



Green Energy  
**Markets**

## **Small-scale technology certificates Data modelling for 2015 to 2017**

Report to the Clean Energy Regulator

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Green Energy Markets  
2 Domville Ave Hawthorn VIC 3122  
T: 03 9805 0777 F: 03 9815 1066  
[admin@greenmarkets.com.au](mailto:admin@greenmarkets.com.au)  
[www.greenmarkets.com.au](http://www.greenmarkets.com.au)

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## Table of Contents

	<b>Page</b>
Executive Summary	5
1. Project Scope	8
2. Methodology and Assumptions	9
3. STC Market Overview	11
4. PV Market Review	12
5. SWH Market Review	18
6. Solar PV Projections – New Residential	20
7. Solar PV Projections – Non-residential (Commercial)	26
8. Solar PV Projections – Upgrades	32
9. SWH and Air Sourced Heat Pump Projections	33
10. Other small generating units	38
11. Resources	39

### 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 for PV Systems
Attachment 12.	Delay in Creation for SWH Systems

### Disclaimer

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## Executive Summary

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 2015 calendar year, and for the 2016 and 2017 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 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. We have assumed that a wholesale spot STC price of \$38.00 applies for the 2015 to 2017 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

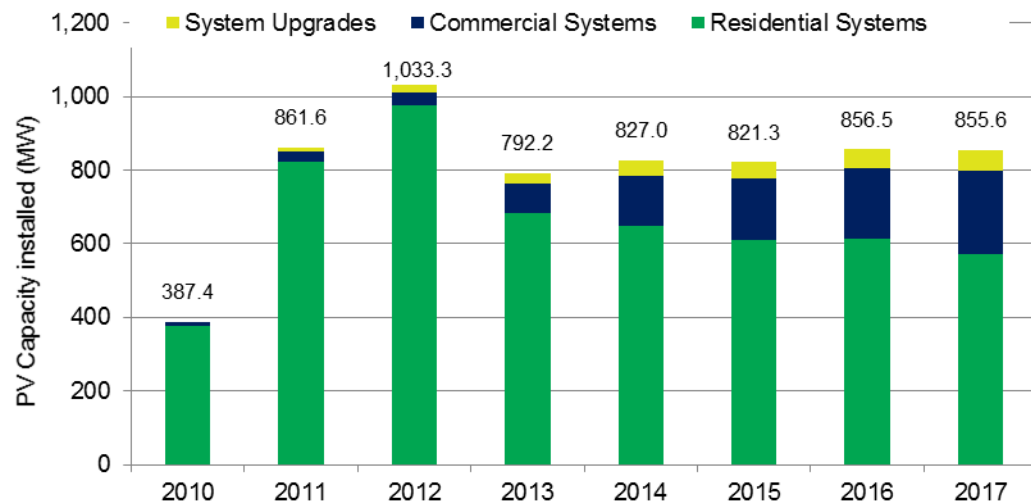
The market attributes, financial and economic drivers for each of these sectors vary and where possible we have segmented the data provided by the CER data to separately identify the level and size of installations in each segment. This has formed the basis of our projections for the 2015 to 2017 period.

On analysis of the CER data the following key trends are worth noting:

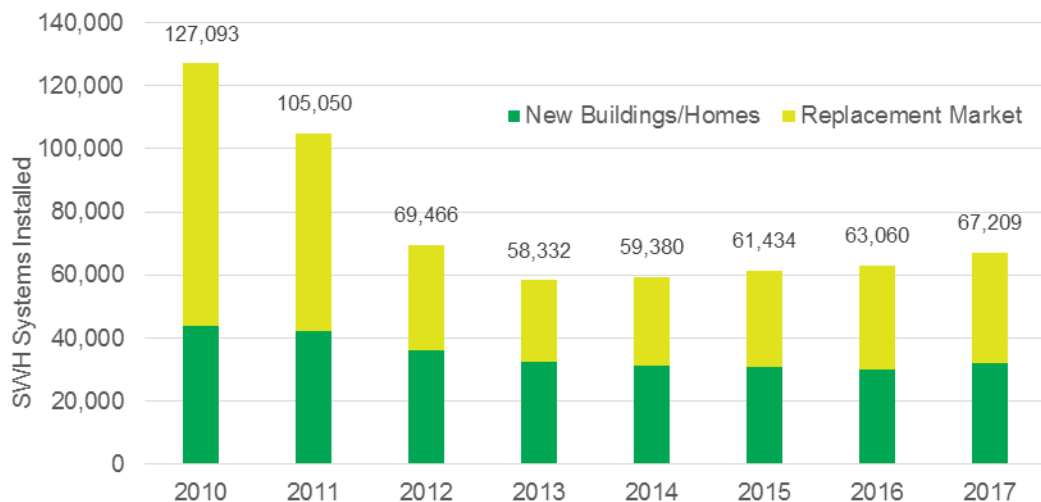
- The number of new residential PV installations has continued to fall and is half the level achieved several years ago;
- The number of commercial size PV system installations (greater than 10 kW) has continued to increase and accounted for approximately 17 per cent of installed PV capacity in 2014;
- The average system size across all PV market segments continues to increase, though the rate of increase has slowed;
- The number of STCs per installed kW of PV has continued to drop as the removal of Solar Credits Multiplier has worked its way through the system;
- The number of SWH systems installed in new homes has remained reasonably stable over the last 5 years, generally following the level of new home installations; and
- The number of SWH systems installed in the replacement market has dropped dramatically over the last few years however installations seem to have bottomed in 2013 with installations expected to increase by 8 per cent in 2014.

Solar PV is expected to continue to dominate STC creation accounting for 90 per cent of total creation in 2014. Installed solar PV capacity claiming STCs is expected to increase by 4.4 per cent in 2014 to 827 MW. This is 20 per cent lower than the peak reached in 2012 of 1,033 MW.

We expect that 821 MW will be installed in 2015, slightly lower than 2014 levels. Installations are projected to grow modestly in 2016 and 2017. We expect that the residential PV market will continue to decline, however the loss in capacity is expected to be made up by the growing commercial and upgrade markets (refer to chart below).



The SWH market appears to have bottomed with 2014 experiencing a growth in system installations following three years of decline. We expect a modest increase in SWH installations driven largely by increases in the replacement market.



In STC creation terms we expect that 17.9 million STCs will be submitted for registration in 2014 a reduction of 12 per cent from 2013. We expect that 17.9 million STCs will also be submitted for registration in 2015 and we expect this to increase marginally to 18.6 million

in 2016 and then fall to 17.7 million in 2017. The fall in creation in 2017 is primarily due to the reduction in the deeming period for solar PV from 15 years to 14 years.

Year of Creation	2013	2014	2015	2016	2017
<b>STCs for systems installed in the year</b>					
Solar PV	16,272	16,187	16,083	16,768	15,628
SWH	1,743	1,788	1,853	1,903	2,027
<b>Total</b>	<b>18,015</b>	<b>17,975</b>	<b>17,935</b>	<b>18,671</b>	<b>17,655</b>
Less STCs submitted the following year (lag)	1,826	1,905	1,938	2,043	1,989
Add Previous year installs created this year	4,121	1,826	1,905	1,938	2,043
<b>STCs submitted for creation</b>	<b>20,310</b>	<b>17,897</b>	<b>17,902</b>	<b>18,566</b>	<b>17,709</b>

There is uncertainty around the estimates in particular around the following factors:

- Variability in international PV system prices and exchange rates;
- Extent of the contraction in the residential PV market; and
- Extent of the growth in the commercial PV market.

We have undertaken a sensitivity analysis and believe that the lower bound estimate for 2015 creation is 16.7 million and the upper bound estimate is 19.1 million STCs.

'000 STCs Submitted for Creation	2013	2014	2015	2016	2017
Total Certificates - Base Case	20,310	17,897	17,902	18,566	17,709
Total Certificates - High Case	20,310	17,897	19,102	19,769	18,755
Total Certificates - Low Case	20,310	17,897	16,702	17,363	16,663

## 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 2015 calendar year, and for the 2016 and 2017 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 2015 to 31 December 2015, and the following two calendar years 2016 and 2017.

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 2014; and
- Large Generation Certificates as defined by the amended legislation.



## 2. Methodology and Assumptions

GEM has developed forward estimates separately for each of the small-scale technologies that are able to produce STCs over the 2015 to 2017 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.

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 three sub-markets which are each subject to different incentives and regulations – these are the new building market (residential), the replacement market (for existing water heaters in residences) and the million solar roofs market. 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);
- We assume that the regulated phase out of electric resistant water heaters does not happen or at least is deferred beyond the forecast period; 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.

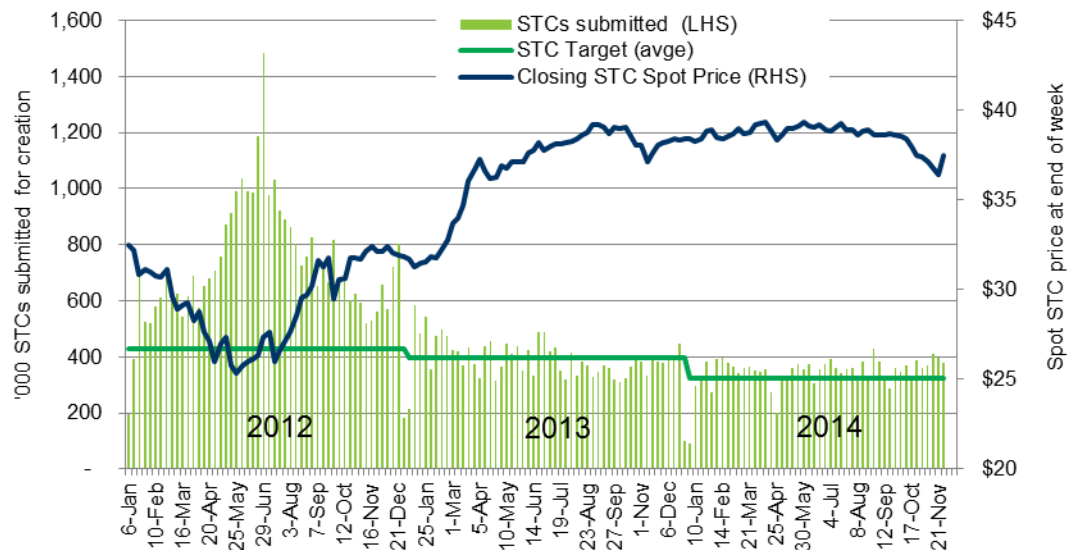
### 3. STC Market Overview

#### STC market

The level of STC creation over the 2013 to 2014 period has been very stable and has broadly tracked the level of the STC target (Figure 3.1). This is in stark contrast to the level of creation in 2012 which was quite volatile and impacted by changes to the Solar Credits Multiplier and changes to state feed-in tariffs.

The stable level of STC creation has resulted in a progressive increase in the STC price through 2013. The spot STC price has been fairly stable for most of 2014 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 and averaged \$38.59 for 2014 (to the end of November). For the purposes of our analysis we have assumed that the average STC price for 2015 is \$38 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 2015 the number of certificates created from the installation of solar systems in 2014.

We have analysed the time it takes to create STCs for each of the market sectors that we analysed (refer to Attachments 11 and 12). For solar PV systems installed in 2013, 90.4 per cent of STCs were created in 2013 and 9.6 per cent were created in 2014. For SWH systems installed in 2013, 15.5 per cent of STCs were created in 2014. We have assumed that similar profiles apply to solar PV and SWH systems installed in 2014 and beyond.

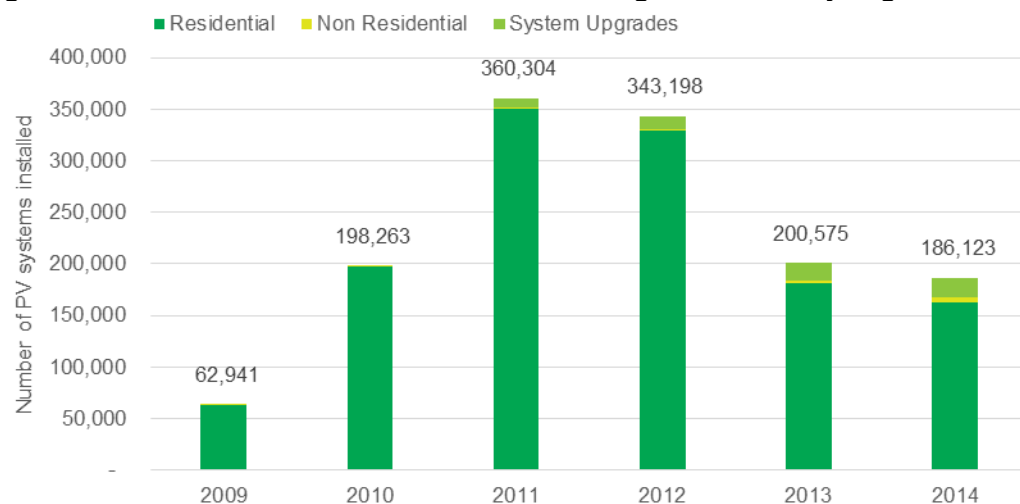
## 4. Solar PV - Market Review

The Australian solar PV market has undergone considerable change as it has grown from 20 MW of installations in 2008 to more than 1,030 MW in 2012.

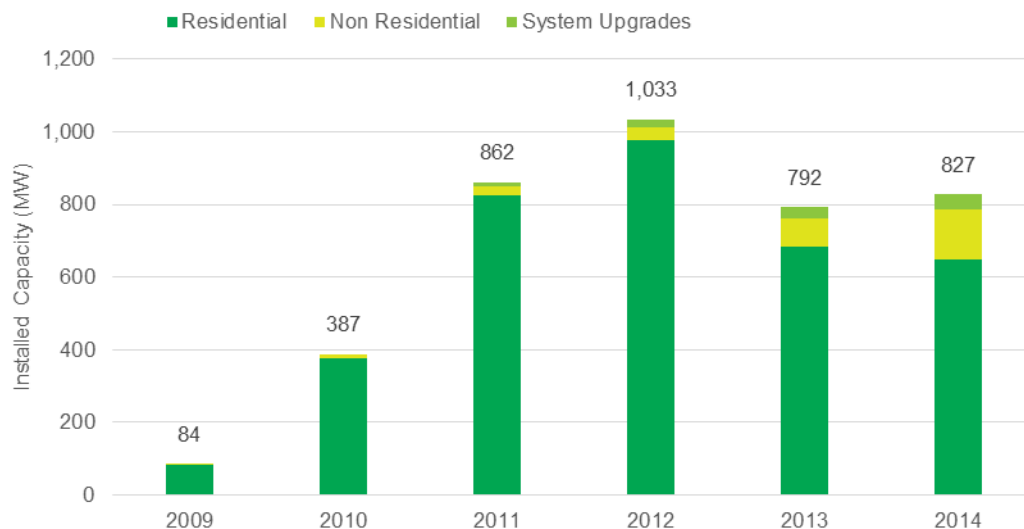
Unlike many international markets the Australian PV market is predominantly a residential market with relatively few large installations. The solar PV market grew to a peak of more than 360,000 installations in 2013 supported by attractive state-based feed in tariffs and the Solar Credit Multiplier (refer to Figure 4.1). As these support mechanisms were progressively unwound the number of installations dropped dramatically reaching 186,000 in 2014.

By the end of October 2014 a total of 1.32 million solar PV systems had been installed and claimed certificates accounting for an installed capacity of nearly 3,800 MW.

**Figure 4.1 Number of Solar PV installations claiming Certificates by Segment**



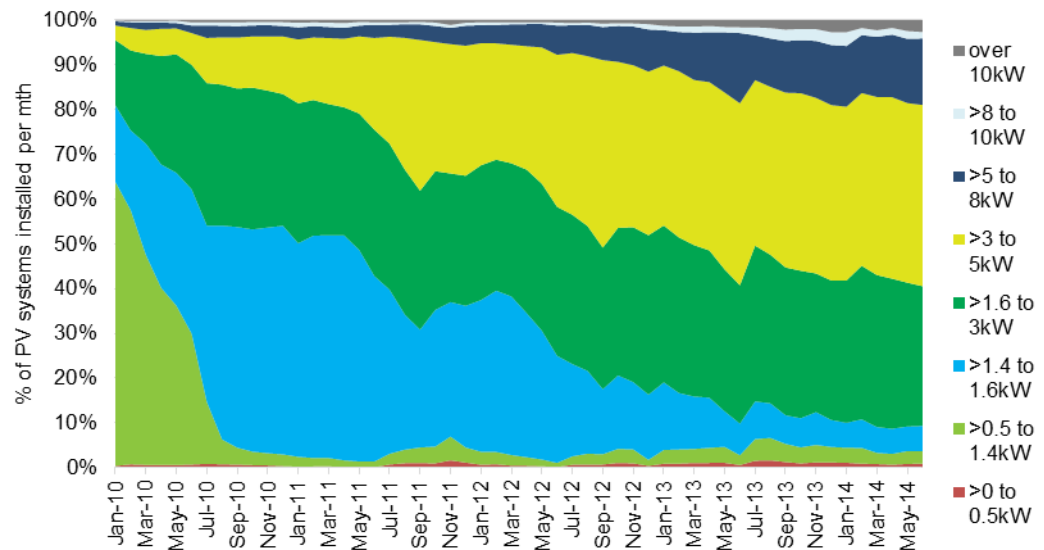
**Figure 4.2 Solar PV installed capacity claiming Certificates by Segment**



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 139 MW in 2014 and account for 16.8 per cent of capacity installed for the year (Figure 4.2).

