759	24,996	7,614	5,887	3,868	2,735	2,557	2,408	2,649	2,848	3,061
WA	6,604	8,792	11,569	10,337	7,785	7,102	6,337	6,681	7,024	7,376	7,560	7,749
Total	23,669	51,306	157,279	83,044	62,720	33,127	25,983	26,960	26,042	27,834	29,070	30,376
SWH certificates created												
ACT	12,141	28,397	50,169	22,897	19,099	9,354	8,345	10,142	9,362	9,794	10,039	10,290
NSW	170,768	713,696	3,021,137	1,167,325	662,471	262,431	210,361	212,787	170,468	194,791	209,401	225,106
NT	26,915	26,505	65,827	31,740	20,807	14,673	8,781	13,489	8,568	9,047	9,273	9,505
QLD	191,928	346,445	1,045,900	793,279	666,758	309,804	217,464	256,925	241,243	258,123	264,576	271,190
SA	60,666	133,496	321,816	170,271	109,047	68,624	64,718	34,623	45,008	51,944	55,839	60,027
TAS	6,653	58,209	143,895	61,940	40,289	22,502	23,303	25,069	16,890	17,911	18,359	18,818
VIC	47,899	578,923	1,652,280	398,889	184,229	118,345	85,835	79,984	73,224	81,705	87,833	94,421
WA	184,539	287,502	385,193	310,613	220,545	198,832	185,532	194,441	203,052	213,937	219,285	224,767
Total	701,509	2,173,173	6,686,217	2,956,954	1,923,245	1,004,565	804,339	827,460	767,815	837,252	874,605	914,124
Certificates per SWH System												
ACT	29.3	32.0	34.2	31.6	31.0	31.0	31.7	32.2	32.4	32.3	32.3	32.3
NSW	31.1	43.2	36.8	34.9	31.8	31.9	32.4	31.8	29.5	30.6	30.6	30.6
NT	31.1	32.1	47.5	36.6	27.9	28.3	28.7	26.9	26.6	26.8	26.8	26.8
QLD	29.9	32.4	40.2	33.4	30.9	31.2	31.6	31.2	30.1	30.7	30.7	30.7
SA	30.9	32.7	42.0	33.1	28.9	28.4	29.2	30.6	27.9	29.3	29.3	29.3
TAS	28.1	79.3	68.8	53.1	26.3	29.5	31.3	29.4	28.8	29.1	29.1	29.1
VIC	28.6	66.1	66.1	52.4	31.3	30.6	31.4	31.3	30.4	30.8	30.8	30.8
WA	27.9	32.7	33.3	30.0	28.3	28.0	29.3	29.1	28.9	29.0	29.0	29.0
Total	29.6	42.4	42.5	35.6	30.7	30.3	31.0	30.7	29.5	30.1	30.1	30.1

Solar PV by Segment

Includes Pending Registration

Summary of REC-Registry Data**(Certificates created as at 25 November 2014)****Attachment 9**

