



## **Household Solar in Australia: State of the Small-scale Renewable Energy Scheme**

**Report for the REC Agents Association  
prepared by Green Energy Markets Pty Ltd**

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### Executive Summary

This report has been prepared for the REC Agents Association by Green Energy Markets and reviews the development of Australia's solar industry and the role that the Small-scale Renewable Energy Scheme has played.

The REC Agents Association (RAA) is a national industry association which represents companies that create and trade in renewable energy certificates under the Renewable Energy Target.

The Small-scale Renewable Energy Scheme (SRES) operates as part of the Renewable Energy Target, the other component being the Large-scale Renewable Energy Target. The SRES is the key policy mechanism supporting the residential and commercial solar industry in Australia. It has successfully supported the growth of solar in Australia, where it has been embraced by Australian families and makes a material contribution to meeting our energy needs.

Key dimensions of Australia's solar industry:

- More than 1.1 million solar panel PV systems have been installed in Australia. This means that 13 per cent of homes have a solar PV system and 3 million Australians live in a house that has solar panels on its roof;
- More than 760,000 solar water heater (SWH) systems have been installed in Australia representing nearly 9 per cent of total homes;
- There are a combined 1.86 million solar systems (PV and SWH) installed in Australia – accounting for more than 21 per cent of homes. Australians have embraced solar with more than one in five homes in Australia having a solar system;
- 1038 megawatts (MW) of solar PV was installed in 2012 which makes Australia the seventh largest market in the world, accounting for 3.5 per cent of global installed capacity in 2012;
- Energy supplied by Solar PV and SWH systems resulted in a 2.2 per cent reduction in Australia's electricity consumption in 2012; and
- More than 18,450 people were employed in Australia's solar industry in 2012 across more than 4300 businesses, predominantly small and medium sized enterprises. Solar accounted for 76 per cent of employment across the wider renewables industry of 24,300.

The level of activity in the residential solar industry may well have peaked. The industry is now going through a consolidation process and faces a number of challenges. Key findings of this report are:

- The level of solar installations is falling as government support for solar has been progressively unwound. Installed PV capacity in 2013 is expected to be 800 MW, a 22 per cent reduction on 2012 levels;
- The level of employment in the solar PV industry is expected to decline by 3,400 people as the level of installed capacity reduces;
- The SRES scheme seems to be working as was initially intended. The initial oversupply of renewable energy certificates is being progressively absorbed and certificate prices are moving closer to the \$40 clearing house price;
- The contribution of small-scale solar to energy supply is seen as a demand reduction and its contribution is expected to increase to 3.5 per cent of total demand

by 2016. Another way to look at this is that solar is contributing to more than a 0.4% reduction in electricity consumption each year;

- The cost passed through to consumers for the SRES is expected to amount to only 1.3 per cent of a customer's bill. However once we allow for solar's positive impact on reducing wholesale prices the increase in household electricity bills is only one third of this - only 0.3 per cent or \$1.90 increase on a typical quarterly electricity bill; and
- Solar provides competitive pressure to network investment and fossil fuel electricity generation and protects customers against future rises in gas prices and network investments.

The future of the residential solar market in Australia may depend on finding new ways of refinancing the cost to customers, tax changes to make solar leasing more attractive and finding new markets, such as renters and low income earners.

The Government's Million Solar Roofs program has the potential to help low income earners reduce their power bills by installing solar, as well as potentially helping renters access solar. The Million Solar Roofs program, if successfully implemented, may stabilise demand for residential solar through to 2020.

## 1. Solar PV market in Australia

Australia is one of the largest markets for solar PV globally and was ranked seventh in size for capacity installed in 2012. According to data compiled by the Australian PV Association (APVA) 1038 MW of solar PV was installed in 2012 of which 1008 MW or 97% was grid-connected decentralised roof-top solar on homes and businesses across Australia.