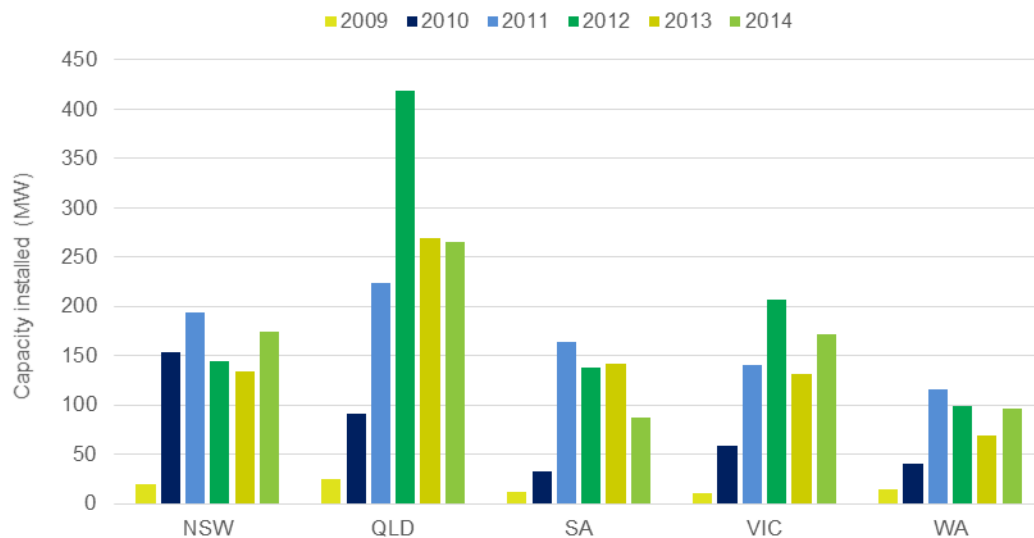
The size of PV systems installed has increased considerably since 2009 as the level of policy support has changed (Figure 4.3).

**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**

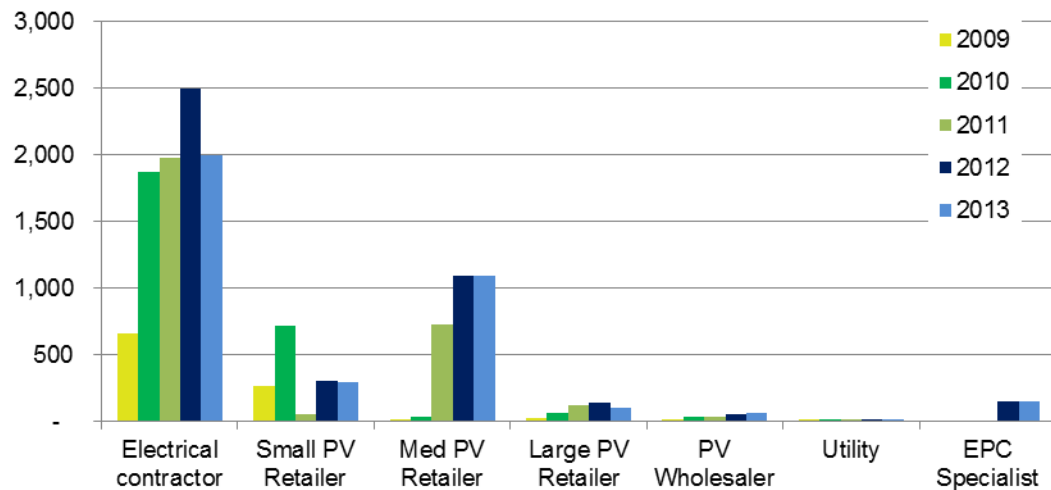


Queensland has clearly been the largest market for solar PV over the last four years (Figure 4.4). Queensland and South Australia were the last key states to wind back their feed in

tariffs and as a result achieved saturation rates in excess of 35 per cent in the residential market (refer to Section 6). After achieving significant growth in 2012, capacity installed across most states fell and appears to have stabilised over the 2013-14 period.

In our 2013 Report for the CER we undertook a more detailed assessment of the structure of the PV market in Australia.<sup>1</sup> At the end of 2013, there were an estimated 3,780 businesses active in the PV industry in Australia, a decline of at least 12 per cent compared to the previous year (Figure 4.5).

**Figure 4.5 Number of active businesses in the solar PV market**



The capacity installed in 2014 is 4.4 per cent higher than in 2013 and the market structure in 2014 is broadly the same as it was in 2013. The industry has continued to experience intense competition driven by the desire to maintain volume and market share which has led to lower margins.

The winding back of feed in tariffs and the growth in the commercial market has resulted in added complexity in the sales process. The enhanced sophistication required in the sales process is also likely to support industry consolidation as it is not as easy to sell a system as it once was.

The highest number of businesses represented are electrical contractors, accounting for more than half of the total number of businesses active in the PV industry in 2013. These businesses play a vital role in the installation of PV and their number is a crucial measure of the industry's capacity to install any given volume. Indications are that many of these businesses have been a lot less active in solar PV over the last few years and have focused on other market sectors.

### Forecasting Installed PV costs

Installed system costs continued to fall through 2013 and 2014 as local market competition became more intense as the level of installed capacity reduced.

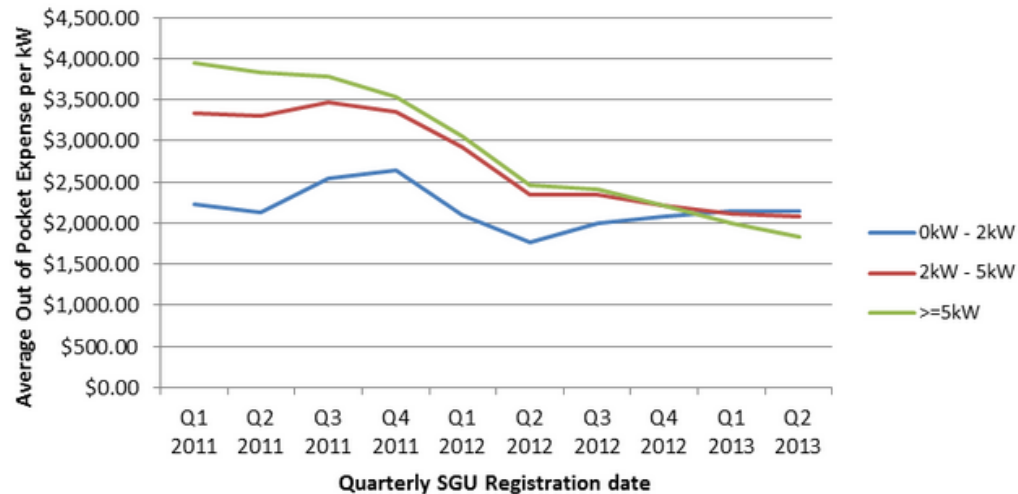
In previous years we were able to utilise CER data for "out of pocket expense". Unfortunately since July 2013, the requirement to collect and analyse this information has ceased as a

<sup>1</sup> SolarBusinessServices assessment of the Australian PV market.

result of changes to regulations. The last published data for Q2 2013 (Figure 4.6) shows that net “out of pocket expenses” declined to approximately \$2,000 per kW by Q2 2013.

**Figure 4.6 Average “out-of-pocket” costs (Extract from CER website)**

Quarterly average out-of-pocket expense per kW by installed capacity

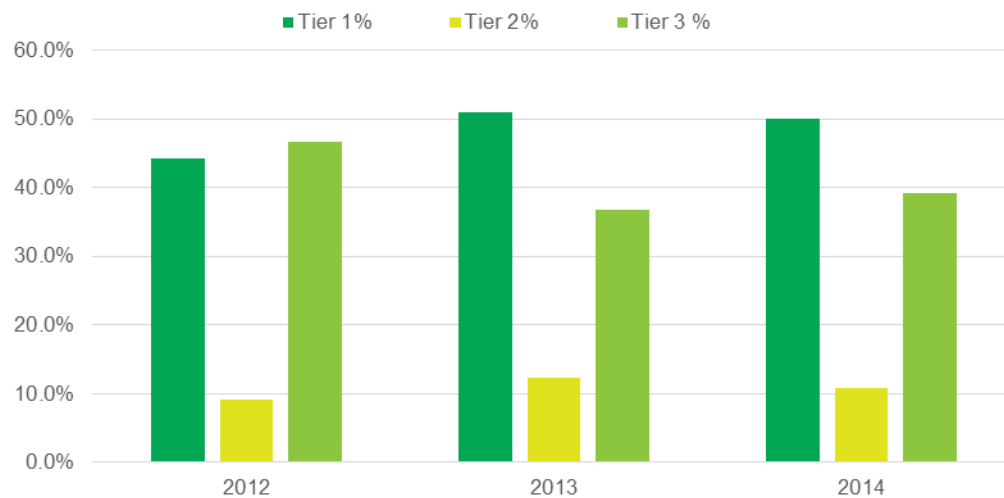


Although the cost of PV modules has decreased in importance, it remains the largest single component of the installed cost of a system. Cost reductions have occurred through all components of a PV system through to 2013. In 2014 however, total system cost reductions have been predominantly due to non-module components. Sales, marketing, installation and administration costs have all continued to fall. In addition margins have also contracted due to increased competition.

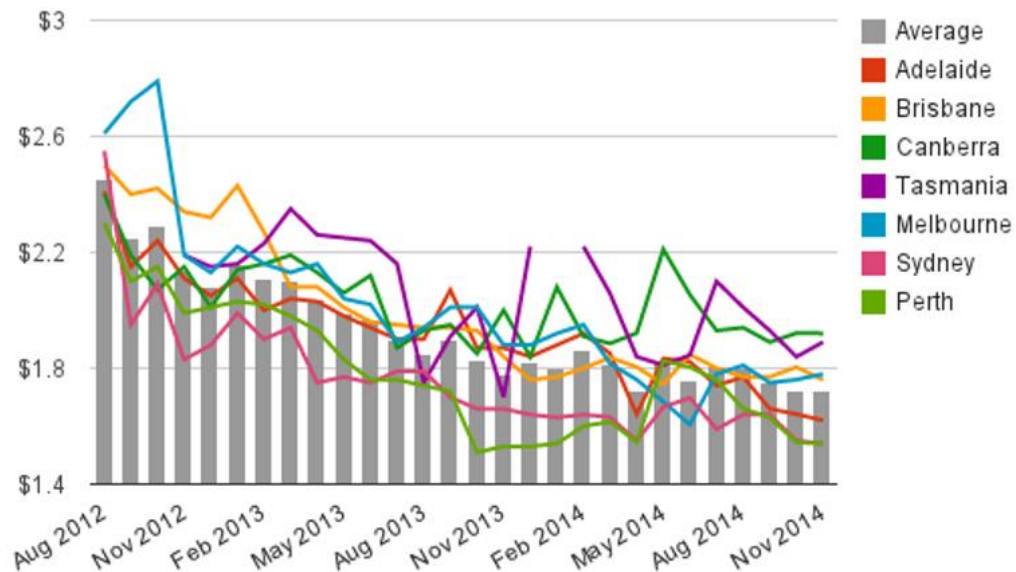
With rising saturation levels in the residential market it has become more difficult to secure and close sales. This has increased the cost and complexity of achieving sales. In addition the cost and time it takes to arrange connection to local distribution networks is also increasing and putting pressure 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 85 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.

Australia has thus been viewed as an attractive market and has one of the highest proportions of Tier 2 and 3 products, estimated at 65 per cent in 2011 resulting in average PV prices at or below the lowest average world prices. However, this has been steadily changing with the number of Tier 1 installations continuing to increase so that they represent half the market (Figure 4.7).

**Figure 4.7 Changes in nature of panels installed in Australia**

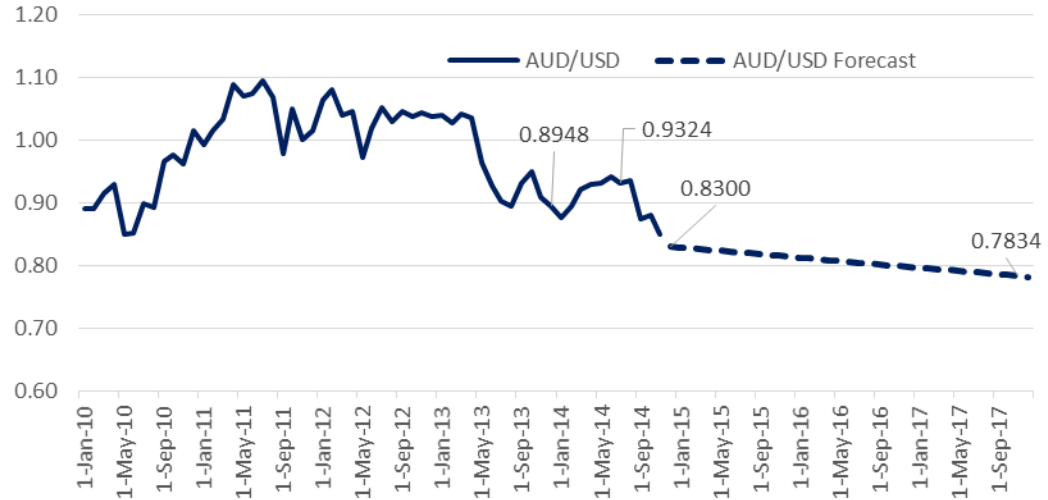
Solar Choice publishes average installed system prices (Figure 4.8) this incorporates the value of STCs and so reflects the out of pocket expense for the customer (similar approach to the CER analysis in Figure 4.6). The Solar Choice analysis shows that net system prices fell steadily from the middle of 2012 to the end of 2013. During 2014, however prices have remained reasonably stable falling only slightly over the course of the year.

**Figure 4.8 Installed system Costs (after STCs) for 4kW system (\$/Watt) (Solar Choice end November 2014)**

Key factors that will influence system pricing over the next three years include:

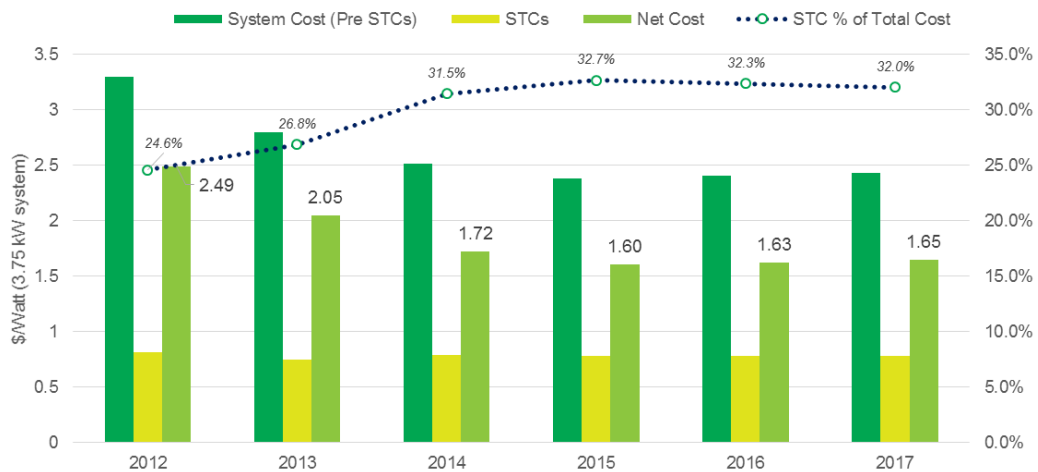
- Changes to the AUD/USD exchange rate;
- The continued growth in commercial and project sales will continue to favour more bankable Tier 1 brands and thus, may potentially increase average prices;
- Global supply and demand factors; and
- Local consolidation across the supply chain and the reduction in industry volumes will put increased pressure on margin requirements and thus increase average prices.



**Figure 4.9 AUD/USD Exchange Rate**

We expect that the installed system cost for 2015 will average \$1.60 Watt which broadly reflects the price in December 2014 and factors in a AUD/USD exchange rate of 0.83. We expect that the exchange will deteriorate slightly over the forecast period (Figure 4.9) which will result in a nominal increase in total system cost of 1 per cent per annum in 2016 and 2017 (Figure 4.10). In real terms installed system costs are expected to reduce slightly.

STCs will increasingly play an important role in making solar PV attractive to customers accounting for 32 per cent of total system cost in 2014 compared to 25 per cent in 2012.

**Figure 4.10 Forecast Installed system Costs for 3.75kW system (\$/Watt)**

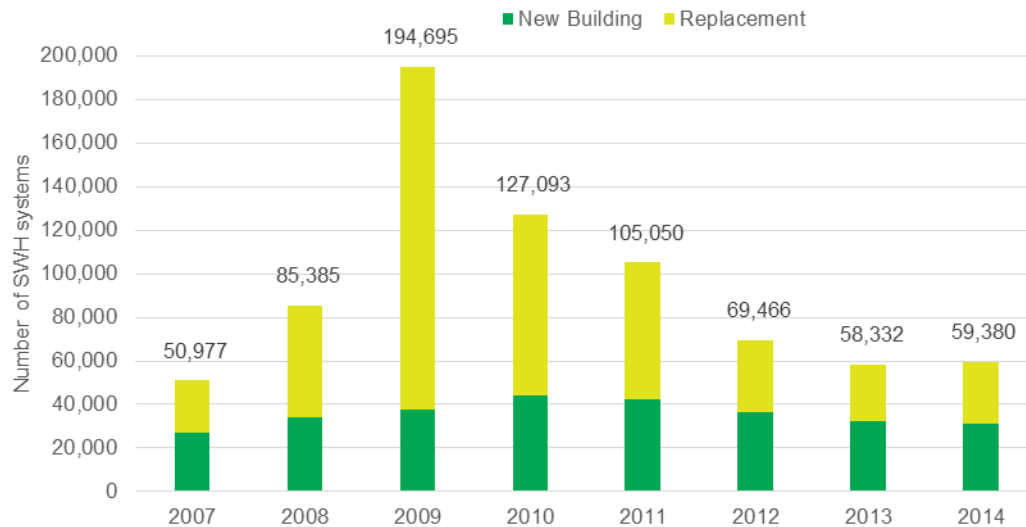
## 5. Solar Water Heater - Market Review

The Solar Water Heater (SWH) market in Australia has been in decline since 2009 where a peak of 195,000 SWH systems were installed that created certificates. Indications are that the SWH market may well have bottomed in 2013, with 2014 installations increasing by 2 per cent.