Installation year	State	2009						2010					
		Upgrade	Residential	>10 to 30kW	>30 to 50kW	>50 to 100kW	Total >10kW	Upgrade	Residential	>10 to 30kW	>30 to 50kW	>50 to 100kW	Total >10kW
Installed capacity	ACT		1,253	30			30		4,848	221	41	261	5,109
	NSW		18,673	272	106	151	530		148,553	5,247	43	265	154,109
	NT		366	43			43		1,136	121			1,257
	QLD		24,144	268	66		334		89,185	1,382	469	55	91,091
	SA		12,254	71	83		154		32,460	513	82	99	33,153
	TAS		1,722				-		2,913	37			2,949
	VIC		10,513				-		58,615	218		67	58,899
	WA		14,040	170	30		200		40,256	315	107	159	40,837
		-	82,965	854	285	151	1,290	-	377,966	8,053	741	645	387,405
Valid RECs created	ACT		42,956	740	-	-	740		315,103	5,939	965	-	322,007
	NSW		552,685	6,412	2,329	3,138	11,879		10,410,416	166,960	1,015	5,858	10,584,249
	NT		18,767	1,190	-	-	1,190		84,252	3,495	-	-	87,747
	QLD		768,930	6,457	1,598	-	8,055		6,599,771	38,345	11,543	1,268	6,650,927
	SA		338,146	1,405	1,834	-	3,239		2,157,340	14,425	1,815	2,045	2,175,625
	TAS		38,204	-	-	-	-		112,863	755	-	-	113,618
	VIC		337,483	-	-	-	-		3,290,949	4,916	-	1,190	3,297,055
	WA		372,786	3,828	623	-	4,451		2,666,494	8,345	2,508	3,127	2,680,474
		-	2,469,957	20,032	6,384	3,138	29,554	-	25,637,188	243,180	17,846	13,488	25,911,702
Systems							-						-
	ACT		802	1	-	-	1		2,311	11	1	-	2,323
	NSW		13,990	17	3	2	22		69,667	490	1	3	70,161
	NT		206	3	-	-	3		620	9	-	-	629
	QLD		18,260	19	2	-	21		48,548	91	14	1	48,654
	SA		8,594	6	2	-	8		16,666	32	2	1	16,701
	TAS		1,452	-	-	-	-		1,883	2	-	-	1,885
	VIC		8,429	-	-	-	-		35,658	15	-	1	35,674
	WA		11,142	10	1	-	11		22,209	22	3	2	22,236
		-	62,875	56	8	2	66	-	197,562	672	21	8	198,263
kw/System	ACT		1.56	29.70			29.70		2.10	20.07	40.56		2.20
	NSW		1.33	15.99	35.47	75.72	24.07		2.13	10.71	43.00	88.22	2.20
	NT		1.78	14.32			14.32		1.83	13.42			2.00
	QLD		1.32	14.11	32.87		15.89		1.84	15.19	33.51	55.20	1.87
	SA		1.43	11.90	41.25		19.24		1.95	16.03	40.80	98.69	1.99
	TAS		1.19				1.19		1.55	18.27			1.56
	VIC		1.25				1.25		1.64	14.51		67.00	1.65
	WA		1.26	17.02	30.10		18.21		1.81	14.33	35.57	79.49	1.84
			1.32	15.25	35.59	75.72	19.55		1.91	11.98	35.29	80.57	1.95

Solar PV by Segment

Includes Pending Registration

Summary of REC-Registry Data**(Certificates created as at 25 November 2014)****Attachment 9**