**Table 1. Largest PV Markets - Installed Capacity (MW)**

|                     | 2012          | Share         |
|---------------------|---------------|---------------|
| Germany             | 7,604         | 26.0%         |
| Italy               | 3,647         | 12.4%         |
| China               | 3,500         | 11.9%         |
| US                  | 3,362         | 11.5%         |
| Japan               | 1,718         | 5.9%          |
| France              | 1,079         | 3.7%          |
| Australia           | 1,038         | 3.5%          |
| India               | 950           | 3.2%          |
| UK                  | 925           | 3.2%          |
| Greece              | 900           | 3.1%          |
| Other Countries     | 4,575         | 15.6%         |
| <b>Global Total</b> | <b>29,298</b> | <b>100.0%</b> |

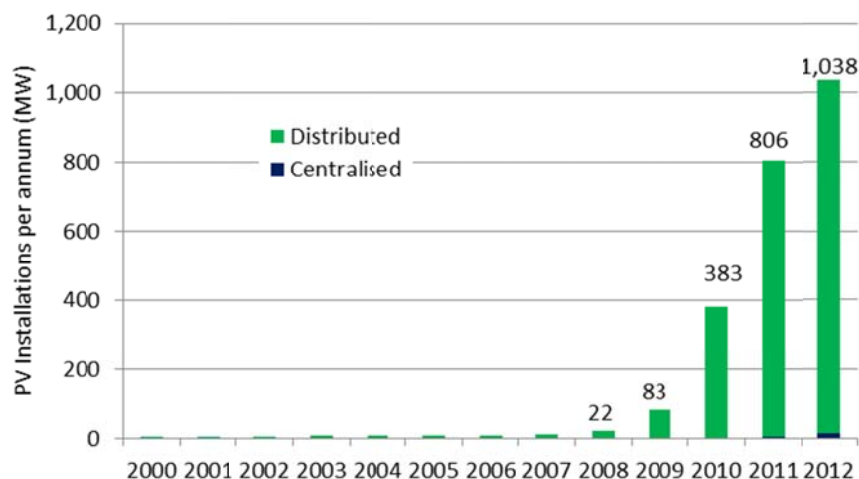
Source: PVPS Trends 2013 in Photovoltaic Applications

A total of 2415 MW of solar PV had been installed in Australia at the end of 2012. The 800 MW expected to be installed in 2013 will bring this figure to 3215 MW.

In Australia very few large or utility scale PV systems have been installed. Solar PV systems greater than 100 kW in size are not eligible to create Small-scale Technology Certificates (STCs) under the SRES and must instead register as power stations under the Large-scale Renewable Energy Scheme. According to the APVA, 14 MW of larger systems were installed in 2012. The 10 MW Greenough River project in WA was the largest installed in 2012 followed by the Carnarvon project in WA at 510 kW.

**Figure 1.1 Installed PV Capacity in Australia on an annual basis**

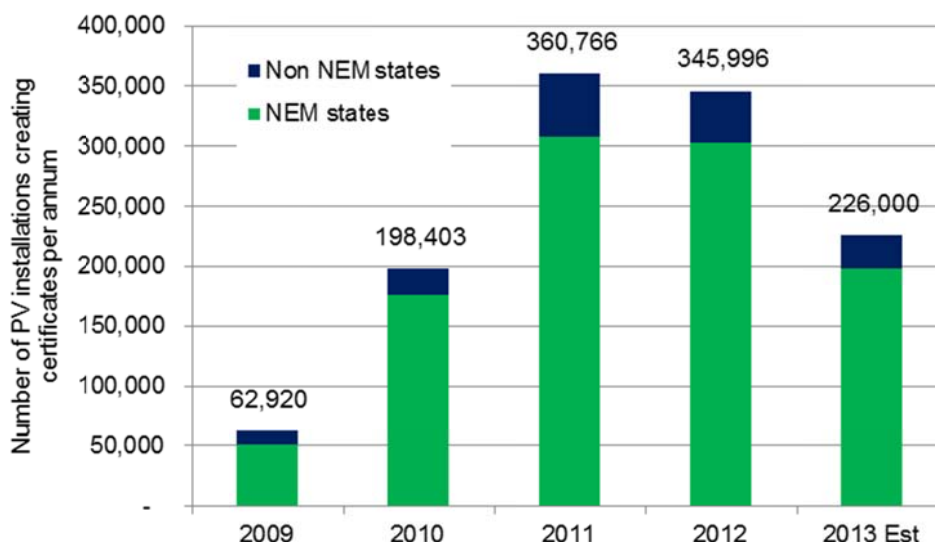
Source: APVA (PV in Australia 2012, May 2013)