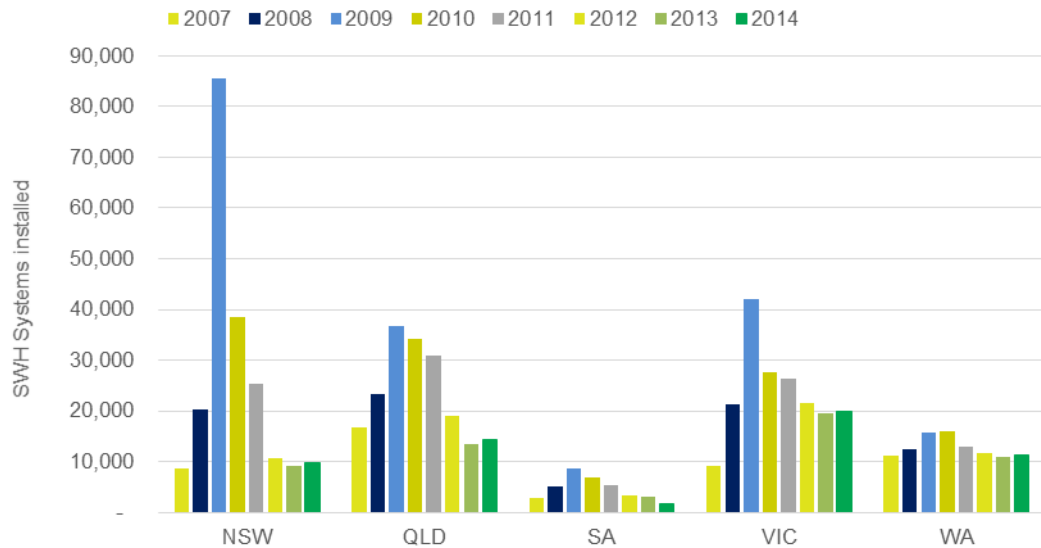
It is important to note that not all SWH systems installed create certificates. Industry estimates place the level of non-creation at between 10 to 15 per cent of total systems installed, predominantly related to the new building market.

The SWH market can be readily segmented into the new building and replacement markets (Figure 5.1). The new building market has been relatively stable over the last eight 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**

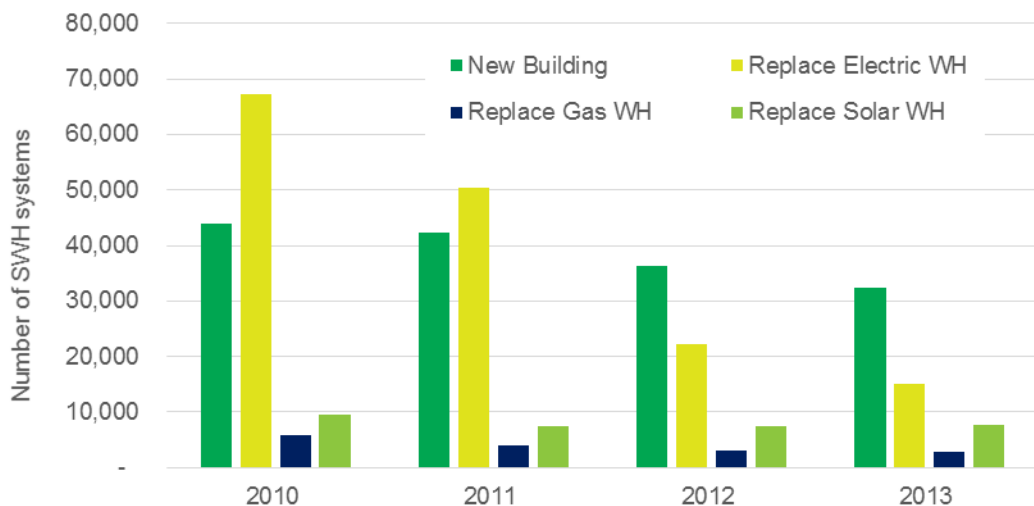


Installations of SHW systems have reduced across all states and territories. The most marked reduction in system installation rates comes from those states with relatively low access to gas and high proportions of electric water heaters (i.e. NSW and Queensland). Commonwealth and state support programs 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 has remained the largest market for SWH over the past three years. 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 (system 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 86 per cent of installed capacity in 2013 and 78 per cent in 2014.

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 expected to rise over the forecast period.

Explicit assumptions used in the model include:

- STC price of \$38 from 2015-2017;
- Removal of the carbon price with effect from 1 July 2014;
- Export price received reflecting removal of carbon price and generally assumed to be 6 cents/kWh;
- Average system size of 3.75 kW;
- Electricity exports of 46 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 increase in the standing charge and reduction in the variable rate; and
- Net installed cost of solar PV of \$1.60 per Watt in 2015 increasing at 1 per cent per annum.

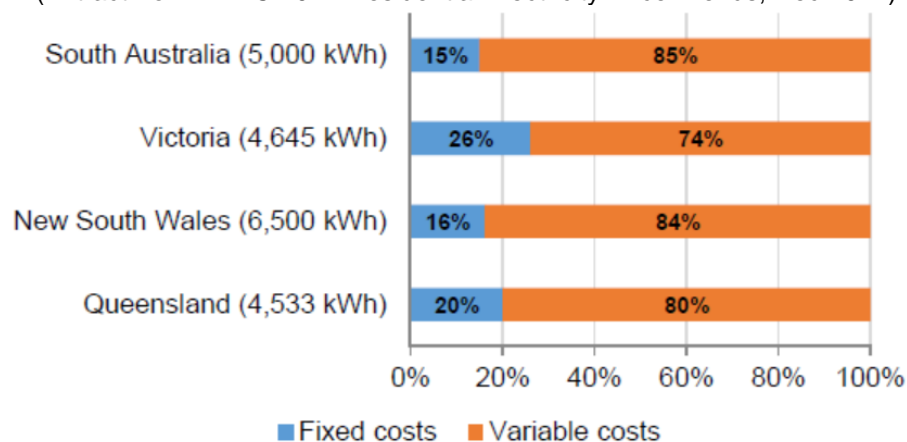
The installed cost and the contribution that STCs make is shown graphically in Figure 4.10 and Attachment 2.

Our electricity price projections have been based on the Australian Energy Market Commission (AEMC) 2014 Residential Electricity Price Trends (December 2014). The AEMC expect that electricity prices will be very stable over the next three years (Figure 6.1). The surge in regulated network charges which had driven large increases in prices in previous years appears to have been brought under control.

**Figure 6.1 AEMC electricity price projections (National Average)**

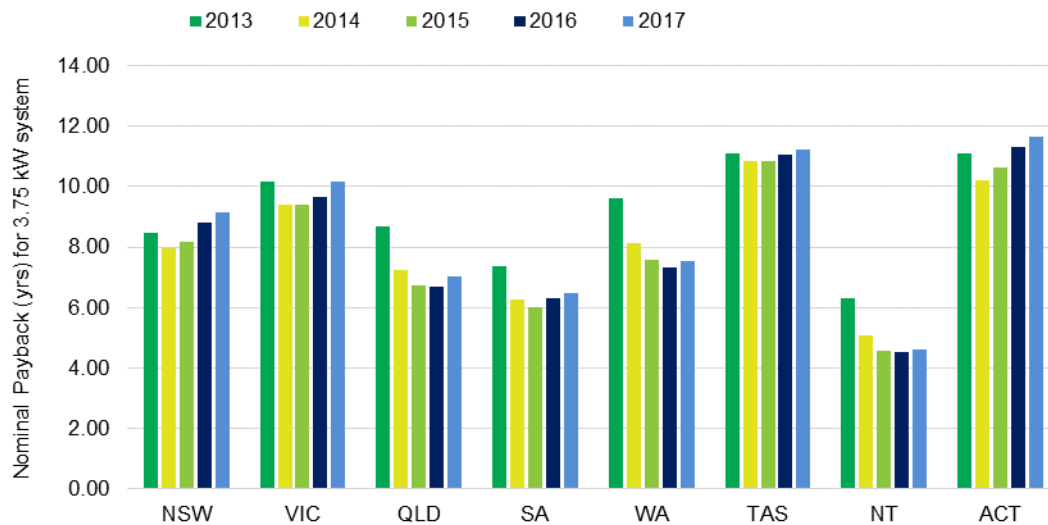
		2013/14	2014/15	2015/16	2016/17
		Base year	Current year		
<b>Environmental policies</b>	<b>c/kWh</b>	<b>4.39</b>	<b>2.11</b>	<b>2.07</b>	<b>2.25</b>
Carbon	c/kWh	2.34	0.00	0.00	0.00
LRET	c/kWh	0.60	0.65	0.78	0.97
SRES	c/kWh	0.63	0.43	0.43	0.43
FIT Schemes	c/kWh	0.71	0.94	0.80	0.80
Other state schemes	c/kWh	0.11	0.09	0.06	0.04
<b>Regulated networks</b>	<b>c/kWh</b>	<b>13.87</b>	<b>14.23</b>	<b>13.68</b>	<b>13.86</b>
Transmission	c/kWh	2.33	2.43	2.43	2.38
Distribution	c/kWh	11.54	11.81	11.26	11.48
<b>Competitive market</b>	<b>c/kWh</b>	<b>10.30</b>	<b>10.49</b>	<b>10.64</b>	<b>10.96</b>
Wholesale and retail					
<b>Total</b>	<b>c/kWh</b>	<b>28.57</b>	<b>26.83</b>	<b>26.38</b>	<b>27.08</b>

The AEMC also included an assessment of the fixed and variable components of a customer's bill based on average electricity consumption levels. Victoria had the highest proportion of fixed costs and South Australia the lowest (Figure 6.2).

**Figure 6.2 Fixed and variable components as share of representative consumer bill**  
(Extract from AEMC 2014 Residential Electricity Price Trends, Dec 2014).

Note: Based on a survey of market offers available in July 2014. Fixed and variable charges have been calculated for jurisdictional representative consumption levels, as indicated above.

Average system payback across all states is expected to reduce slightly in 2015 compared to 2014 due largely to a drop in average installed costs (Figure 6.3). Paybacks are expected to increase in 2016 and 2017 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 (3.75 kW)**

### Demand for solar PV

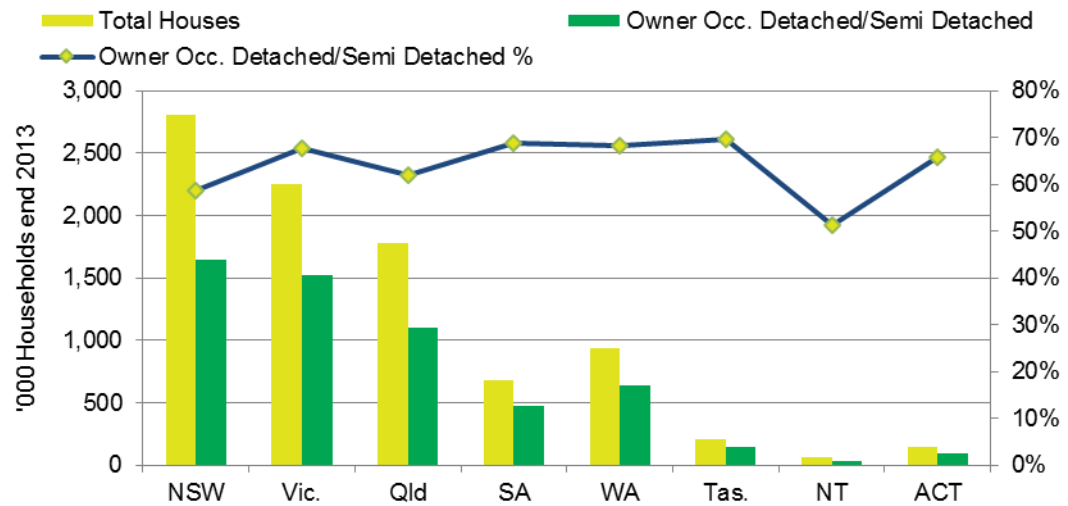
Solar PV is a discretionary purchase for most households so financial attractiveness will be the key determinant of the underlying demand. Like other discretionary purchases uptake will also be significantly impacted by the level of sales, marketing and promotion activity. In addition concerns regarding 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 suspect that the market share is fairly low at present, though growing. The Clean Energy Finance Corporation (CEFC) has announced that it will be providing up to \$120 million finance for the following programs:

- SunEdison - up to \$70 million for a program offering customers solar leases or the option to purchase the power under a Power Purchase Agreement (PPA);
- Tindo Solar - up to \$20 million finance for a program offering a PPA product to commercial and residential customers; and
- Kudos Energy - up to \$30 million for a program offering PPAs focused on commercial and multi-unit residential customers.

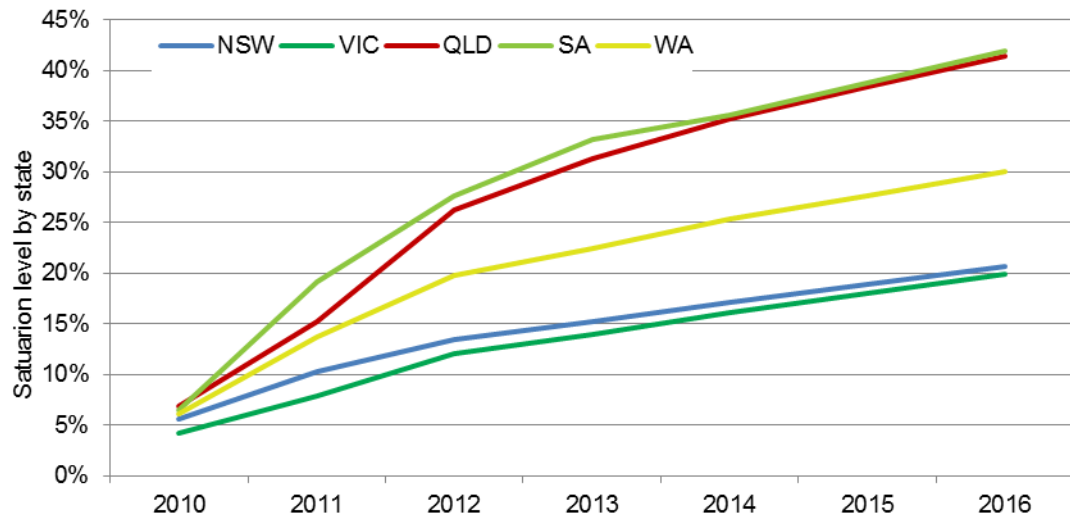
We estimate that there are approximately nine financiers that are active in the residential PV market. These tend to be smaller specialist firms. With the availability of additional capital from the CEFC, as well as other sources, we expect that easily accessible consumer finance will be important to support the residential market as saturation levels increase.

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 2017 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**

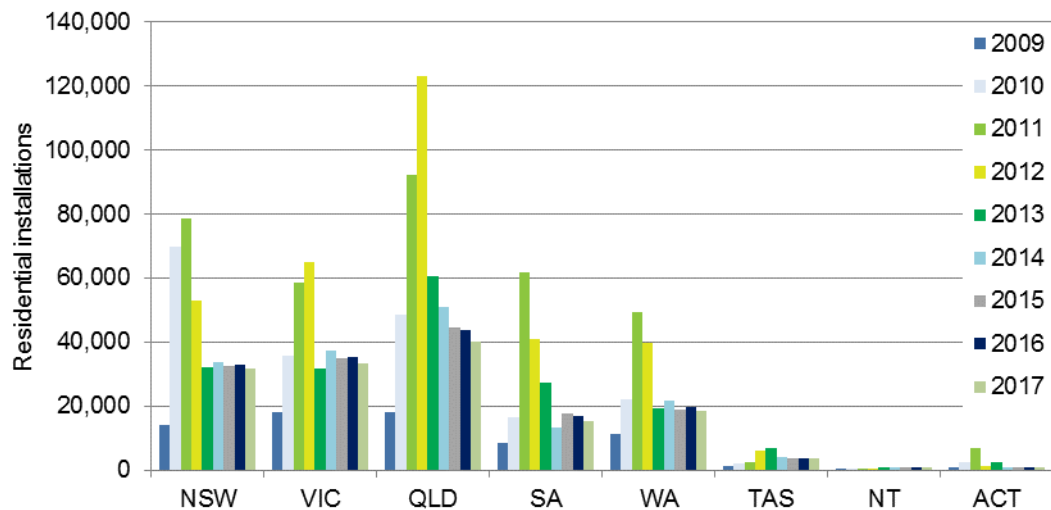
Note: Saturation rate represents the cumulative proportion of residential systems installed as a proportion of owner occupied houses (separate and semi-detached dwellings).

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. Systems installations in Queensland and South Australia in 2013 had also been supported by residual

installations receiving attractive feed-in tariffs. 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 thus 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 35 per cent by the end of 2014.

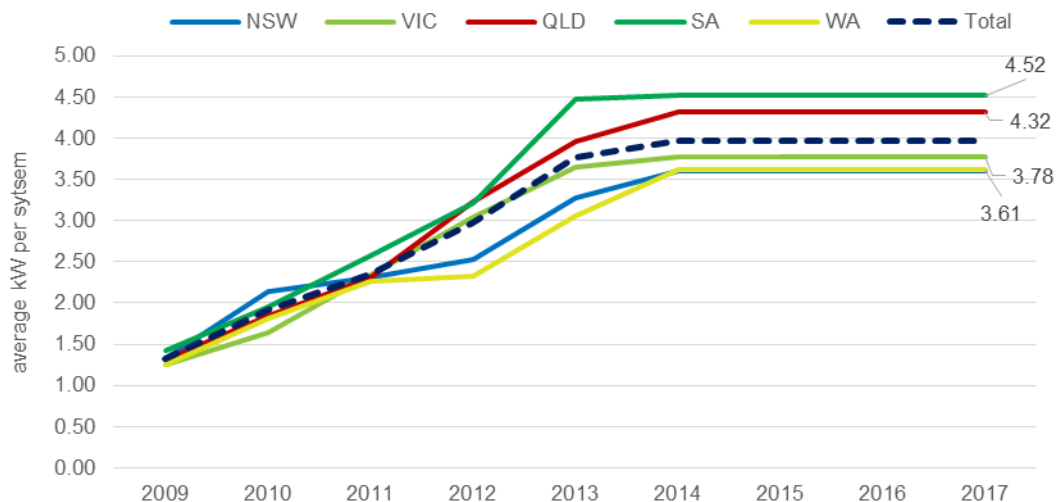
**Figure 6.6 Residential PV systems installed by state**



#### 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 4.0 kW per system in 2014 (refer to Attachment 4 for details). All states have seen an increase in system size through 2014 (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 have assumed that average system sizes experienced in 2014 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**

Year of installation	Estimate 2013	Estimate 2014	Forecast 2015	Forecast 2016	Forecast 2017
Number of Systems Installed	180,957	163,161	153,773	154,429	144,062
Avge kW/system	3.77	3.97	3.98	3.97	3.97
Avge Certificates/kW	20.6	19.6	19.6	19.6	18.3
MW Installed	682.4	647.2	611.8	613.2	571.4
Eligible Certificates ('000)	14,053	12,693	11,999	12,027	10,459

## 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.

A total of 3,668 systems with a capacity of 101.5 MW were installed in 2014 and had created STCs to 25 November 2014 (refer to Attachment 8). After allowing for another five weeks of creation in 2014 and assuming the same level of creation lag as in 2013 we estimate that a total of 5,025 systems with a capacity of 139.1 MW will be installed in 2014 (refer to Table 7.1).