Installation year	State	2011							2012						
		Upgrade	Residential	>10 to 30kW	>30 to 50kW	>50 to 100kW	Total >10kW	Total	Upgrade	Residential	>10 to 30kW	>30 to 50kW	>50 to 100kW	Total >10kW	Total
Installed capacity	ACT	141	15,980	1,048	66		1,115	17,236	109	4,493	293	81	54	429	5,030
	NSW	1,229	181,851	10,695	209	201	11,105	194,185	1,126	133,285	6,342	1,502	1,973	9,817	144,228
	NT	21	881	170	284		453	1,356	119	1,626	301			301	2,045
	QLD	3,090	213,031	5,923	1,885	53	7,860	223,981	11,489	397,438	5,362	3,291	448	9,101	418,028
	SA	2,224	158,864	2,134	98		2,232	163,320	1,277	131,551	4,896	156		5,052	137,879
	TAS	136	5,292	297			297	5,726	720	18,443	709	33	100	841	20,005
	VIC	2,319	136,718	885	79		963	140,001	2,201	197,076	7,156	446	481	8,083	207,360
	WA	2,539	111,548	1,212	265	239	1,715	115,801	3,643	91,906	2,603	537		3,140	98,689
		11,700	824,165	22,363	2,885	493	25,741	861,606	20,682	975,818	27,662	6,046	3,056	36,764	1,033,264
Valid RECs created	ACT	2,885	1,100,605	27,949	1,431	-	29,380	1,132,870	2,233	164,288	6,353	1,764	1,160	9,277	175,798
	NSW	25,033	12,887,701	335,045	4,859	4,235	344,139	13,256,873	23,096	5,286,159	149,669	33,144	42,763	225,576	5,534,831
	NT	483	63,494	4,881	7,279	-	12,160	76,137	2,769	61,210	8,062	-	-	8,062	72,041
	QLD	62,792	14,001,602	151,538	43,401	1,220	196,159	14,260,553	234,952	13,855,852	123,449	71,774	9,591	204,814	14,295,618
	SA	45,078	9,040,285	56,647	2,374	-	59,021	9,144,384	26,048	4,694,971	114,096	3,416	-	117,512	4,838,531
	TAS	2,380	295,401	7,030	-	-	7,030	304,811	12,639	552,294	14,245	586	1,801	16,632	581,565
	VIC	41,321	7,626,742	18,916	1,748	-	20,664	7,688,727	39,221	6,199,833	141,315	8,523	8,760	158,598	6,397,652
	WA	51,861	7,309,081	28,257	6,208	5,334	39,799	7,400,741	74,311	3,855,571	58,423	11,742	-	70,165	4,000,047
		231,833	52,324,911	630,263	67,300	10,789	708,352	53,265,096	415,269	34,670,178	615,612	130,949	64,075	810,636	35,896,083
Systems							-							-	
	ACT	74	6,723	61	2	-	63	6,860	43	1,458	18	2	1	21	1,522
	NSW	626	78,583	995	6	3	1,004	80,213	579	52,863	431	37	25	493	53,935
	NT	13	354	12	7	-	19	386	23	458	20	-	-	20	501
	QLD	2,442	92,405	348	59	1	408	95,255	6,815	122,997	314	100	6	420	130,232
	SA	1,634	61,750	156	3	-	159	63,543	675	40,855	311	4	-	315	41,845
	TAS	88	2,352	23	-	-	23	2,463	347	5,942	57	1	1	59	6,348
	VIC	1,589	58,556	58	2	-	60	60,205	901	64,811	468	12	6	486	66,198
	WA	2,074	49,212	82	8	3	93	51,379	2,805	39,629	167	16	-	183	42,617
		8,540	349,935	1,735	87	7	1,829	360,304	12,188	329,013	1,786	172	39	1,997	343,198
kw/System	ACT	1.91	2.38	17.19	33.02		17.69	2.51	2.53	3.08	16.30	40.31	54.48	20.41	3.30
	NSW	1.96	2.31	10.75	34.85	67.12	11.06	2.42	1.94	2.52	14.71	40.60	78.92	19.91	2.67
	NT	1.60	2.49	14.15	40.51		23.86	3.51	5.17	3.55	15.04			15.04	4.08
	QLD	1.27	2.31	17.02	31.94	52.88	19.26	2.35	1.69	3.23	17.08	32.91	74.63	21.67	3.21
	SA	1.36	2.57	13.68	32.71		14.04	2.57	1.89	3.22	15.74	38.97		16.04	3.29
	TAS	1.55	2.25	12.91			12.91	2.32	2.07	3.10	12.43	33.00	99.84	14.26	3.15
	VIC	1.46	2.33	15.25	39.43		16.06	2.33	2.44	3.04	15.29	37.15	80.17	16.63	3.13
	WA	1.22	2.27	14.78	33.07	79.50	18.44	2.25	1.30	2.32	15.59	33.59		17.16	2.32
		1.37	2.36	12.89	33.16	70.39	14.07	2.39	1.70	2.97	15.49	35.15	78.36	18.41	3.01