### Number of system installations

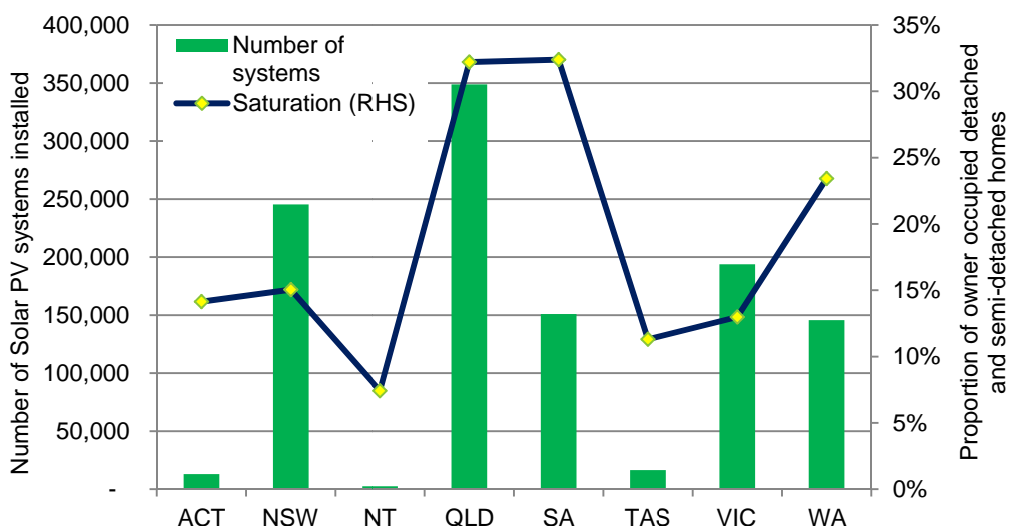
The number of systems installed has been falling after having reached a peak of more than 360,000 in 2011 (Figure 1.2). A total of 1,117,000 solar PV systems had been installed and created certificates by the end of September 2013. This amounts to 12.8 per cent of the 8.7 million occupied dwellings in Australia at the end of 2012.

**Figure 1.2 Total PV installations creating certificates on an annual basis**



When we consider that there are 5.6 million owner occupied, detached and semi-detached dwellings the saturation rate becomes 20.1 per cent. This amounts to an average of one in five suitable homes having a solar PV system installed. This means that 3 million Australians live in a house that has solar PV on its roof.

**Figure 1.3 Total PV systems installed and creating certificates (as at 30 Sep 2013)**

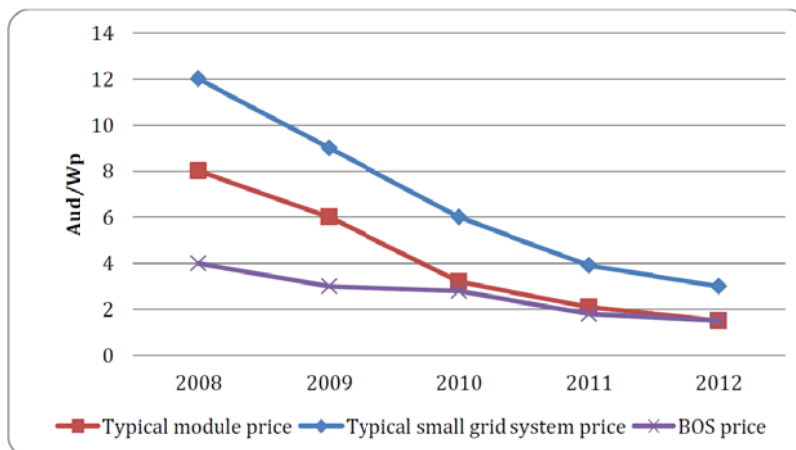


Queensland leads the country with nearly 350,000 solar PV systems installed which amounts to more than 32% of owner occupied, detached and semi-detached homes (Figure 1.3). South Australia has a similar saturation rate to Queensland at the end of September but will overtake Queensland in this metric due to the recent surge in installations following the announcement of the cessation of their feed-in tariff.

## State of the Solar Market

The installed cost for small-scale solar PV in Australia has dropped dramatically over the last four years. The cost in 2012 of \$3 per Watt is only one quarter of the cost four years earlier (Figure 1.4). The installed cost of solar PV may well have bottomed with installed costs in 2013 being at similar levels to 2012. This is despite a substantial reduction in the value of the Australian dollar.