Installed capacity increased by 73 per cent in 2014 compared to 2013 levels. The commercial sector accounted for 16.8 per cent of total installed small-scale solar PV in 2014 compared to 10.2 per cent in 2013.

We have analysed the level of installations by size range to achieve a better understanding of the underlying level of activity (Table 7.1). Most systems installed in 2014 (79 per cent) have been 30 kW or less and have accounted for 54 per cent of installed capacity. During 2014 there has been a noticeable increase in the number of larger systems (greater than 30 kW).

**Table 7.1 Commercial PV systems by sub-segment**

	2009	2010	2011	2012	2013	2014
<b>Number of Systems</b>						
>10 to 30kW	56	672	1,735	1,786	2,892	3,978
>30 to 50kW	8	21	87	172	282	529
>50 to 100kW	2	8	7	39	224	518
<b>Total</b>	<b>66</b>	<b>701</b>	<b>1,829</b>	<b>1,997</b>	<b>3,397</b>	<b>5,025</b>
<b>Installed Capacity (kW)</b>						
>10 to 30kW	854	8,053	22,363	27,662	51,512	75,164
>30 to 50kW	285	741	2,885	6,046	10,403	20,571
>50 to 100kW	151	645	493	3,056	18,518	43,330
<b>Total</b>	<b>1,290</b>	<b>9,439</b>	<b>25,741</b>	<b>36,764</b>	<b>80,433</b>	<b>139,065</b>
<b>Average system size (kW)</b>						
>10 to 30kW	15.25	11.98	12.89	15.49	17.81	18.89
>30 to 50kW	35.59	35.29	33.16	35.15	36.92	38.90
>50 to 100kW	75.72	80.57	70.39	78.36	82.81	83.68
<b>Total</b>	<b>19.55</b>	<b>13.46</b>	<b>14.07</b>	<b>18.41</b>	<b>23.68</b>	<b>27.68</b>

In assessing the market for commercial sized systems it is important to account for the impact of discontinued government support programs so as to determine the true level of the underlying market. Over the 2012 and 2013 period in particular, there have been three programs that have supported commercial sized systems that are no longer operative, these are:

- National Solar Schools Program (NSSP);
- Clean Technology Investment Program (CTIP); and
- Feed-in tariffs (FiT) in some states that supported larger systems

Our assessment of the capacity supported by the above programs is summarised in Table 7.2.

**Table 7.2 Commercial PV capacity (kW) supported by discontinued programs**

	2011	2012	2013	2014
NSSP	177	320	175	0
CTIP	0	0	4,547	2,274
State FIT	15,953	19,307	10,086	0
	<b>16,130</b>	<b>19,627</b>	<b>14,808</b>	<b>2,274</b>

Removing the solar PV capacity supported from the above programs, the underlying installed capacity becomes 65.6 MW in 2013 and 136.8 MW in 2014.

### Potential Demand

There have been more than 13,000 commercial sized systems installed across Australia to 2014. 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
- Businesses sites that consume a reasonable amount of electricity so that not too much of the electricity produced is exported.

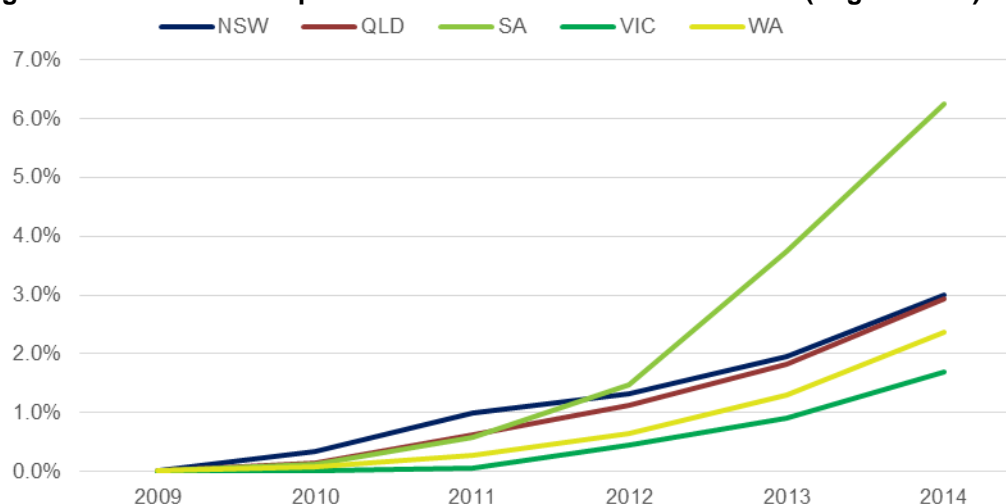
Data is not available by state that represents the above characteristics and we have developed a proxy to assist in assessing market prospects. The ABS publishes data on the number of registered businesses (by number of employees) and the Energy Supply Association of Australia (ESAA) publishes data by 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 >1employee	41.0%	39.0%	38.4%	35.3%	37.7%	40.2%	40.0%	42.4%	39.2%

According to the ESAA there were 1.2 million business connections in Australia in 2013. The ABS estimates that 39 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 3 per per cent market saturation, Victoria and WA have quite a bit lower saturation rate with South Australia having more than 6 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. We have analysed the Registry data and developed a profile of commercial systems by postcode. We have used the ABS urban/regional classification and have used data for systems greater than 10 kW that were installed in 2013 and 2014 and created certificates. This analysis is summarised in Table 7.4.

Most commercial sized systems are installed outside of the major capital cities with NSW and Queensland having more than 70 per cent of systems installed outside of Sydney and Brisbane metropolitan areas respectively.

**Table 7.4 Number of Commercial systems (2013 and 2014) by Urban Classification**

	Major urban		Regional -		Regional -	Rural	Total	Non Capital City Proportion
	Major urban - Capital City	- Non- Capital City	Other	High Urbanisation	Low Urbanisation			
ACT	85			25			110	22.7%
NSW	544	229	4	538	337	465	2,117	74.3%
NT	15		3	14	10	11	53	71.7%
QLD	369	348	2	134	103	317	1,273	71.0%
SA	695		1	141	162	426	1,425	51.2%
TAS	32	14		16	7	52	121	73.6%
VIC	555	76	13	227	110	281	1,262	56.0%
WA	371	14	9	93	32	176	695	46.6%
<b>Total</b>	<b>2,666</b>	<b>681</b>	<b>32</b>	<b>1,188</b>	<b>761</b>	<b>1,728</b>	<b>7,056</b>	<b>62.2%</b>

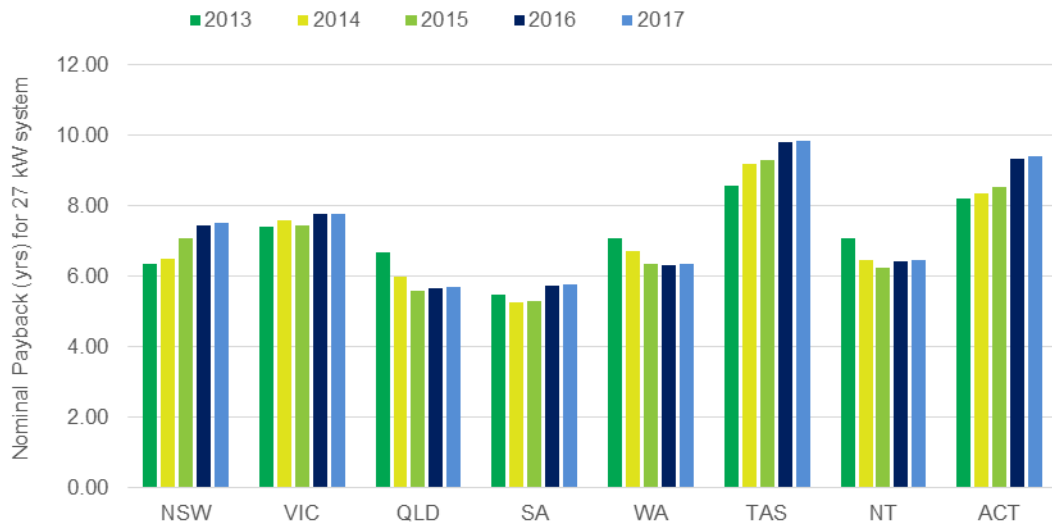
### Financial attractiveness

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.

As for residential systems, paybacks are assumed to increase across all states over the forecast period as the level of non-avoidable electricity charges increase. System paybacks

range from 5 years to more than 8 years over the projection period. This amounts to an internal rate of return between 11 per cent 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.

Research that the Australian Industry Group (AIG) undertook illustrates that these barriers lead to a low level of take-up of energy efficiency and distributed generation. The AIG July 2012 Report – "Energy shock: pressure mounts for efficiency action" found that:

- *"to date most efficiency improvements have been modest, indicating that business capital for investment is either not available or is largely reserved for other purposes"*
- *"While a growing number of businesses are taking action to improve their energy efficiency, most are looking for quick wins and would only consider an energy efficiency project where the expected payback period was less than three years"*
- *"The biggest drivers for efficiency action were concerns about energy prices and the desire to maintain or enhance business profit margins"*

Consistent with findings of previous AIG surveys, it was found that:

- 27 per cent of respondents spent the equivalent of more than 2 per cent of their sales revenue on energy (73% less than 2%);

- while only 7 per cent of respondents spent the equivalent of more than 5 per cent of their sales revenue on energy; and
- 46 per cent of businesses reported an energy spend of less than 1 per cent of their turnover.

In developing projections for 2015 to 2017 we have considered the following factors:

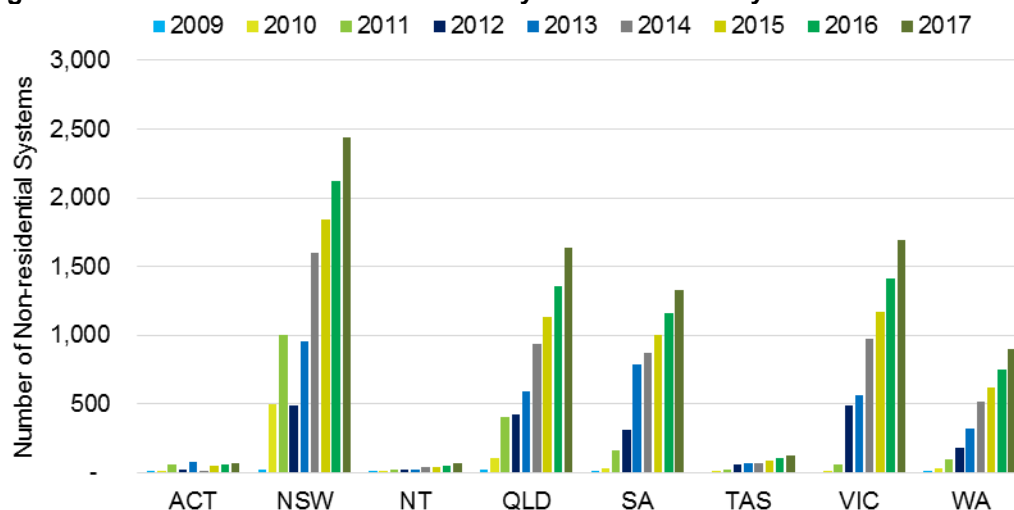
- With the fall in electricity demand there is a movement by network business and retailers to restructure electricity charges so that they are less avoidable by the customer. This means that higher standing charges and demand based charges are becoming more common;
- Selling PV to commercial customers is a more complex and longer 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:

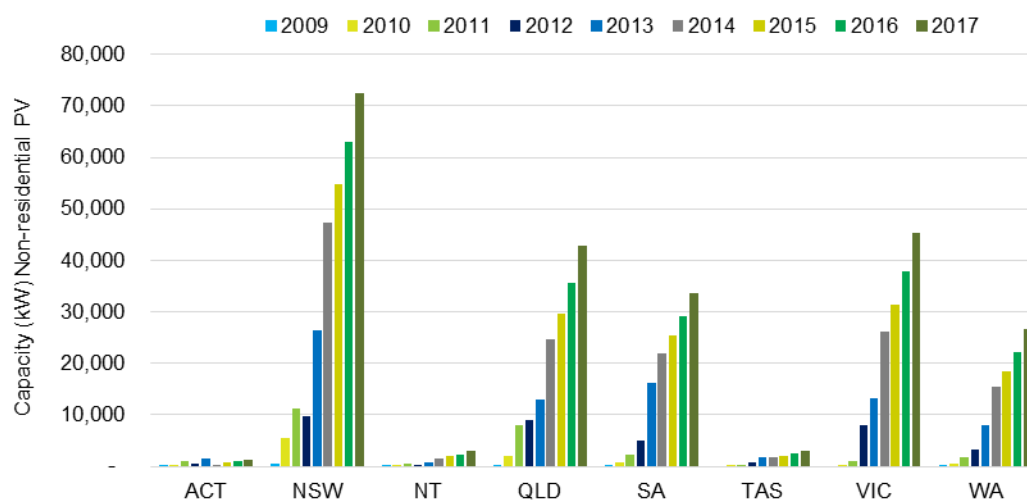
- PV retailers' increasing need to sell commercial PV to offset a contracting market for residential systems;
- Increasing experience and competence of the solar industry in delivering commercial PV with businesses starting to build a pipeline of potential projects; and
- Financing solutions are progressively 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. We assume that the number of systems installed increases by 18.4 per cent in 2015 and 17.8 per cent in each of 2016 and 2017.

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



We have assumed that the average system size by state in 2014 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)**

	Estimate	Estimate	Forecast	Forecast	Forecast
Year of installation	2013	2014	2015	2016	2017
Number of Systems Installed	3,397	5,025	5,952	7,009	8,258
Avg kW/system	23.68	27.68	27.60	27.62	27.64
Avg Certificates/kW	20.3	19.4	19.4	19.4	18.1
MW Installed	80.4	139.1	164.3	193.6	228.2
Eligible Certificates ('000)	1,632	2,698	3,187	3,756	4,133

## 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 nearly 4 kW per system in 2014 (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 2014, 17,900 upgrade systems are expected to be installed, an 11 per cent increase on 2013 levels. We have assumed that this level of increase is broadly maintained over the forecast period. For 2015 we estimate that 19,871 upgrade systems are installed with a combined capacity of 45.2 MW. This amounts to a modest 5.5 per cent share of the total market (refer to Table 8.1).

We have assumed that the average system size by state in 2014 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**

Year of installation	Estimate 2013	Estimate 2014	Forecast 2015	Forecast 2016	Forecast 2017
Number of Systems Installed	16,221	17,937	19,871	21,851	24,545
Avg kW/system	1.81	2.27	2.28	2.28	2.28
Avg Certificates/kW	20.1	19.5	19.8	19.8	18.5
MW Installed	29.3	40.8	45.2	49.7	56.0
Eligible Certificates ('000)	587	796	896	985	1,036



## 9. SWH and Air Sourced Heat Pump Projections

### Overview

We estimate that 59,380 SWH systems will be installed in 2014 that will create STCs. This is a modest 1.8 per cent increase on the 58,332 systems installed in 2013. We expect to see a recovery in the replacement market in 2015, which will more than offset a reduction in the new building market. We expect that 2015 installations will increase to 61,434 systems a 3.5 per cent increase on 2014 levels.

Beyond 2015 we expect continued modest growth as gas prices increase and as the residential solar PV markets reduces creating less competition for customers discretionary expenditure. We expect that 63,060 systems will be installed in 2016 and 67,209 systems installed in 2017.

### Overall Solar Water Heater market drivers

Water heaters can be characterised as essential appliances and may subject to regulations which will increasingly 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). ASHP's 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.

According to the primary CER data, 22,080 SWH systems were installed in new buildings (and created certificates) in 2014 (as at 25 November 2014). If we allow for the lag in STC creation experienced in 2013, total systems installed in new buildings is forecast to increase to 31,240 (an extra 9,160 systems installed and creating certificates). This represents a reduction of 3.4 per cent on 2013 levels.

The level of new home starts is expected to fall by more than 4 per cent in 2015 according to the Housing Industry Association (HIA) Economics Group (Table 9.1).