Solar PV by Segment

Includes Pending Registration

Summary of REC-Registry Data**(Certificates created as at 30 November 2015)**

Installation year	State	2013							2014						
		Upgrade	Residential	>10 to 30kW	>30 to 50kW	>50 to 100kW	Total >10kW	Total	Upgrade	Residential	>10 to 30kW	>30 to 50kW	>50 to 100kW	Total >10kW	Total
Installed capacity	ACT	110	9,262	1,231	30	149	1,410	10,781	70	4,515	131	-	80	211	4,796
	NSW	2,219	104,779	13,125	3,381	9,818	26,324	133,323	4,859	123,276	19,496	6,290	17,958	43,744	171,879
	NT	83	4,245	341	94	283	718	5,046	274	4,226	292	453	837	1,582	6,081
	QLD	16,210	239,653	8,254	2,984	1,537	12,774	268,637	17,634	208,152	12,228	4,008	6,511	22,747	248,533
	SA	3,106	121,962	13,741	421	2,065	16,227	141,295	5,284	58,162	13,909	794	4,190	18,893	82,339
	TAS	1,749	28,056	934	162	574	1,670	31,475	669	16,707	868	299	415	1,582	18,958
	VIC	2,730	115,373	8,843	1,271	3,104	13,218	131,320	3,859	142,977	14,249	2,783	7,370	24,402	171,238
	WA	3,069	58,416	4,901	2,081	1,013	7,995	69,480	3,153	76,518	6,414	4,889	4,010	15,313	94,984
		29,274	681,746	51,370	10,425	18,542	80,336	791,356	35,802	634,533	67,585	19,518	41,371	128,474	798,809
Valid RECs created	ACT	2,260	193,118	25,566	624	3,083	29,273	224,651	1,448	92,912	2,704	-	1,658	4,362	98,722
	NSW	45,806	2,251,874	275,541	71,122	203,466	550,129	2,847,809	100,454	2,541,306	404,262	131,001	372,522	907,785	3,549,545
	NT	1,953	100,324	8,018	2,230	6,517	16,765	119,042	6,324	98,272	6,823	10,602	19,495	36,920	141,516
	QLD	331,470	5,108,201	172,033	61,951	32,062	266,046	5,705,717	361,346	4,298,257	254,160	83,262	135,841	473,263	5,132,866
	SA	63,599	2,532,613	283,226	8,807	41,513	333,546	2,929,758	108,519	1,194,144	286,573	16,455	87,041	390,069	1,692,732
	TAS	30,697	507,278	16,671	2,911	10,200	29,782	567,757	11,750	294,760	15,393	5,318	7,377	28,088	334,598
	VIC	48,602	2,106,029	161,494	23,449	56,970	241,913	2,396,544	68,101	2,542,938	258,820	51,266	135,863	445,949	3,056,988
	WA	62,595	1,239,771	102,147	42,295	18,912	163,354	1,465,720	64,466	1,575,377	132,743	99,404	79,107	311,254	1,951,097
		586,982	14,039,208	1,044,696	213,389	372,723	1,630,808	16,256,998	722,408	12,637,966	1,361,478	397,308	838,904	2,597,690	15,958,064
Systems							-								16,002
	ACT	32	2,297	79	1	2	82	2,411	22	1,191	8	-	1	9	1,222
	NSW	1,021	32,007	754	85	117	956	33,984	1,832	33,897	1,091	151	213	1,455	37,184
	NT	27	971	21	2	3	26	1,024	74	912	17	11	10	38	1,024
	QLD	9,992	60,609	478	87	20	585	71,186	8,730	48,145	669	111	80	860	57,735
	SA	1,136	27,258	753	11	24	788	29,182	1,431	12,967	683	21	48	752	15,150
	TAS	749	6,836	59	4	8	71	7,656	243	3,900	51	8	5	64	4,207
	VIC	1,105	31,657	495	32	38	565	33,327	1,367	37,768	747	67	94	908	40,043
	WA	2,147	19,132	245	60	12	317	21,596	1,897	21,088	319	134	46	499	23,484
kw/System		16,209	180,767	2,884	282	224	3,390	200,366	15,596	159,868	3,585	503	497	4,585	180,049
	ACT	3.43	4.03	15.58	30.14	74.38	17.19	4.47	3.20	3.79	16.33		80.00	23.41	3.93
	NSW	2.17	3.27	17.41	39.78	83.92	27.54	3.92	2.65	3.64	17.87	41.66	84.31	30.06	4.62
	NT	3.07	4.37	16.26	47.01	94.30	27.63	4.93	3.70	4.63	17.16	41.21	83.67	41.63	5.94
	QLD	1.62	3.95	17.27	34.30	76.84	21.84	3.77	2.02	4.32	18.28	36.10	81.39	26.45	4.30
	SA	2.73	4.47	18.25	38.28	86.03	20.59	4.84	3.69	4.49	20.36	37.82	87.30	25.12	5.43
	TAS	2.33	4.10	15.82	40.59	71.76	23.52	4.11	2.75	4.28	17.01	37.43	83.03	24.72	4.51
	VIC	2.47	3.64	17.86	39.72	81.68	23.39	3.94	2.82	3.79	19.08	41.54	78.40	26.87	4.28
	WA	1.43	3.05	20.00	34.69	84.39	25.22	3.22	1.66	3.63	20.11	36.49	87.16	30.69	4.04
		1.81	3.77	17.81	36.97	82.78	23.70	3.95	2.30	3.97	18.85	38.80	83.24	28.02	4.44