**Figure 1.4 Typical module, system and balance of system costs in Australia**  
Extract from APVA, PV in Australia 2012, May 2013)

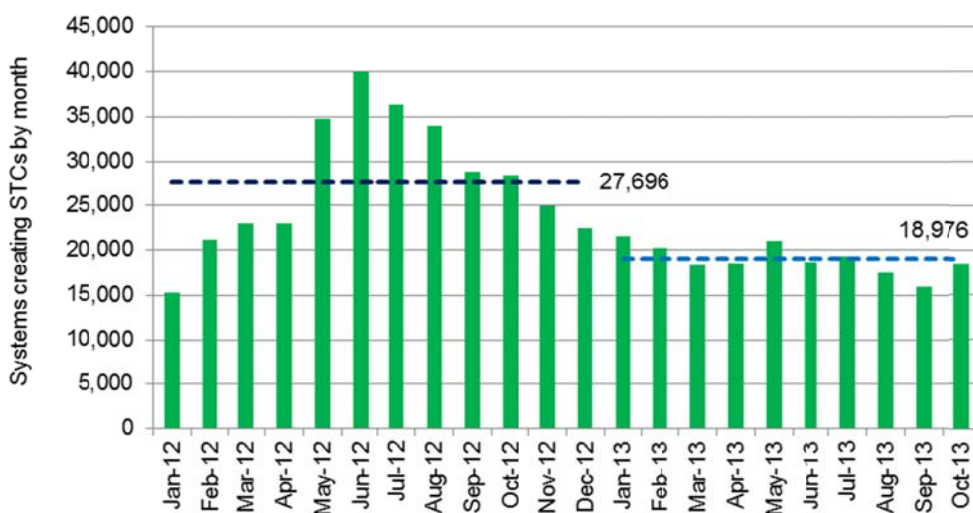


Lower installed system costs, Solar Credits Multiplier and attractive state feed-in tariffs had supported strong growth in installations. However, the level of solar PV installations in 2013 has reduced markedly following the removal of the Solar Credits Multiplier and the progressive winding back of state feed-in tariffs.

The number of solar PV systems creating certificates has been progressively declining through 2013 with Queensland and SA experiencing brief surges in activity due to the impending deadlines for installations to receive feed-in tariffs.

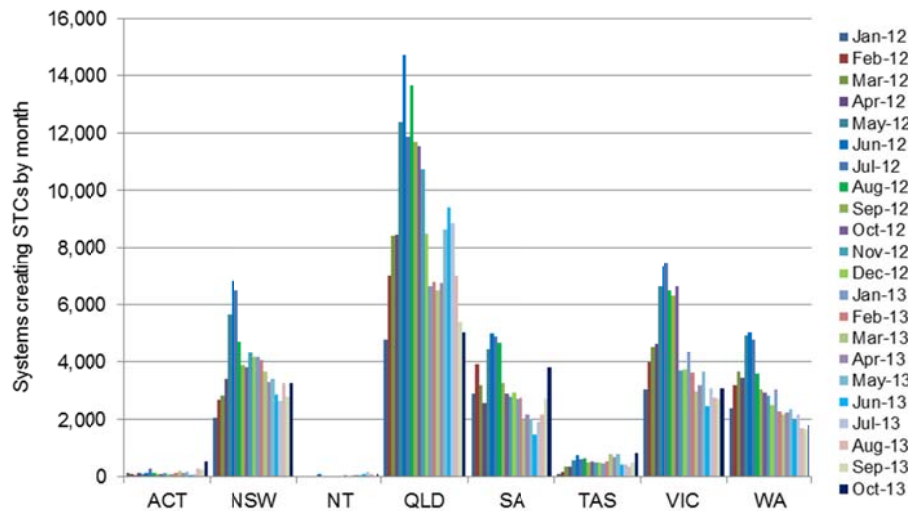
The solar PV market has declined some 33 per cent so far this year (to end October) compared to the same period last year. The cumulative impact of the winding down of government support programs, including the solar multiplier and state feed in tariffs has had a material impact. So far in 2013, an average of 8,700 fewer systems have been sold and installed each month compared to the 2012 average (Figure 1.5).

**Figure 1.5 Solar PV systems creating STCs by month**



Queensland installations have reduced to more normal levels in recent months (refer to Figure 1.6). Solar PV installations have declined across all states. The recent increase in South Australia can be attributed to the announced winding back of the feed-in tariff in that state and the desire to install systems before the cut-off date.