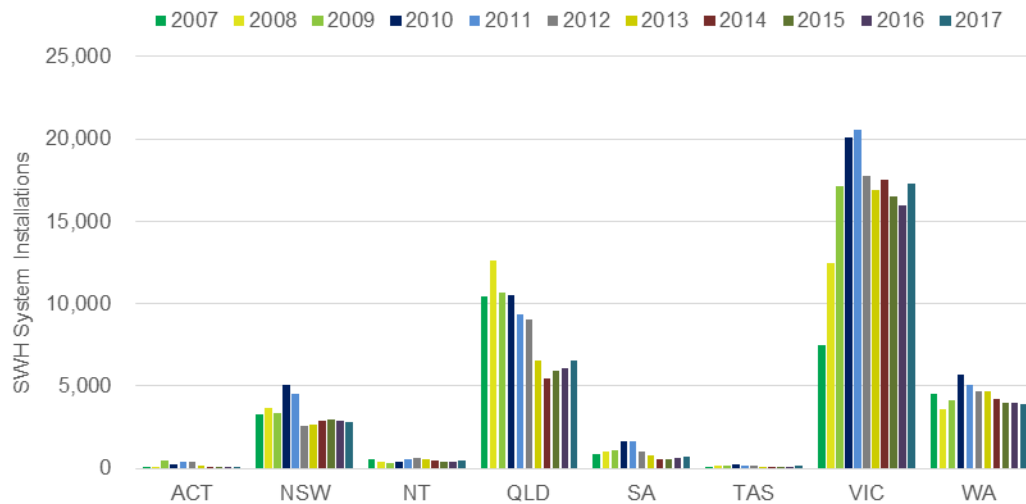
**Table 9.1 Housing Industry Association – Forecast New Home starts**

	2015	2016	2017
ACT	-20.3%	2.1%	9.8%
NSW	-0.9%	-6.2%	-3.3%
NT	-12.0%	4.9%	11.2%
QLD	4.2%	-0.2%	5.8%
SA	-1.1%	4.2%	8.0%
TAS	12.5%	-2.6%	7.1%
VIC	-10.6%	-6.0%	5.7%
WA	-10.0%	-3.2%	-4.6%

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 8.1. Victoria which has the most progressive new building regulations accounted for more than half of SWH certificates created from new homes in 2014. Victoria's installations are expected to decline by 5.6 per cent in 2015, in line with the lower level of new homes being built.

**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 \$400 to \$600 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
<b>Overall</b>	<b>38.9</b>	<b>81.6</b>	<b>10.9</b>	<b>58.4</b>	<b>68.3</b>	<b>4.4</b>	<b>2.9</b>	<b>74.6</b>	<b>47.9</b>

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

According to the primary CER data a total of 22,317 SWH systems were installed and created certificates in existing buildings in 2014 (as at 25 November 2014). Once we allow for the lag in creation consistent with 2013, we forecast 28,140 systems will be installed in 2014 that will eventually create certificates. This represents an 8.3 per cent increase on 2013 levels.

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 2015 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 2015 to 30,781 systems, representing growth of 9.4 per cent growth. We expect to see further growth in replacement SWH system installations in 2016 and 2017 of 7 per cent.

### Certificates created from the installation of water heater systems

We have assumed that the average certificates per system for the 2015 to 2017 forecast period will be similar to 2014 levels for each market.

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**

Year of installation	Estimate 2013	Estimate 2014	Forecast 2015	Forecast 2016	Forecast 2017
<b>New Buildings</b>					
Number of Systems Installed	32,342	31,240	30,653	30,144	31,991
Avge Certificates/System	29.0	30.0	30.1	30.1	30.0
Eligible Certificates ('000)	939	937	922	907	961
<b>Replacement</b>					
Number of Systems Installed	25,989	28,140	30,781	32,916	35,217
Avge Certificates/System	31.0	30.2	30.2	30.3	30.3
Eligible Certificates ('000)	804	851	931	996	1,066
<b>Total</b>					
Number of Systems Installed	58,332	59,380	61,434	63,060	67,209
Avge Certificates/System	30	30	30	30	30
Eligible Certificates ('000)	1,743	1,788	1,853	1,903	2,027

## **10. Other small generating units**

Wind and Hydro SGUs remain an extremely small part of STC creation. So far for 2014 a total of 387 valid STCs had been created from 9 installations.

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
- SolarBusinessServices – Solar PV Module classification
- REC Agents Association, Research Notes and Media Releases
- Housing Industry Association, Housing Forecasts – Aug 2014
- ESAA, Electricity Gas Australia 2014
- Australian Energy Market Commission, Residential Electricity Price Trends report, December 2014

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## Summary of Results

## Base Case

Year of installation	Actual 2010	Actual 2011	Actual 2012	Estimate 2013	Estimate 2014	Forecast 2015	Forecast 2016	Forecast 2017
<b>1. SGUs (PV)</b>								
<b>1.1 New Residential</b>	Base Case							
Number of Systems Installed	197,562	349,935	329,013	180,957	163,161	153,773	154,429	144,062
Avg kW/system	1.91	2.36	2.97	3.77	3.97	3.98	3.97	3.97
Avg Certificates/kW	67.8	63.5	35.5	20.6	19.6	19.6	19.6	18.3
MW Installed	378.0	824.2	975.8	682.4	647.2	611.8	613.2	571.4
Eligible Certificates ('000)	25,637	52,325	34,670	14,053	12,693	11,999	12,027	10,459
<b>1.2 Non Residential</b>	Base Case							
Number of Systems Installed	701	1,829	1,997	3,397	5,025	5,952	7,009	8,258
Avg kW/system	13.46	14.07	18.41	23.68	27.68	27.60	27.62	27.64
Avg Certificates/kW	22.9	29.1	27.5	20.3	19.4	19.4	19.4	18.1
MW Installed	9.4	25.7	36.8	80.4	139.1	164.3	193.6	228.2
Eligible Certificates ('000)	216	749	1,012	1,632	2,698	3,187	3,756	4,133
<b>1.3 Residential System Upgrades</b>								
Number of Systems Installed		8,540	12,188	16,221	17,937	19,871	21,851	24,545
Avg kW/system		1.37	1.70	1.81	2.27	2.28	2.28	2.28
Avg Certificates/kW		19.8	20.1	20.1	19.5	19.8	19.8	18.5
MW Installed		11.7	20.7	29.3	40.8	45.2	49.7	56.0
Eligible Certificates ('000)		232	415	587	796	896	985	1,036
<b>Total PV Systems</b>								
Number of Systems Installed	198,263	360,304	343,198	200,575	186,123	179,596	183,289	176,865
Avg kW/system	1.95	2.39	3.01	3.95	4.44	4.57	4.67	4.84
Avg Certificates/kW	66.7	61.9	34.9	20.5	19.6	19.6	19.6	18.3
MW Installed	387.4	861.6	1,033.3	792.2	827.0	821.3	856.5	855.6
Eligible Certificates ('000)	25,853	53,305	36,097	16,272	16,187	16,083	16,768	15,628
<b>2. SWH Systems</b>								
<b>2.1 SWH System (New Homes)</b>								
Number of Systems Installed	44,049	42,330	36,339	32,342	31,240	30,653	30,144	31,991
Avg Certificates/System	29.9	28.3	27.1	29.0	30.0	30.1	30.1	30.0
Eligible Certificates ('000)	1,317	1,198	986	939	937	922	907	961
<b>2.2 SWH System (Replacement)</b>								
Number of Systems Installed	83,044	62,720	33,127	25,989	28,140	30,781	32,916	35,217
Avg Certificates/System	35.6	30.7	30.3	31.0	30.2	30.2	30.3	30.3
Eligible Certificates ('000)	2,957	1,923	1,005	804	851	931	996	1,066
<b>Total SWH Systems</b>								
Number of Systems Installed	127,093	105,050	69,466	58,332	59,380	61,434	63,060	67,209
Avg Certificates/System	33.6	29.7	28.7	29.9	30.1	30.2	30.2	30.2
Eligible Certificates ('000)	4,274	3,121	1,991	1,743	1,788	1,853	1,903	2,027

**Summary of Results****Base Case**

Year of installation	Actual 2010	Actual 2011	Actual 2012	Estimate 2013	Estimate 2014	Forecast 2015	Forecast 2016	Forecast 2017
<b>3. Small Wind/Hydro Systems</b>								
Number of Systems	140	65	11	4	6	6	6	6
Avg Certificate/System	99.7	90.0	45.0	75.8	20.0	20.0	20.0	20.0
Eligible Certificates ('000)	14	6	0	0	0	0	0	0
<b>TOTAL Certificates ('000)</b>	<b>30,142</b>	<b>56,433</b>	<b>38,088</b>	<b>18,016</b>	<b>17,975</b>	<b>17,935</b>	<b>18,671</b>	<b>17,655</b>

**Calculating STCs to be created for the year**

Year of Creation	2013	2014	2015	2016	2017
<b>STCs for systems installed in the year</b>					
Solar PV	16,272	16,187	16,083	16,768	15,628
SWH	1,743	1,788	1,853	1,903	2,027
<b>Total</b>	<b>18,015</b>	<b>17,975</b>	<b>17,935</b>	<b>18,671</b>	<b>17,655</b>
Less STCs submitted the following year (lag)	1,826	1,905	1,938	2,043	1,989
Add Previous year installs created this year	4,121	1,826	1,905	1,938	2,043
<b>STCs submitted for creation</b>	<b>20,310</b>	<b>17,897</b>	<b>17,902</b>	<b>18,566</b>	<b>17,709</b>

STCs submitted in year following installation		2013	2014	2015	2016	2017
PV New Residential	8.7%	1,223	1,104	1,044	1,046	910
PV Non Residential	15.1%	246	407	481	567	624
PV System Upgrades	14.9%	88	119	134	147	154
SWH New Building	20.1%	189	188	185	182	193
SWH Replacement	10.1%	81	86	94	101	108
<b>Total</b>		<b>1,826</b>	<b>1,905</b>	<b>1,938</b>	<b>2,043</b>	<b>1,989</b>
Change			78	33	105	-54

**Sensitivity Analysis**

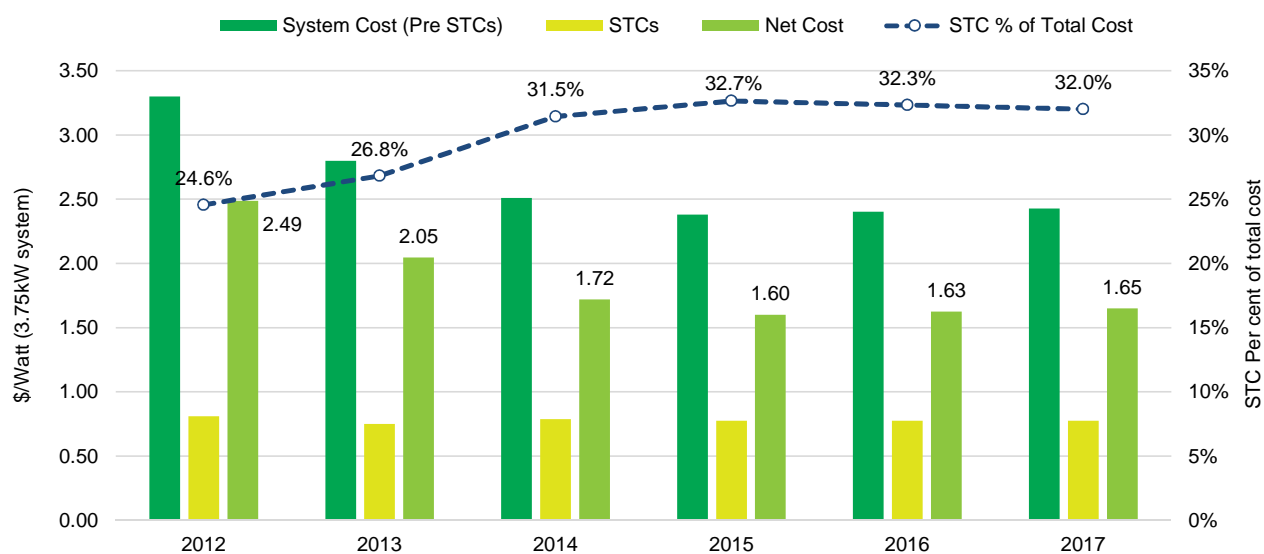
'000 STCs Submitted for Creation	2013	2014	2015	2016	2017
Total Certificates - Base Case	20,310	17,897	17,902	18,566	17,709
Total Certificates - High Case	20,310	17,897	19,102	19,769	18,755
Total Certificates - Low Case	20,310	17,897	16,702	17,363	16,663

## Attachment 2

### Residential PV Systems

## PV Financial Attractiveness

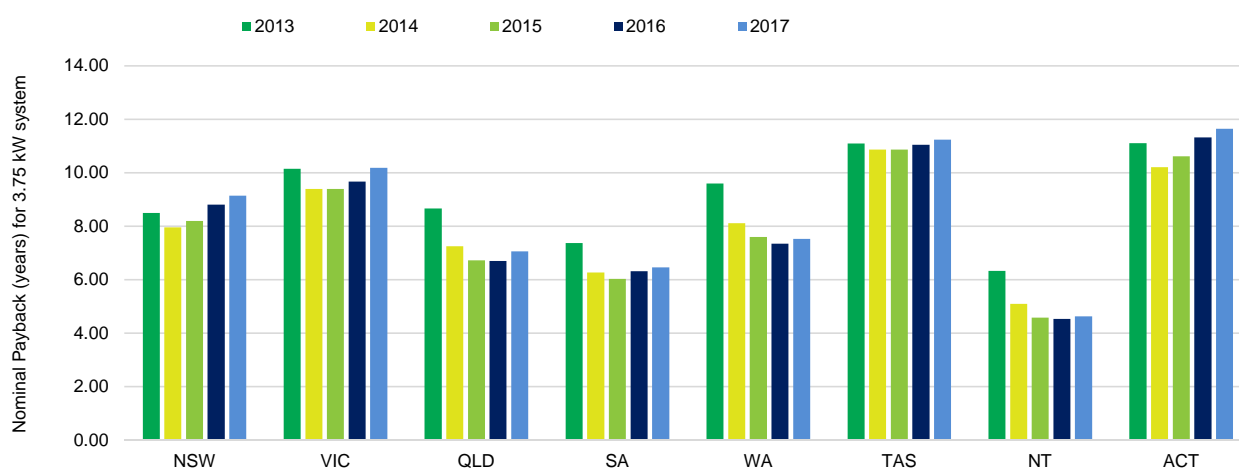
### Projected Installed cost of solar PV



### Average Nominal Payback (assuming 3.75 kW system)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
2013	8.49	10.14	8.66	7.37	9.60	11.09	6.33	11.10
2014	7.95	9.39	7.25	6.27	8.11	10.86	5.09	10.20
2015	8.19	9.38	6.72	6.03	7.59	10.86	4.58	10.61
2016	8.81	9.66	6.69	6.31	7.34	11.04	4.53	11.32
2017	9.14	10.18	7.05	6.46	7.53	11.24	4.63	11.64

### 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
<b>Cumulative grid systems installed to end 2011</b>	<b>165,776</b>	<b>115,370</b>	<b>161,454</b>	<b>87,958</b>	<b>83,823</b>	<b>5,998</b>	<b>1,245</b>	<b>10,019</b>	<b>631,643</b>
<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 2011 ('000)	<b>1,615</b>	<b>1,465</b>	<b>1,062</b>	<b>461</b>	<b>609</b>	<b>145</b>	<b>34</b>	<b>91</b>	<b>5,482</b>
Proportion of Owner Occupied Dwellings	10.3%	7.9%	15.2%	19.1%	13.8%	4.1%	3.6%	11.0%	11.5%
<b>Estimates for 2012</b>									
<b>Total 2012 systems</b>	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 ('000)	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%
<b>Estimates for 2013</b>									
Average number of systems installed/mth (derived)	2,670	2,641	5,056	2,273	1,596	570	81	192	15,080
Annulised installations	32,045	31,690	60,677	27,278	19,154	6,840	972	2,300	180,957
Cumulative installations	250,684	211,871	345,128	156,091	142,607	18,780	2,675	13,777	1,141,613
Owner occupied dwelling at year end ('000)	1,647	1,522	1,104	471	635	148	35	94	5,656
Proportion of Owner Occupied Dwellings	15.2%	13.9%	31.3%	33.1%	22.4%	12.7%	7.7%	14.7%	20.2%
<b>Projections for 2014</b>									
Average number of systems installed/mth (derived)	2,678	2,226	3,515	1,686	1,762	294	62	112	12,335
Annulised installations	33,799	37,396	51,077	13,148	21,568	4,247	907	1,020	163,161
Cumulative installations	284,484	249,267	396,205	169,239	164,175	23,027	3,582	14,796	1,304,774
Owner occupied dwelling at year end ('000)	1,663	1,550	1,126	476	649	149	35	95	5,743
Proportion of Owner Occupied Dwellings	17.1%	16.1%	35.2%	35.5%	25.3%	15.5%	10.2%	15.5%	22.7%
<b>Projections for 2015</b>									
Average number of systems installed/mth (derived)	2,695	2,907	3,700	1,464	1,584	315	72	77	12,814
Annulised installations	32,341	34,885	44,400	17,567	19,003	3,783	870	925	153,773
Cumulative installations	316,824	284,152	440,605	186,806	183,178	26,810	4,452	15,721	1,458,548
Owner occupied dwelling at year end ('000)	1,680	1,578	1,147	481	662	150	35	97	5,830
Proportion of Owner Occupied Dwellings	18.9%	18.0%	38.4%	38.8%	27.7%	17.9%	12.6%	16.2%	25.0%
<b>Projections for 2016</b>									
Average number of systems installed/mth (derived)	2,740	2,958	3,636	1,422	1,651	311	70	81	12,869
Annulised installations	32,880	35,494	43,631	17,061	19,817	3,732	846	968	154,429
Cumulative installations	349,705	319,646	484,236	203,867	202,995	30,542	5,297	16,689	1,612,977
Owner occupied dwelling at year end ('000)	1,696	1,606	1,169	486	675	151	36	99	5,917
Proportion of Owner Occupied Dwellings	20.6%	19.9%	41.4%	41.9%	30.1%	20.2%	14.8%	16.9%	27.3%
<b>Projections for 2017</b>									
Average number of systems installed/mth (derived)	2,636	2,763	3,340	1,286	1,534	302	74	70	12,005
Annulised installations	31,633	33,159	40,085	15,429	18,406	3,620	887	842	144,062
Cumulative installations	381,338	352,805	524,321	219,296	221,401	34,162	6,184	17,531	1,757,039
Owner occupied dwelling at year end ('000)	1,712	1,634	1,190	492	688	152	36	100	6,003
Proportion of Owner Occupied Dwellings	22.3%	21.6%	44.1%	44.6%	32.2%	22.5%	17.2%	17.5%	29.3%