Solar PV by Segment**Attachment 9**

Includes Pending Registration

Installation year	State	2015						Total
		Upgrade	Residential	>10 to 30kW	>30 to 50kW	>50 to 100kW	Total >10kW	
Installed capacity	ACT	127	2,964	219	86	1,087	1,393	4,484
	NSW	3,948	105,746	20,462	6,282	15,419	42,163	151,857
	NT	49	4,450	345	465	1,769	2,580	7,079
	QLD	12,377	136,491	11,206	3,674	5,273	20,153	169,021
	SA	4,824	38,736	9,345	552	2,777	12,674	56,234
	TAS	197	5,756	793	391	414	1,598	7,552
	VIC	4,027	94,350	13,061	3,217	8,701	24,979	123,356
	WA	2,003	63,108	6,308	5,128	4,222	15,658	80,769
		27,554	451,601	61,741	19,796	39,661	121,198	600,352
Valid RECs created	ACT	2,622	60,982	4,542	1,788	22,530	28,860	92,464
	NSW	81,622	2,179,938	424,304	130,829	319,840	874,973	3,136,533
	NT	1,139	103,483	8,075	10,875	41,227	60,177	164,799
	QLD	253,632	2,818,477	232,905	76,339	110,009	419,253	3,491,361
	SA	99,072	795,302	192,549	11,438	57,672	261,660	1,156,035
	TAS	3,470	101,550	14,078	6,949	7,351	28,378	133,398
	VIC	71,068	1,678,082	237,244	59,247	160,413	456,905	2,206,054
	WA	40,958	1,299,291	130,561	104,257	83,288	318,106	1,658,355
		553,583	9,037,104	1,244,258	401,722	802,332	2,448,312	12,038,999
Systems							-	
	ACT	35	687	12	2	13	27	749
	NSW	1,350	26,076	1,190	153	183	1,526	28,952
	NT	21	967	17	11	20	48	1,036
	QLD	5,096	29,246	646	103	62	811	35,153
	SA	1,136	8,665	497	14	32	543	10,344
	TAS	63	1,465	46	10	6	62	1,590
	VIC	1,259	23,919	711	80	106	897	26,075
	WA	1,037	16,136	353	140	45	538	17,711
		9,997	107,161	3,472	513	467	4,452	121,610
kw/System	ACT	3.64	4.31	18.29	43.19	83.62	51.59	5.99
	NSW	2.92	4.06	17.20	41.06	84.25	27.63	5.25
	NT	2.35	4.60	20.31	42.27	88.47	53.74	6.83
	QLD	2.43	4.67	17.35	35.67	85.05	24.85	4.81
	SA	4.25	4.47	18.80	39.44	86.77	23.34	5.44
	TAS	3.13	3.93	17.25	39.12	68.95	25.78	4.75
	VIC	3.20	3.94	18.37	40.21	82.09	27.85	4.73
	WA	1.93	3.91	17.87	36.63	93.81	29.10	4.56
		2.76	4.21	17.78	38.59	84.93	27.22	4.94

Solar Hot Water by Segment**Summary of REC-Registry Data**
(Certificates created as at end November 2015)**Attachment 10**

SWH certificates		Includes Pending Registration																	
		New building									Replacement								
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2007	2008	2009	2010	2011	2012	2013	2014	2015
ACT		1,111	3,641	18,125	7,501	13,138	12,503	6,071	4,684	4,425	12,141	28,397	50,169	22,897	19,099	9,354	8,345	10,130	7,484
NSW		100,171	130,824	131,981	172,125	145,841	83,654	87,769	97,168	60,841	170,768	713,696	3,021,137	1,167,325	662,471	262,431	210,361	212,545	136,265
NT		16,672	13,851	10,468	13,429	13,929	18,070	15,734	15,179	11,086	26,915	26,505	65,827	31,740	20,807	14,673	8,781	13,474	6,849
QLD		330,947	418,149	374,016	339,788	275,585	259,317	198,795	171,145	105,435	191,928	346,445	1,045,900	793,279	666,758	309,804	217,464	256,632	192,840
SA		28,075	36,438	38,281	54,845	51,074	29,642	22,678	25,088	11,361	60,666	133,496	321,816	170,271	109,047	68,624	64,718	34,584	35,978
TAS		3,301	8,056	11,377	8,115	4,994	3,889	2,401	3,416	4,382	6,653	58,209	143,895	61,940	40,289	22,502	23,303	25,040	13,501
VIC		184,040	325,693	457,839	533,397	531,095	434,730	461,636	510,996	377,187	47,899	578,923	1,652,280	398,889	184,229	118,345	85,835	79,893	58,532
WA		150,930	121,986	142,995	188,152	162,535	144,164	143,109	131,762	100,542	184,539	287,502	385,193	310,613	220,545	198,832	185,532	194,220	162,312
Total		815,247	1,058,638	1,185,082	1,317,352	1,198,191	985,969	938,193	959,438	675,259	701,509	2,173,173	6,686,217	2,956,954	1,923,245	1,004,565	804,339	826,518	613,761