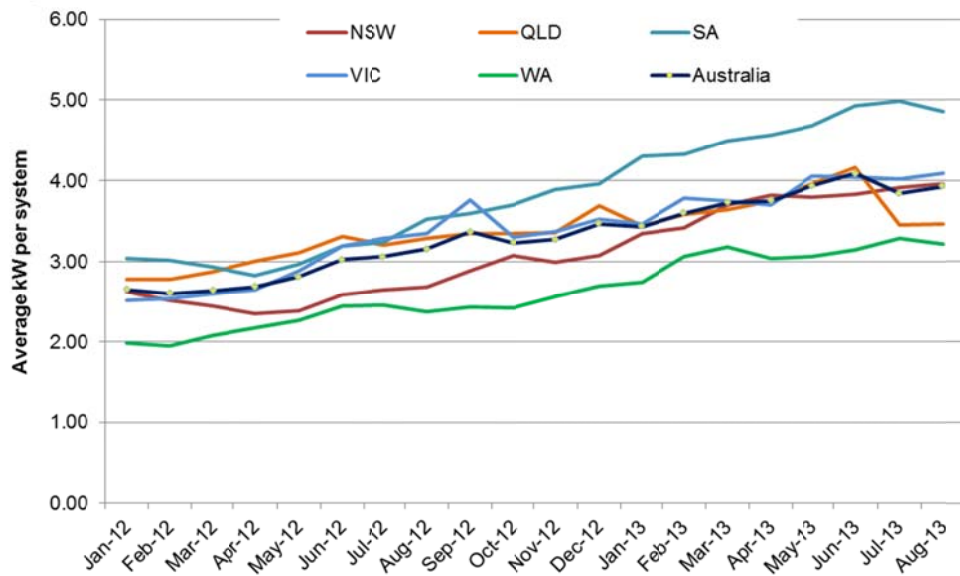
**Figure 1.6 Solar PV systems creating STCs by state by month**



The level of small-scale solar PV installed in Australia in 2013 is expected to be 800 MW a 22 per cent reduction on the 1024 MW installed in 2012.

Of particular note is that the average system size has grown considerably over the last few years to nearly 4 kW per system (Figure 1.7). This has started to decline in recent months and we expect this trend might continue due to the unattractive export rates being offered for power sent back to the grid.

**Figure 1.7 Average system size for PV installations**

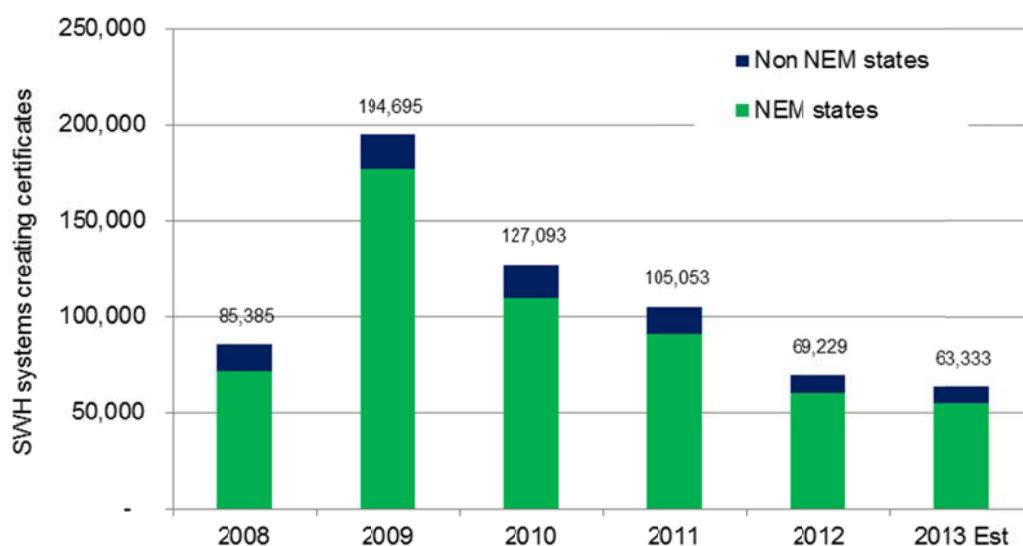




## 2. Solar Water Heater market in Australia

The SWH market in Australia reached a peak in 2009 with nearly 195,000 systems creating certificates. Attractive state and commonwealth government rebates as a response to the global financial crisis supported a surge in activity. Since this time however, the SWH market has been in decline and in recent years has fallen below the levels seen prior to the peak year. The removal of rebates and competition for discretionary expenditure from solar PV has been the key reasons for the reduction.