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%	31.3%	33.1%	22.4%	12.7%	7.7%	14.7%	20.2%
2014	17.1%	16.1%	35.2%	35.5%	25.3%	15.5%	10.2%	15.5%	22.7%
2015	18.9%	18.0%	38.4%	38.8%	27.7%	17.9%	12.6%	16.2%	25.0%
2016	20.6%	19.9%	41.4%	41.9%	30.1%	20.2%	14.8%	16.9%	27.3%
2017	22.3%	21.6%	44.1%	44.6%	32.2%	22.5%	17.2%	17.5%	29.3%
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	32,045	31,690	60,677	27,278	19,154	6,840	972	2,300	180,957
2014	33,799	37,396	51,077	13,148	21,568	4,247	907	1,020	163,161
2015	32,341	34,885	44,400	17,567	19,003	3,783	870	925	153,773
2016	32,880	35,494	43,631	17,061	19,817	3,732	846	968	154,429
2017	31,633	33,159	40,085	15,429	18,406	3,620	887	842	144,062

## Attachment 4

## Certificate Creation - Solar PV Residential

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
<b>Residential Systems installed (No.)</b>									
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	32,045	31,690	60,677	27,278	19,154	6,840	972	2,300	180,957
2014	33,799	37,396	51,077	13,148	21,568	4,247	907	1,020	163,161
2015	32,341	34,885	44,400	17,567	19,003	3,783	870	925	153,773
2016	32,880	35,494	43,631	17,061	19,817	3,732	846	968	154,429
2017	31,633	33,159	40,085	15,429	18,406	3,620	887	842	144,062
<b>Average system size (kW/system)</b>									
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	3.60	3.78	4.32	4.52	3.61	4.30	4.62	3.72	3.97
2015	3.60	3.78	4.32	4.52	3.61	4.30	4.62	3.72	3.98
2016	3.60	3.78	4.32	4.52	3.61	4.30	4.62	3.72	3.97
2017	3.60	3.78	4.32	4.52	3.61	4.30	4.62	3.72	3.97
<b>Installed Capacity (MW)</b>									
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	104.9	115.5	239.9	122.0	58.5	28.1	4.2	9.3	682.4
2014	121.8	141.3	220.5	59.4	78.0	18.3	4.2	3.8	647.2
2015	116.6	131.8	191.7	79.3	68.7	16.3	4.0	3.4	611.8
2016	118.5	134.1	188.3	77.0	71.6	16.1	3.9	3.6	613.2
2017	114.0	125.3	173.0	69.7	66.5	15.6	4.1	3.1	571.4
<b>Avge Zone Rating</b>	1.382	1.185	1.382	1.382	1.382	1.185	1.536	1.382	
<b>Average Certificates/kW installed</b>									
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	20.2	17.5	20.4	20.2	20.3	17.5	22.8	20.3	19.6
2015	20.2	17.5	20.4	20.2	20.3	17.5	22.8	20.3	19.6
2016	20.2	17.5	20.4	20.2	20.3	17.5	22.8	20.3	19.6
2017	18.9	16.3	19.0	18.8	19.0	16.3	21.3	19.0	18.3
<b>Calculated Certificates ('000) ##</b>									
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	2,254	2,108	5,114	2,534	1,241	507	100	193	14,053
2014	2,461	2,471	4,487	1,199	1,583	319	96	77	12,693
2015	2,355	2,305	3,901	1,601	1,395	284	92	70	12,003
2016	2,394	2,345	3,833	1,555	1,455	281	89	73	12,025
2017	2,150	2,045	3,287	1,313	1,261	254	87	59	10,456

## 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
<b>Number of Systems</b>									
ACT	1	12	63	21	82	10	47	57	69
NSW	22	494	1,004	493	958	1,601	1,844	2,122	2,442
NT	3	9	19	20	26	37	45	54	66
QLD	21	106	408	420	588	941	1,131	1,359	1,632
SA	8	35	159	315	790	873	1,005	1,157	1,333
TAS	-	2	23	59	71	68	84	102	124
VIC	-	16	60	486	565	977	1,173	1,409	1,692
WA	11	27	93	183	318	518	623	749	900
	<b>66</b>	<b>701</b>	<b>1,829</b>	<b>1,997</b>	<b>3,397</b>	<b>5,025</b>	<b>5,952</b>	<b>7,009</b>	<b>8,258</b>
<b>Installed Capacity (kW)</b>									
ACT	30	261	1,115	429	1,413	251	878	1,070	1,297
NSW	530	5,555	11,105	9,817	26,322	47,426	54,659	62,935	72,459
NT	43	121	453	301	720	1,615	1,964	2,357	2,890
QLD	334	1,906	7,860	9,101	12,839	24,663	29,643	35,653	42,844
SA	154	693	2,232	5,052	16,272	21,957	25,348	29,212	33,717
TAS	-	37	297	841	1,675	1,649	2,053	2,526	3,088
VIC	-	285	963	8,083	13,175	26,141	31,418	37,782	45,410
WA	200	581	1,715	3,140	8,017	15,363	18,337	22,068	26,536
Australia	<b>1,290</b>	<b>9,439</b>	<b>25,741</b>	<b>36,764</b>	<b>80,433</b>	<b>139,065</b>	<b>164,300</b>	<b>193,603</b>	<b>228,242</b>
Growth rate:				42.8%	118.8%	72.9%	18.1%	17.8%	17.9%
<b>kw/System</b>									
ACT	29.70	21.78	17.69	20.41	17.19	26.21	18.68	18.77	18.79
NSW	24.07	11.25	11.06	19.91	27.49	29.62	29.64	29.66	29.67
NT	14.32	13.42	23.86	15.04	27.63	43.65	43.65	43.65	43.79
QLD	15.89	17.99	19.26	21.67	21.85	26.21	26.21	26.23	26.25
SA	19.24	19.81	14.04	16.04	20.59	25.16	25.22	25.25	25.29
TAS		18.27	12.91	14.26	23.52	24.07	24.44	24.76	24.90
VIC		17.79	16.06	16.63	23.34	26.76	26.78	26.81	26.84
WA	18.21	21.51	18.44	17.16	25.22	29.67	29.43	29.46	29.48
	<b>19.55</b>	<b>13.46</b>	<b>14.07</b>	<b>18.41</b>	<b>23.68</b>	<b>27.68</b>	<b>27.60</b>	<b>27.62</b>	<b>27.64</b>
<b>Certificates per kW</b>									
ACT	24.92	26.42	26.36	21.65	20.77	11.67	11.67	11.67	10.89
NSW	22.43	31.29	30.99	22.98	20.90	20.03	20.03	20.03	18.70
NT	27.70	28.94	26.82	26.80	23.34	19.72	19.72	19.72	18.41
QLD	24.13	26.83	24.96	22.50	20.78	20.12	20.12	20.12	18.78
SA	21.05	26.38	26.44	23.26	20.55	20.01	20.01	20.01	18.67
TAS		20.66	23.67	19.77	17.62	15.98	15.98	15.98	14.92
VIC		21.45	21.45	19.62	18.31	17.24	17.24	17.24	16.09
WA	22.22	24.07	23.21	22.34	20.43	19.55	19.55	19.55	18.25
	<b>22.91</b>	<b>29.08</b>	<b>27.52</b>	<b>22.05</b>	<b>20.29</b>	<b>19.40</b>	<b>19.40</b>	<b>19.40</b>	<b>18.11</b>
<b>Certificates Created</b>									
ACT	740	6,904	29,380	9,277	29,353	2,933	10,245	12,488	14,125
NSW	11,879	173,833	344,139	225,576	550,089	950,094	1,094,992	1,260,782	1,354,810
NT	1,190	3,495	12,160	8,062	16,811	31,841	38,740	46,488	53,195
QLD	8,055	51,156	196,159	204,814	266,775	496,166	596,345	717,252	804,474
SA	3,239	18,285	59,021	117,512	334,460	439,291	507,147	584,443	629,611
TAS		755	7,030	16,632	29,508	26,351	32,810	40,361	46,061
VIC		6,106	20,664	158,598	241,178	450,710	541,686	651,417	730,737
WA	4,451	13,980	39,799	70,165	163,802	300,415	358,562	431,535	484,303
	<b>29,554</b>	<b>274,514</b>	<b>708,352</b>	<b>810,636</b>	<b>1,631,976</b>	<b>2,697,800</b>	<b>3,180,528</b>	<b>3,744,767</b>	<b>4,117,314</b>

## 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
State								
Installed capacity	ACT	141	109	110	56	68	75	83
	NSW	1,229	1,126	2,220	5,512	6,062	6,669	8,671
	NT	21	119	83	331	333	333	333
	QLD	3,090	11,489	16,225	20,063	22,069	24,277	26,706
	SA	2,224	1,277	3,109	6,255	6,880	7,568	8,323
	TAS	136	720	1,749	801	1,282	1,411	1,553
	VIC	2,319	2,201	2,732	4,183	4,603	5,065	5,571
	WA	2,539	3,643	3,070	3,583	3,941	4,336	4,771
		<b>11,700</b>	<b>20,682</b>	<b>29,298</b>	<b>40,786</b>	<b>45,239</b>	<b>49,734</b>	<b>56,011</b>
Valid RECs created	ACT	2,885	2,233	2,262	1,161	1,392	1,552	1,599
	NSW	25,033	23,096	45,826	110,544	123,354	135,705	164,675
	NT	483	2,769	1,955	7,491	7,687	7,687	7,175
	QLD	62,792	234,952	331,775	397,311	444,164	488,596	501,644
	SA	45,078	26,048	63,658	123,139	138,176	151,986	156,011
	TAS	2,380	12,639	30,711	13,633	22,162	24,383	25,051
	VIC	41,321	39,221	48,647	71,026	80,057	88,082	90,431
	WA	51,861	74,311	62,619	71,469	79,498	87,461	89,809
		<b>231,833</b>	<b>415,269</b>	<b>587,452</b>	<b>795,774</b>	<b>896,490</b>	<b>985,453</b>	<b>1,036,395</b>
Systems								
	ACT	74	43	32	22	26	29	32
	NSW	626	579	1,021	2,134	2,347	2,582	3,357
	NT	13	23	27	90	90	90	90
	QLD	2,442	6,815	10,001	10,078	11,086	12,195	13,415
	SA	1,634	675	1,137	1,665	1,831	2,014	2,215
	TAS	88	347	749	293	469	516	568
	VIC	1,589	901	1,106	1,487	1,636	1,800	1,980
	WA	2,074	2,805	2,148	2,169	2,386	2,625	2,888
		<b>8,540</b>	<b>12,188</b>	<b>16,221</b>	<b>17,937</b>	<b>19,871</b>	<b>21,851</b>	<b>24,545</b>
kw/System								
	ACT	1.91	2.53	3.43	2.60	2.60	2.60	2.60
	NSW	1.96	1.94	2.17	2.58	2.58	2.58	2.58
	NT	1.60	5.17	3.07	3.70	3.70	3.70	3.70
	QLD	1.27	1.69	1.62	1.99	1.99	1.99	1.99
	SA	1.36	1.89	2.73	3.76	3.76	3.76	3.76
	TAS	1.55	2.07	2.34	2.73	2.73	2.73	2.73
	VIC	1.46	2.44	2.47	2.81	2.81	2.81	2.81
	WA	1.22	1.30	1.43	1.65	1.65	1.65	1.65
		<b>1.37</b>	<b>1.70</b>	<b>1.81</b>	<b>2.27</b>	<b>2.28</b>	<b>2.28</b>	<b>2.28</b>
RECs/kW								
	ACT	20.4	20.5	20.6	20.6	20.6	20.6	19.2
	NSW	20.4	20.5	20.6	20.1	20.3	20.3	19.0
	NT	23.2	23.3	23.5	22.6	23.1	23.1	21.5
	QLD	20.3	20.5	20.4	19.8	20.1	20.1	18.8
	SA	20.3	20.4	20.5	19.7	20.1	20.1	18.7
	TAS	17.5	17.6	17.6	17.0	17.3	17.3	16.1
	VIC	17.8	17.8	17.8	17.0	17.4	17.4	16.2
	WA	20.4	20.4	20.4	19.9	20.2	20.2	18.8
		<b>19.81</b>	<b>20.08</b>	<b>20.05</b>	<b>19.51</b>	<b>19.82</b>	<b>19.81</b>	<b>18.50</b>



## SWH Systems - New Buildings

## Attachment 7

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>SWH systems installed</b>											
ACT	39	113	507	236	422	432	190	122	103	108	121
NSW	3,276	3,675	3,361	5,098	4,522	2,579	2,645	2,865	2,983	2,872	2,849
NT	548	410	346	436	522	653	579	439	408	438	498
QLD	10,414	12,631	10,652	10,497	9,359	9,042	6,535	5,442	5,939	6,077	6,580
SA	903	1,023	1,126	1,669	1,677	1,060	766	557	579	618	683
TAS	113	172	177	266	192	137	83	102	120	120	131
VIC	7,480	12,449	17,124	20,119	20,559	17,726	16,888	17,510	16,526	15,946	17,247
WA	4,535	3,606	4,123	5,728	5,077	4,710	4,656	4,204	3,995	3,965	3,881
<b>Total</b>	<b>27,308</b>	<b>34,079</b>	<b>37,416</b>	<b>44,049</b>	<b>42,330</b>	<b>36,339</b>	<b>32,342</b>	<b>31,240</b>	<b>30,653</b>	<b>30,144</b>	<b>31,991</b>
<b>SWH certificates created</b>											
ACT	1,111	3,641	18,125	7,501	13,138	12,503	6,078	4,095	3,469	3,628	4,074
NSW	100,171	130,824	131,981	172,125	145,841	83,654	87,720	91,023	94,766	91,236	90,526
NT	16,672	13,851	10,468	13,429	13,929	18,070	15,752	12,585	11,710	12,572	14,301
QLD	330,947	418,149	374,016	339,788	275,585	259,317	198,911	172,682	188,485	192,865	208,822
SA	28,075	36,438	38,281	54,845	51,074	29,642	22,704	17,042	17,702	18,889	20,867
TAS	3,301	8,056	11,377	8,115	4,994	3,889	2,404	3,062	3,598	3,594	3,941
VIC	184,040	325,693	457,839	533,397	531,095	434,730	462,064	497,041	469,097	452,631	489,574
WA	150,930	121,986	142,995	188,152	162,535	144,164	143,210	139,899	132,960	131,973	129,175
<b>Total</b>	<b>815,247</b>	<b>1,058,638</b>	<b>1,185,082</b>	<b>1,317,352</b>	<b>1,198,191</b>	<b>985,969</b>	<b>938,844</b>	<b>937,428</b>	<b>921,788</b>	<b>907,388</b>	<b>961,279</b>
<b>Certificates per SWH System</b>											
ACT	28.5	32.2	35.7	31.8	31.1	28.9	32.0	33.7	33.7	33.7	33.7
NSW	30.6	35.6	39.3	33.8	32.3	32.4	33.2	31.8	31.8	31.8	31.8
NT	30.4	33.8	30.3	30.8	26.7	27.7	27.2	28.7	28.7	28.7	28.7
QLD	31.8	33.1	35.1	32.4	29.4	28.7	30.4	31.7	31.7	31.7	31.7
SA	31.1	35.6	34.0	32.9	30.5	28.0	29.6	30.6	30.6	30.6	30.6
TAS	29.2	46.8	64.3	30.5	26.0	28.4	28.9	30.1	30.1	30.1	30.1
VIC	24.6	26.2	26.7	26.5	25.8	24.5	27.4	28.4	28.4	28.4	28.4
WA	33.3	33.8	34.7	32.8	32.0	30.6	30.8	33.3	33.3	33.3	33.3
<b>Total</b>	<b>29.9</b>	<b>31.1</b>	<b>31.7</b>	<b>29.9</b>	<b>28.3</b>	<b>27.1</b>	<b>29.0</b>	<b>30.0</b>	<b>30.1</b>	<b>30.1</b>	<b>30.0</b>

**SWH Systems - Replacement Market****Attachment 8**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>SWH systems installed</b>											
ACT	414	888	1,467	724	616	302	263	316	340	357	375
NSW	5,489	16,528	82,095	33,427	20,809	8,231	6,503	7,003	7,879	8,667	9,533
NT	866	826	1,385	867	745	518	305	303	325	342	359
QLD	6,416	10,699	26,007	23,765	21,578	9,931	6,880	8,920	9,589	10,068	10,572
SA	1,966	4,080	7,668	5,143	3,767	2,413	2,219	1,103	1,241	1,365	1,502
TAS	237	734	2,092	1,167	1,533	762	744	801	861	904	949
VIC	1,677	8,759	24,996	7,614	5,887	3,868	2,735	2,490	2,802	3,082	3,390
WA	6,604	8,792	11,569	10,337	7,785	7,102	6,341	7,204	7,744	8,131	8,538
<b>Total</b>	<b>23,669</b>	<b>51,306</b>	<b>157,279</b>	<b>83,044</b>	<b>62,720</b>	<b>33,127</b>	<b>25,989</b>	<b>28,140</b>	<b>30,781</b>	<b>32,916</b>	<b>35,217</b>
<b>SWH certificates created</b>											
ACT	12,141	28,397	50,169	22,897	19,099	9,354	8,350	9,950	10,696	11,231	11,793
NSW	170,768	713,696	3,021,137	1,167,325	662,471	262,431	210,435	219,031	246,410	271,051	298,157
NT	26,915	26,505	65,827	31,740	20,807	14,673	8,746	8,301	8,923	9,369	9,838
QLD	191,928	346,445	1,045,900	793,279	666,758	309,804	217,433	273,705	294,232	308,944	324,391
SA	60,666	133,496	321,816	170,271	109,047	68,624	64,754	32,980	37,102	40,813	44,894
TAS	6,653	58,209	143,895	61,940	40,289	22,502	23,316	24,725	26,579	27,908	29,303
VIC	47,899	578,923	1,652,280	398,889	184,229	118,345	85,818	75,510	84,949	93,444	102,788
WA	184,539	287,502	385,193	310,613	220,545	198,832	185,635	206,512	222,000	233,100	244,755
<b>Total</b>	<b>701,509</b>	<b>2,173,173</b>	<b>6,686,217</b>	<b>2,956,954</b>	<b>1,923,245</b>	<b>1,004,565</b>	<b>804,485</b>	<b>850,713</b>	<b>930,893</b>	<b>995,860</b>	<b>1,065,919</b>
<b>Certificates per SWH System</b>											
ACT	29.3	32.0	34.2	31.6	31.0	31.0	31.7	31.4	31.4	31.4	31.4
NSW	31.1	43.2	36.8	34.9	31.8	31.9	32.4	31.3	31.3	31.3	31.3
NT	31.1	32.1	47.5	36.6	27.9	28.3	28.7	27.4	27.4	27.4	27.4
QLD	29.9	32.4	40.2	33.4	30.9	31.2	31.6	30.7	30.7	30.7	30.7
SA	30.9	32.7	42.0	33.1	28.9	28.4	29.2	29.9	29.9	29.9	29.9
TAS	28.1	79.3	68.8	53.1	26.3	29.5	31.3	30.9	30.9	30.9	30.9
VIC	28.6	66.1	66.1	52.4	31.3	30.6	31.4	30.3	30.3	30.3	30.3
WA	27.9	32.7	33.3	30.0	28.3	28.0	29.3	28.7	28.7	28.7	28.7
<b>Total</b>	<b>29.6</b>	<b>42.4</b>	<b>42.5</b>	<b>35.6</b>	<b>30.7</b>	<b>30.3</b>	<b>31.0</b>	<b>30.2</b>	<b>30.2</b>	<b>30.3</b>	<b>30.3</b>