SWH systems installed

New building										Replacement									
	2007	2008	2009	2010	2011	2012	2013	2014	2015		2007	2008	2009	2010	2011	2012	2013	2014	2015
ACT	39	113	507	236	422	432	190	135	128		414	888	1,467	724	616	302	263	315	231
NSW	3,276	3,675	3,361	5,098	4,522	2,579	2,646	2,942	2,006		5,489	16,528	82,095	33,427	20,809	8,231	6,499	6,693	4,624
NT	548	410	346	436	522	653	578	525	405		866	826	1,385	867	745	518	306	500	257
QLD	10,414	12,631	10,652	10,497	9,359	9,042	6,529	5,218	3,283		6,416	10,699	26,007	23,765	21,578	9,931	6,881	8,214	6,407
SA	903	1,023	1,126	1,669	1,677	1,060	765	801	359		1,966	4,080	7,668	5,143	3,767	2,413	2,218	1,129	1,290
TAS	113	172	177	266	192	137	83	111	156		237	734	2,092	1,167	1,533	762	744	851	468
VIC	7,480	12,449	17,124	20,119	20,559	17,726	16,873	18,085	13,754		1,677	8,759	24,996	7,614	5,887	3,868	2,735	2,554	1,925
WA	4,535	3,606	4,123	5,728	5,077	4,710	4,652	3,999	2,917		6,604	8,792	11,569	10,337	7,785	7,102	6,337	6,673	5,615
Total	27,308	34,079	37,416	44,049	42,330	36,339	32,316	31,816	23,008		23,669	51,306	157,279	83,044	62,720	33,127	25,983	26,929	20,817

Certificates per SWH System

		New building									Replacement								
	2007	2008	2009	2010	2011	2012	2013	2014	2015		2007	2008	2009	2010	2011	2012	2013	2014	2015
ACT	28.5	32.2	35.7	31.8	31.1	28.9	32.0	34.7	34.6		29.3	32.0	34.2	31.6	31.0	31.0	31.7	32.2	32.4
NSW	30.6	35.6	39.3	33.8	32.3	32.4	33.2	33.0	30.3		31.1	43.2	36.8	34.9	31.8	31.9	32.4	31.8	29.5
NT	30.4	33.8	30.3	30.8	26.7	27.7	27.2	28.9	27.4		31.1	32.1	47.5	36.6	27.9	28.3	28.7	26.9	26.6
QLD	31.8	33.1	35.1	32.4	29.4	28.7	30.4	32.8	32.1		29.9	32.4	40.2	33.4	30.9	31.2	31.6	31.2	30.1
SA	31.1	35.6	34.0	32.9	30.5	28.0	29.6	31.3	31.6		30.9	32.7	42.0	33.1	28.9	28.4	29.2	30.6	27.9
TAS	29.2	46.8	64.3	30.5	26.0	28.4	28.9	30.8	28.1		28.1	79.3	68.8	53.1	26.3	29.5	31.3	29.4	28.8
VIC	24.6	26.2	26.7	26.5	25.8	24.5	27.4	28.3	27.4		28.6	66.1	66.1	52.4	31.3	30.6	31.4	31.3	30.4
WA	33.3	33.8	34.7	32.8	32.0	30.6	30.8	32.9	34.5		27.9	32.7	33.3	30.0	28.3	28.0	29.3	29.1	28.9
Total	29.9	31.1	31.7	29.9	28.3	27.1	29.0	30.2	29.3		29.6	42.4	42.5	35.6	30.7	30.3	31.0	30.7	29.5