**Solar PV by Segment****Summary of REC-Registry Data****Attachment 9**

Includes Pending Registration

**(Certificates created as at 25 November 2014)**

Installation year		2009							2010							
	State	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	Upgrade
Installed capacity	ACT		1,253	30			30	1,283		4,848	221	41		261	5,109	141
	NSW		18,673	272	106	151	530	19,202		148,553	5,247	43	265	5,555	154,109	1,229
	NT		366	43			43	409		1,136	121			121	1,257	21
	QLD		24,144	268	66		334	24,477		89,185	1,382	469	55	1,906	91,091	3,090
	SA		12,254	71	83		154	12,408		32,460	513	82	99	693	33,153	2,224
	TAS		1,722				-	1,722		2,913	37			37	2,949	136
	VIC		10,513				-	10,513		58,615	218		67	285	58,899	2,319
	WA		14,040	170	30		200	14,240		40,256	315	107	159	581	40,837	2,539
		-	82,965	854	285	151	1,290	84,255	-	377,966	8,053	741	645	9,439	387,405	11,700
Valid RECs created	ACT		42,956	740	-	-	740	43,696		315,103	5,939	965	-	6,904	322,007	2,885
	NSW		552,685	6,412	2,329	3,138	11,879	564,564		10,410,416	166,960	1,015	5,858	173,833	10,584,249	25,033
	NT		18,767	1,190	-	-	1,190	19,957		84,252	3,495	-	-	3,495	87,747	483
	QLD		768,930	6,457	1,598	-	8,055	776,985		6,599,771	38,345	11,543	1,268	51,156	6,650,927	62,792
	SA		338,146	1,405	1,834	-	3,239	341,385		2,157,340	14,425	1,815	2,045	18,285	2,175,625	45,078
	TAS		38,204	-	-	-	-	38,204		112,863	755	-	-	755	113,618	2,380
	VIC		337,483	-	-	-	-	337,483		3,290,949	4,916	-	1,190	6,106	3,297,055	41,321
	WA		372,786	3,828	623	-	4,451	377,237		2,666,494	8,345	2,508	3,127	13,980	2,680,474	51,861
		-	2,469,957	20,032	6,384	3,138	29,554	2,499,511	-	25,637,188	243,180	17,846	13,488	274,514	25,911,702	231,833
Systems							-							-		
	ACT		802	1	-	-	1	803		2,311	11	1	-	12	2,323	74
	NSW		13,990	17	3	2	22	14,012		69,667	490	1	3	494	70,161	626
	NT		206	3	-	-	3	209		620	9	-	-	9	629	13
	QLD		18,260	19	2	-	21	18,281		48,548	91	14	1	106	48,654	2,442
	SA		8,594	6	2	-	8	8,602		16,666	32	2	1	35	16,701	1,634
	TAS		1,452	-	-	-	-	1,452		1,883	2	-	-	2	1,885	88
	VIC		8,429	-	-	-	-	8,429		35,658	15	-	1	16	35,674	1,589
	WA		11,142	10	1	-	11	11,153		22,209	22	3	2	27	22,236	2,074
	-	62,875	56	8	2	66	62,941	-	197,562	672	21	8	701	198,263	8,540	
kw/System																
	ACT		1.56	29.70			29.70	1.60		2.10	20.07	40.56		21.78	2.20	1.91
	NSW		1.33	15.99	35.47	75.72	24.07	1.37		2.13	10.71	43.00	88.22	11.25	2.20	1.96
	NT		1.78	14.32			14.32	1.96		1.83	13.42			13.42	2.00	1.60
	QLD		1.32	14.11	32.87		15.89	1.34		1.84	15.19	33.51	55.20	17.99	1.87	1.27
	SA		1.43	11.90	41.25		19.24	1.44		1.95	16.03	40.80	98.69	19.81	1.99	1.36
	TAS		1.19					1.19		1.55	18.27			18.27	1.56	1.55
	VIC		1.25					1.25		1.64	14.51		67.00	17.79	1.65	1.46
	WA		1.26	17.02	30.10		18.21	1.28		1.81	14.33	35.57	79.49	21.51	1.84	1.22
		1.32	15.25	35.59	75.72	19.55	1.34		1.91	11.98	35.29	80.57	13.46	1.95	1.37	

## Solar PV by Segment

Includes Pending Registration

## Summary of REC-Registry Data

(Certificates created as at 25 November 2014)

## Attachment 9

Installation year		2011						2012								
	State	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	Upgrade	Residential
Installed capacity	ACT	15,980	1,048	66		1,115	17,236	109	4,493	293	81	54	429	5,030	110	9,262
	NSW	181,851	10,695	209	201	11,105	194,185	1,126	133,285	6,342	1,502	1,973	9,817	144,228	2,218	104,783
	NT	881	170	284		453	1,356	119	1,626	301			301	2,045	83	4,245
	QLD	213,031	5,923	1,885	53	7,860	223,981	11,489	397,438	5,362	3,291	448	9,101	418,028	16,210	239,638
	SA	158,864	2,134	98		2,232	163,320	1,277	131,551	4,896	156		5,052	137,879	3,106	121,897
	TAS	5,292	297			297	5,726	720	18,443	709	33	100	841	20,005	1,748	28,037
	VIC	136,718	885	79		963	140,001	2,201	197,076	7,156	446	481	8,083	207,360	2,730	115,359
	WA	111,548	1,212	265	239	1,715	115,801	3,643	91,906	2,603	537		3,140	98,689	3,067	58,417
		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	29,271	681,638
Valid RECs created	ACT	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	2,260	193,118
	NSW	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	45,784	2,251,812
	NT	63,494	4,881	7,279	-	12,160	76,137	2,769	61,210	8,062	-	-	8,062	72,041	1,953	100,324
	QLD	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	331,470	5,107,695
	SA	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	63,599	2,530,899
	TAS	295,401	7,030	-	-	7,030	304,811	12,639	552,294	14,245	586	1,801	16,632	581,565	30,683	506,791
	VIC	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	48,602	2,105,763
	WA	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	62,561	1,239,670
		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	586,912	14,036,072
Systems						-							-			
	ACT	6,723	61	2	-	63	6,860	43	1,458	18	2	1	21	1,522	32	2,297
	NSW	78,583	995	6	3	1,004	80,213	579	52,863	431	37	25	493	53,935	1,020	32,008
	NT	354	12	7	-	19	386	23	458	20	-	-	20	501	27	971
	QLD	92,405	348	59	1	408	95,255	6,815	122,997	314	100	6	420	130,232	9,992	60,606
	SA	61,750	156	3	-	159	63,543	675	40,855	311	4	-	315	41,845	1,136	27,246
	TAS	2,352	23	-	-	23	2,463	347	5,942	57	1	1	59	6,348	748	6,832
	VIC	58,556	58	2	-	60	60,205	901	64,811	468	12	6	486	66,198	1,105	31,653
	WA	49,212	82	8	3	93	51,379	2,805	39,629	167	16	-	183	42,617	2,146	19,132
		349,935	1,735	87	7	1,829	360,304	12,188	329,013	1,786	172	39	1,997	343,198	16,206	180,745
kw/System																
	ACT	2.38	17.19	33.02		17.69	2.51	2.53	3.08	16.30	40.31	54.48	20.41	3.30	3.43	4.03
	NSW	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	2.17	3.27
	NT	2.49	14.15	40.51		23.86	3.51	5.17	3.55	15.04			15.04	4.08	3.07	4.37
	QLD	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	1.62	3.95
	SA	2.57	13.68	32.71		14.04	2.57	1.89	3.22	15.74	38.97		16.04	3.29	2.73	4.47
	TAS	2.25	12.91			12.91	2.32	2.07	3.10	12.43	33.00	99.84	14.26	3.15	2.34	4.10
	VIC	2.33	15.25	39.43		16.06	2.33	2.44	3.04	15.29	37.15	80.17	16.63	3.13	2.47	3.64
	WA	2.27	14.78	33.07	79.50	18.44	2.25	1.30	2.32	15.59	33.59		17.16	2.32	1.43	3.05
		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	1.81	3.77

**Solar PV by Segment**

Includes Pending Registration

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

Installation year		2013							2014				
	State	>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
<b>Installed capacity</b>	<b>ACT</b>	1,231	30	149	1,410	<b>10,781</b>	42	3,134	103		80	183	<b>3,359</b>
	<b>NSW</b>	13,125	3,381	9,744	26,250	<b>133,251</b>	4,063	100,604	15,928	5,016	13,677	34,621	<b>139,288</b>
	<b>NT</b>	341	94	283	718	<b>5,046</b>	244	3,464	187	255	737	1,179	<b>4,887</b>
	<b>QLD</b>	8,284	2,984	1,537	12,804	<b>268,652</b>	14,789	182,071	9,863	3,085	5,055	18,004	<b>214,864</b>
	<b>SA</b>	13,741	421	2,065	16,227	<b>141,230</b>	4,611	49,032	11,804	722	3,503	16,028	<b>69,671</b>
	<b>TAS</b>	934	162	574	1,670	<b>31,455</b>	590	15,085	691	197	315	1,204	<b>16,879</b>
	<b>VIC</b>	8,815	1,221	3,104	13,139	<b>131,228</b>	3,084	116,702	11,152	2,263	5,668	19,083	<b>138,869</b>
	<b>WA</b>	4,901	2,081	1,013	7,995	<b>69,479</b>	2,641	64,375	5,141	3,479	2,596	11,215	<b>78,232</b>
		51,371	10,375	18,467	80,213	791,122	30,064	534,466	54,870	15,017	31,631	101,517	666,047
<b>Valid RECs created</b>	<b>ACT</b>	25,566	624	3,083	29,273	<b>224,651</b>	856	63,698	2,141	-	-	2,141	<b>66,695</b>
	<b>NSW</b>	275,541	71,122	201,923	548,586	<b>2,846,182</b>	81,485	2,032,581	320,907	104,625	268,034	693,566	<b>2,807,632</b>
	<b>NT</b>	8,018	2,230	6,517	16,765	<b>119,042</b>	5,522	78,974	4,397	6,024	12,823	23,244	<b>107,740</b>
	<b>QLD</b>	172,033	61,951	32,062	266,046	<b>5,705,211</b>	292,868	3,705,798	200,879	62,600	98,721	362,200	<b>4,360,866</b>
	<b>SA</b>	283,226	8,807	41,513	333,546	<b>2,928,044</b>	90,769	989,811	239,786	14,953	65,942	320,681	<b>1,401,261</b>
	<b>TAS</b>	16,316	2,911	10,200	29,427	<b>566,901</b>	10,049	263,716	11,911	3,499	3,826	19,236	<b>293,001</b>
	<b>VIC</b>	160,988	22,561	56,970	240,519	<b>2,394,884</b>	52,355	2,040,279	199,158	40,595	89,264	329,017	<b>2,421,651</b>
	<b>WA</b>	102,147	42,295	18,912	163,354	<b>1,465,585</b>	52,682	1,307,276	104,267	68,882	46,153	219,302	<b>1,579,260</b>
		1,043,835	212,501	371,180	1,627,516	16,250,500	586,586	10,482,133	1,083,446	301,178	584,763	1,969,387	13,038,106
<b>Systems</b>					-							-	
	<b>ACT</b>	79	1	2	82	<b>2,411</b>	16	842	6	-	1	7	<b>865</b>
	<b>NSW</b>	754	85	116	955	<b>33,983</b>	1,573	27,912	887	120	162	1,169	<b>30,654</b>
	<b>NT</b>	21	2	3	26	<b>1,024</b>	66	749	12	6	9	27	<b>842</b>
	<b>QLD</b>	479	87	20	586	<b>71,184</b>	7,429	42,180	539	86	62	687	<b>50,296</b>
	<b>SA</b>	753	11	24	788	<b>29,170</b>	1,227	10,858	578	19	40	637	<b>12,722</b>
	<b>TAS</b>	59	4	8	71	<b>7,651</b>	216	3,507	41	5	4	50	<b>3,773</b>
	<b>VIC</b>	494	31	38	563	<b>33,321</b>	1,096	30,882	587	55	71	713	<b>32,691</b>
	<b>WA</b>	245	60	12	317	<b>21,595</b>	1,599	17,811	254	95	29	378	<b>19,788</b>
		2,884	281	223	3,388	200,339	13,222	134,741	2,904	386	378	3,668	151,631
<b>kw/System</b>	<b>ACT</b>	15.58	30.14	74.38	17.19	<b>4.47</b>	2.60	3.72	17.24		80.00	26.21	<b>3.88</b>
	<b>NSW</b>	17.41	39.78	84.00	27.49	<b>3.92</b>	2.58	3.60	17.96	41.80	84.42	29.62	<b>4.54</b>
	<b>NT</b>	16.26	47.01	94.30	27.63	<b>4.93</b>	3.70	4.62	15.62	42.42	81.86	43.65	<b>5.80</b>
	<b>QLD</b>	17.29	34.30	76.84	21.85	<b>3.77</b>	1.99	4.32	18.30	35.88	81.54	26.21	<b>4.27</b>
	<b>SA</b>	18.25	38.28	86.03	20.59	<b>4.84</b>	3.76	4.52	20.42	37.99	87.57	25.16	<b>5.48</b>
	<b>TAS</b>	15.82	40.59	71.76	23.52	<b>4.11</b>	2.73	4.30	16.86	39.40	78.83	24.07	<b>4.47</b>
	<b>VIC</b>	17.84	39.39	81.68	23.34	<b>3.94</b>	2.81	3.78	19.00	41.15	79.83	26.76	<b>4.25</b>
	<b>WA</b>	20.00	34.69	84.39	25.22	<b>3.22</b>	1.65	3.61	20.24	36.62	89.51	29.67	<b>3.95</b>
		17.81	36.92	82.81	23.68	<b>3.95</b>	2.27	3.97	18.89	38.90	83.68	27.68	<b>4.39</b>

**Solar Hot Water by Segment****Summary of REC-Registry Data**  
(Certificates created as at 25 November 2014)**Attachment 10**

SWH certificates	Includes Pending Registration															
	New building								Replacement							
	2007	2008	2009	2010	2011	2012	2013	2014	2007	2008	2009	2010	2011	2012	2013	2014
ACT	1,111	3,641	18,125	7,501	13,138	12,503	6,071	2,894	12,141	28,397	50,169	22,897	19,099	9,354	8,345	7,891
NSW	100,171	130,824	131,981	172,125	145,841	83,654	87,619	64,334	170,768	713,696	3,021,137	1,167,325	662,471	262,431	210,318	173,705
NT	16,672	13,851	10,468	13,429	13,929	18,070	15,734	8,895	26,915	26,505	65,827	31,740	20,807	14,673	8,741	6,583
QLD	330,947	418,149	374,016	339,788	275,585	259,317	198,682	122,050	191,928	346,445	1,045,900	793,279	666,758	309,804	217,312	217,064
SA	28,075	36,438	38,281	54,845	51,074	29,642	22,678	12,045	60,666	133,496	321,816	170,271	109,047	68,624	64,718	26,155
TAS	3,301	8,056	11,377	8,115	4,994	3,889	2,401	2,164	6,653	58,209	143,895	61,940	40,289	22,502	23,303	19,608
VIC	184,040	325,693	457,839	533,397	531,095	434,730	461,531	351,304	47,899	578,923	1,652,280	398,889	184,229	118,345	85,770	59,884
WA	150,930	121,986	142,995	188,152	162,535	144,164	143,045	98,879	184,539	287,502	385,193	310,613	220,545	198,832	185,532	163,776
<b>Total</b>	<b>815,247</b>	<b>1,058,638</b>	<b>1,185,082</b>	<b>1,317,352</b>	<b>1,198,191</b>	<b>985,969</b>	<b>937,761</b>	<b>662,565</b>	<b>701,509</b>	<b>2,173,173</b>	<b>6,686,217</b>	<b>2,956,954</b>	<b>1,923,245</b>	<b>1,004,565</b>	<b>804,039</b>	<b>674,666</b>

**SWH systems installed**

	New building								Replacement							
	2007	2008	2009	2010	2011	2012	2013	2014	2007	2008	2009	2010	2011	2012	2013	2014
ACT	39	113	507	236	422	432	190	86	414	888	1,467	724	616	302	263	251
NSW	3,276	3,675	3,361	5,098	4,522	2,579	2,642	2,025	5,489	16,528	82,095	33,427	20,809	8,231	6,499	5,554
NT	548	410	346	436	522	653	578	310	866	826	1,385	867	745	518	305	240
QLD	10,414	12,631	10,652	10,497	9,359	9,042	6,527	3,846	6,416	10,699	26,007	23,765	21,578	9,931	6,876	7,074
SA	903	1,023	1,126	1,669	1,677	1,060	765	394	1,966	4,080	7,668	5,143	3,767	2,413	2,218	875
TAS	113	172	177	266	192	137	83	72	237	734	2,092	1,167	1,533	762	744	635
VIC	7,480	12,449	17,124	20,119	20,559	17,726	16,869	12,376	1,677	8,759	24,996	7,614	5,887	3,868	2,733	1,975
WA	4,535	3,606	4,123	5,728	5,077	4,710	4,651	2,971	6,604	8,792	11,569	10,337	7,785	7,102	6,337	5,713
<b>Total</b>	<b>27,308</b>	<b>34,079</b>	<b>37,416</b>	<b>44,049</b>	<b>42,330</b>	<b>36,339</b>	<b>32,305</b>	<b>22,080</b>	<b>23,669</b>	<b>51,306</b>	<b>157,279</b>	<b>83,044</b>	<b>62,720</b>	<b>33,127</b>	<b>25,975</b>	<b>22,317</b>

**Certificates per SWH System**

	New building								Replacement							
	2007	2008	2009	2010	2011	2012	2013	2014	2007	2008	2009	2010	2011	2012	2013	2014
ACT	28.5	32.2	35.7	31.8	31.1	28.9	32.0	33.7	29.3	32.0	34.2	31.6	31.0	31.0	31.7	31.4
NSW	30.6	35.6	39.3	33.8	32.3	32.4	33.2	31.8	31.1	43.2	36.8	34.9	31.8	31.9	32.4	31.3
NT	30.4	33.8	30.3	30.8	26.7	27.7	27.2	28.7	31.1	32.1	47.5	36.6	27.9	28.3	28.7	27.4
QLD	31.8	33.1	35.1	32.4	29.4	28.7	30.4	31.7	29.9	32.4	40.2	33.4	30.9	31.2	31.6	30.7
SA	31.1	35.6	34.0	32.9	30.5	28.0	29.6	30.6	30.9	32.7	42.0	33.1	28.9	28.4	29.2	29.9
TAS	29.2	46.8	64.3	30.5	26.0	28.4	28.9	30.1	28.1	79.3	68.8	53.1	26.3	29.5	31.3	30.9
VIC	24.6	26.2	26.7	26.5	25.8	24.5	27.4	28.4	28.6	66.1	66.1	52.4	31.3	30.6	31.4	30.3
WA	33.3	33.8	34.7	32.8	32.0	30.6	30.8	33.3	27.9	32.7	33.3	30.0	28.3	28.0	29.3	28.7
<b>Total</b>	<b>29.9</b>	<b>31.1</b>	<b>31.7</b>	<b>29.9</b>	<b>28.3</b>	<b>27.1</b>	<b>29.0</b>	<b>30.0</b>	<b>29.6</b>	<b>42.4</b>	<b>42.5</b>	<b>35.6</b>	<b>30.7</b>	<b>30.3</b>	<b>31.0</b>	<b>30.2</b>

**Solar Hot Water by Segment****Summary of REC-Registry Data****Attachment 10****(Certificates created as at 25 November 2014)**

<b>SWH certificates</b>	<b>Includes Pending Registration</b>							
	<b>Total Market</b>							
	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
ACT	13,252	32,038	68,294	30,398	32,237	21,857	14,416	10,785
NSW	270,939	844,520	3,153,118	1,339,450	808,312	346,085	297,937	238,039
NT	43,587	40,356	76,295	45,169	34,736	32,743	24,475	15,478
QLD	522,875	764,594	1,419,916	1,133,067	942,343	569,121	415,994	339,114
SA	88,741	169,934	360,097	225,116	160,121	98,266	87,396	38,200
TAS	9,954	66,265	155,272	70,055	45,283	26,391	25,704	21,772
VIC	231,939	904,616	2,110,119	932,286	715,324	553,075	547,301	411,188
WA	335,469	409,488	528,188	498,765	383,080	342,996	328,577	262,655
<b>Total</b>	<b>1,516,756</b>	<b>3,231,811</b>	<b>7,871,299</b>	<b>4,274,306</b>	<b>3,121,436</b>	<b>1,990,534</b>	<b>1,741,800</b>	<b>1,337,231</b>

**SWH systems installed**

	<b>Total Market</b>							
	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
ACT	453	1,001	1,974	960	1,038	734	453	337
NSW	8,765	20,203	85,456	38,525	25,331	10,810	9,141	7,579
NT	1,414	1,236	1,731	1,303	1,267	1,171	883	550
QLD	16,830	23,330	36,659	34,262	30,937	18,973	13,403	10,920
SA	2,869	5,103	8,794	6,812	5,444	3,473	2,983	1,269
TAS	350	906	2,269	1,433	1,725	899	827	707
VIC	9,157	21,208	42,120	27,733	26,446	21,594	19,602	14,351
WA	11,139	12,398	15,692	16,065	12,862	11,812	10,988	8,684
<b>Total</b>	<b>50,977</b>	<b>85,385</b>	<b>194,695</b>	<b>127,093</b>	<b>105,050</b>	<b>69,466</b>	<b>58,280</b>	<b>44,397</b>

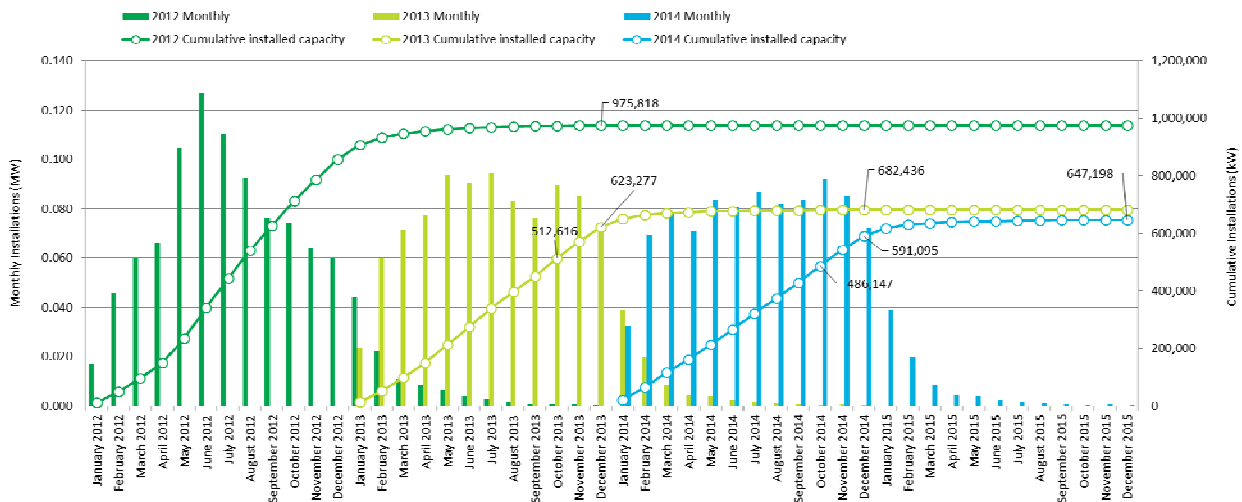
**Certificates per SWH :**

	<b>Total Market</b>							
	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
ACT	29.3	32.0	34.6	31.7	31.1	29.8	31.8	32.0
NSW	30.9	41.8	36.9	34.8	31.9	32.0	32.6	31.4
NT	30.8	32.7	44.1	34.7	27.4	28.0	27.7	28.1
QLD	31.1	32.8	38.7	33.1	30.5	30.0	31.0	31.1
SA	30.9	33.3	40.9	33.0	29.4	28.3	29.3	30.1
TAS	28.4	73.1	68.4	48.9	26.3	29.4	31.1	30.8
VIC	25.3	42.7	50.1	33.6	27.0	25.6	27.9	28.7
WA	30.1	33.0	33.7	31.0	29.8	29.0	29.9	30.2
<b>Total</b>	<b>29.8</b>	<b>37.8</b>	<b>40.4</b>	<b>33.6</b>	<b>29.7</b>	<b>28.7</b>	<b>29.9</b>	<b>30.1</b>

## Delay in Certificate creation for PV

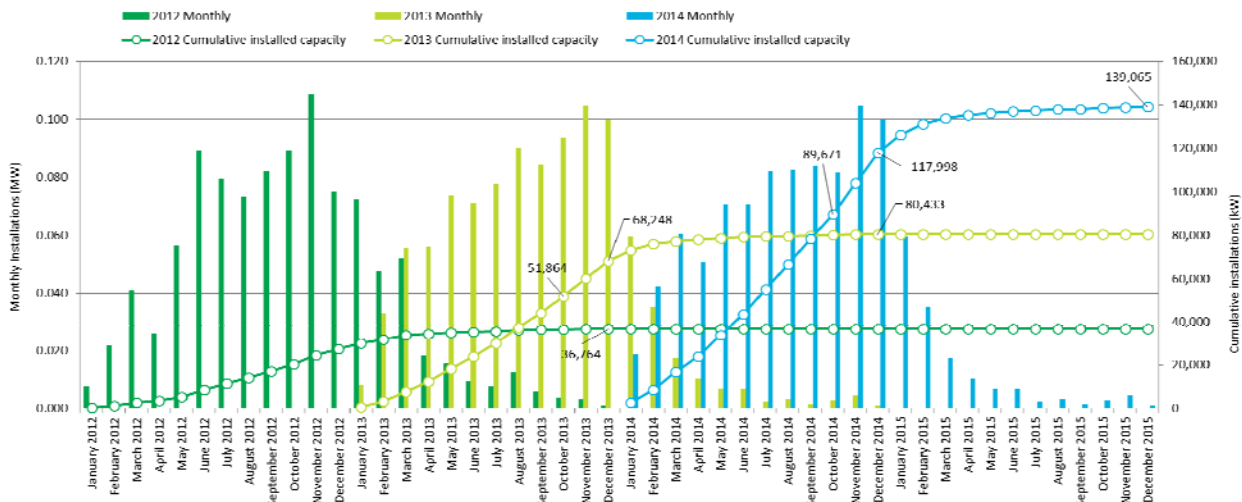
## PV New Residential

kW Installed



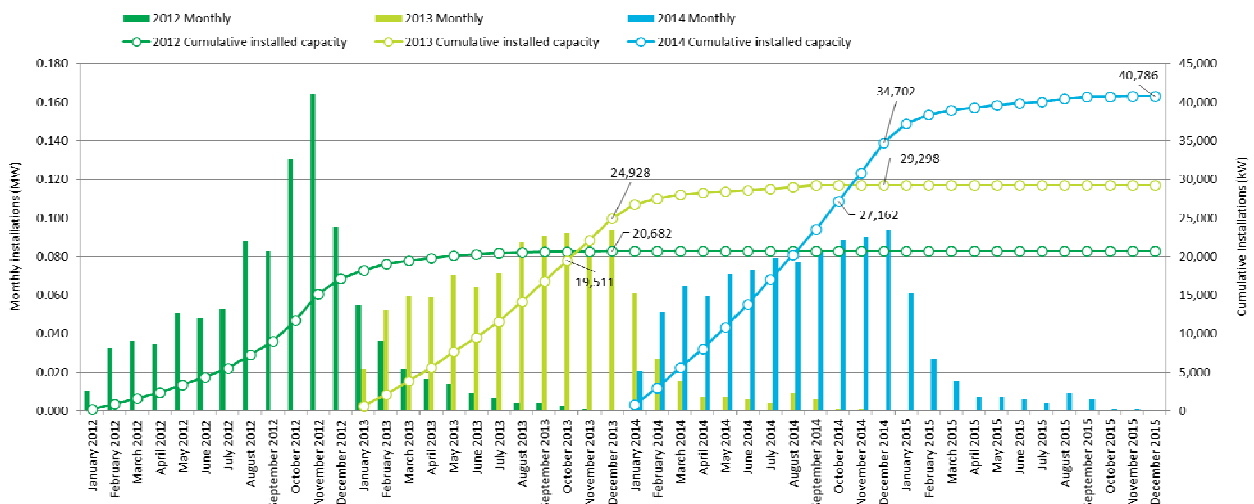
## PV Non Residential

kW Installed



## PV System Upgrades

kW Installed





## Attachment 11

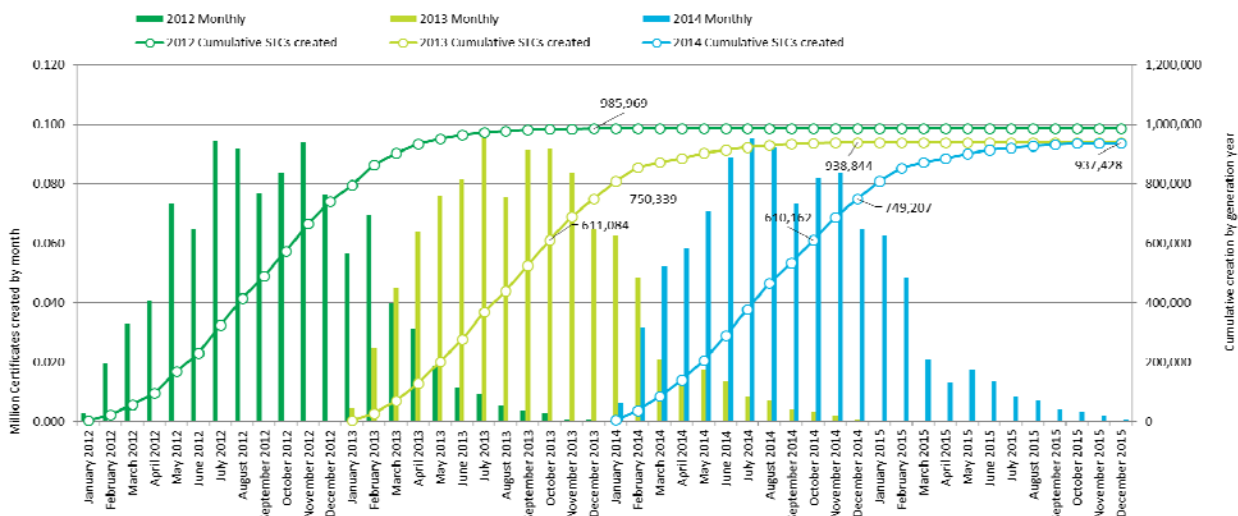
## Delay in Certificate creation for PV

kW installations	To Oct 2013	To Dec 2013	To Dec 2014	% created in 2014
<b>2013 Generation year</b>				
New Residential	512,616	623,277	682,436	8.7%
Non Residential	51,864	68,248	80,433	15.1%
System Upgrades	19,511	24,928	29,298	14.9%
	<b>583,991</b>	<b>716,453</b>	<b>792,167</b>	<b>9.6%</b>

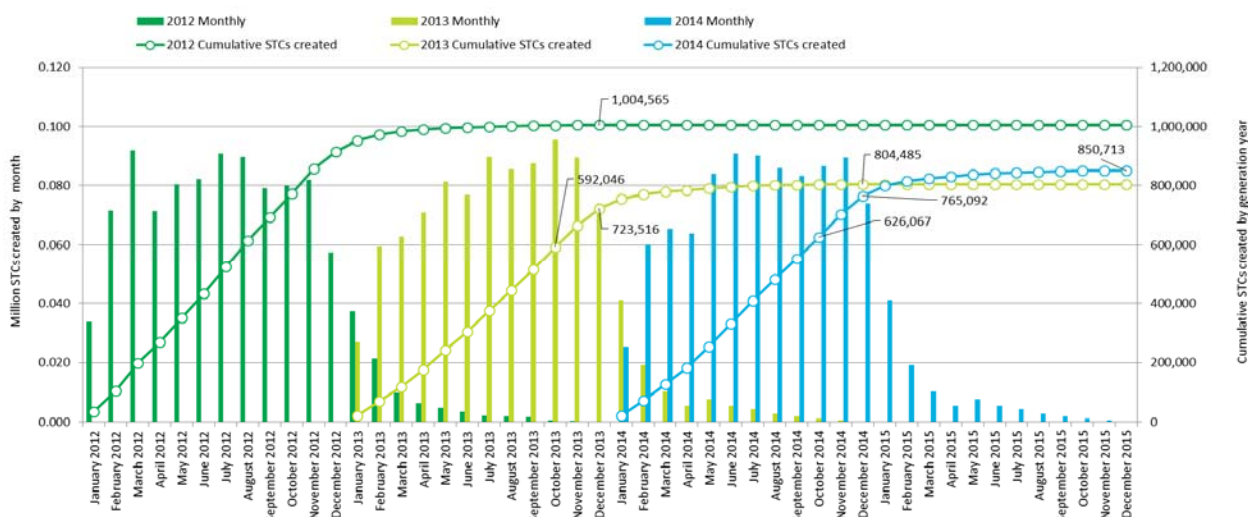
kW installations	To Oct 2014	To Dec 2014	To Dec 2015	% created in 2015
<b>2014 Generation year</b>				
New Residential	486,147	591,095	647,198	8.7%
Non Residential	89,671	117,998	139,065	15.1%
System Upgrades	27,162	34,702	40,786	14.9%
	<b>602,980</b>	<b>743,795</b>	<b>827,049</b>	<b>10.1%</b>

## Delay in Certificate creation for SWH

### SWH - New Building Market STCs created



### SWH - Replacement Market STCs created



	% created in		
	To Oct 2013	To Dec 2013	To Dec 2014
2013 Generation year			2014
New Building	611,084	750,339	938,844
Replacement	592,046	723,516	804,485
	<b>1,203,130</b>	<b>1,473,855</b>	<b>1,743,329</b>

	% created in		
	To Oct 2014	To Dec 2014	To Dec 2015
2014 Generation year			2015
New Building	610,162	749,207	937,428
Replacement	626,067	765,092	850,713
	<b>1,236,229</b>	<b>1,514,299</b>	<b>1,788,141</b>