Solar Hot Water by Segment
Summary of REC-Registry Data
(Certificates created as at end November 2015)
Attachment 10**SWH certificates****Includes Pending Registration**

	Total Market								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
ACT	13,252	32,038	68,294	30,398	32,237	21,857	14,416	14,814	11,909
NSW	270,939	844,520	3,153,118	1,339,450	808,312	346,085	298,130	309,713	197,106
NT	43,587	40,356	76,295	45,169	34,736	32,743	24,515	28,653	17,935
QLD	522,875	764,594	1,419,916	1,133,067	942,343	569,121	416,259	427,777	298,275
SA	88,741	169,934	360,097	225,116	160,121	98,266	87,396	59,672	47,339
TAS	9,954	66,265	155,272	70,055	45,283	26,391	25,704	28,456	17,883
VIC	231,939	904,616	2,110,119	932,286	715,324	553,075	547,471	590,889	435,719
WA	335,469	409,488	528,188	498,765	383,080	342,996	328,641	325,982	262,854
Total	1,516,756	3,231,811	7,871,299	4,274,306	3,121,436	1,990,534	1,742,532	1,785,956	1,289,020

SWH systems installed

	Total Market								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
ACT	453	1,001	1,974	960	1,038	734	453	450	359
NSW	8,765	20,203	85,456	38,525	25,331	10,810	9,145	9,635	6,630
NT	1,414	1,236	1,731	1,303	1,267	1,171	884	1,025	662
QLD	16,830	23,330	36,659	34,262	30,937	18,973	13,410	13,432	9,690
SA	2,869	5,103	8,794	6,812	5,444	3,473	2,983	1,930	1,649
TAS	350	906	2,269	1,433	1,725	899	827	962	624
VIC	9,157	21,208	42,120	27,733	26,446	21,594	19,608	20,639	15,679
WA	11,139	12,398	15,692	16,065	12,862	11,812	10,989	10,672	8,532
Total	50,977	85,385	194,695	127,093	105,050	69,466	58,299	58,745	43,825

Certificates per SWH :

	Total Market								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
ACT	29.3	32.0	34.6	31.7	31.1	29.8	31.8	32.9	33.2
NSW	30.9	41.8	36.9	34.8	31.9	32.0	32.6	32.1	29.7
NT	30.8	32.7	44.1	34.7	27.4	28.0	27.7	28.0	27.1
QLD	31.1	32.8	38.7	33.1	30.5	30.0	31.0	31.8	30.8
SA	30.9	33.3	40.9	33.0	29.4	28.3	29.3	30.9	28.7
TAS	28.4	73.1	68.4	48.9	26.3	29.4	31.1	29.6	28.7
VIC	25.3	42.7	50.1	33.6	27.0	25.6	27.9	28.6	27.8
WA	30.1	33.0	33.7	31.0	29.8	29.0	29.9	30.5	30.8
Total	29.8	37.8	40.4	33.6	29.7	28.7	29.9	30.4	29.4

Attachment 11

Delay in Certificate Creation

1. Solar PV

kW installations	To Dec 2014	To Nov 2015	To Dec 2015	% created in 2015
2014 Generation year				
New Residential	591,095	634,533	636,284	7.1%
Non Residential	117,998	128,474	128,829	8.4%
System Upgrades	34,702	35,802	35,901	3.3%
	743,795	798,809	801,014	7.1%

kW installations	To Nov 2015	To Dec 2015	To Dec 2016	% created in 2016
2015 Generation year				
New Residential	451,601	497,664	535,711	7.1%
Non Residential	121,198	133,560	145,819	8.4%
System Upgrades	27,554	30,365	31,413	3.3%
	600,353	661,589	712,943	7.2%

2. Solar Hot Water

STCs	To Dec 2014	To Nov 2015	To Dec 2015	% created in 2015
2014 Generation year				
New Building	749,207	959,438	960,532	22.0%
Replacement	765,092	826,518	827,460	7.5%
	1,514,299	1,785,956	1,787,992	15.3%

STCs	To Nov 2015	To Dec 2015	To Dec 2016	% created in 2016
2015 Generation year				
New Building	675,259	781,067	1,001,379	22.0%
Replacement	613,761	709,933	767,805	7.5%
	1,289,020	1,491,000	1,769,183	15.7%