**Figure 2.1 SWH systems creating certificates (on installed year basis)**



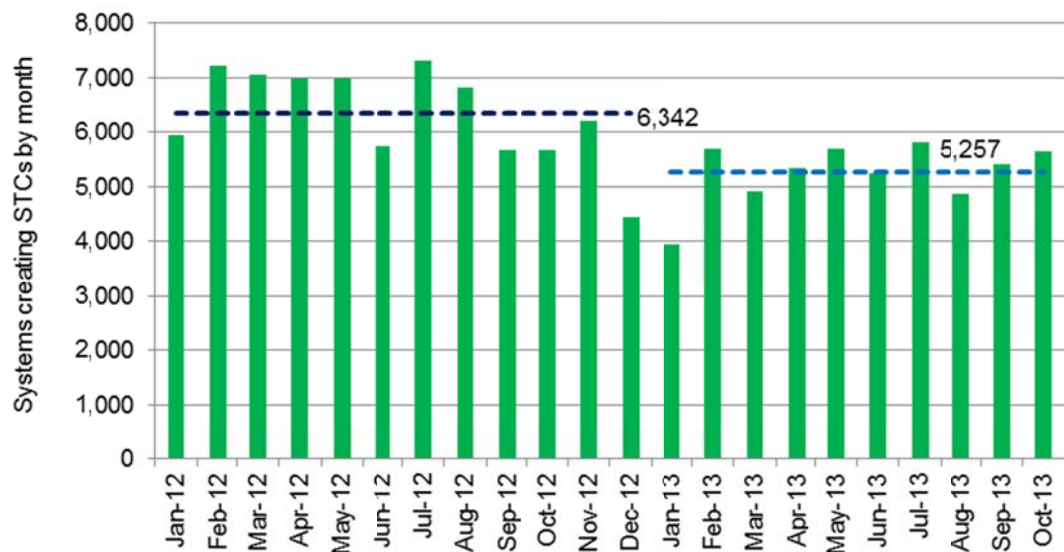
Note: 10 to 15 per cent of SWH systems are estimated not to create certificates

A total of 769,000 SWH systems had been installed and claimed certificates by the end of September 2013. This amounts to 8.8 per cent of total dwellings and 13.8 per cent of owner occupied detached and semi-detached homes.

The SWH market declined by 20 per cent for the 10 months to October compared to the same period in 2012. So far in 2013 we are averaging nearly 1,000 less system sales and installations per month compared to the 2102 average (Figure 2.2).

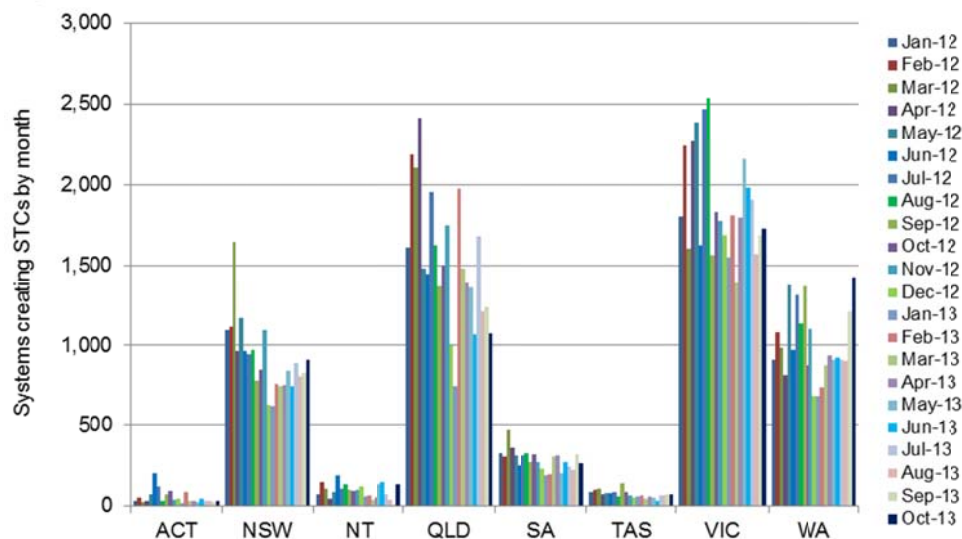
In 2013, it is estimated that some 63,000 solar hot water systems will be installed, the lowest level since before 2008.

**Figure 2.2 Solar Hot Water systems creating STCs by state by month**



All states have experienced a decline over this period as illustrated by Figure 2.3. System installations in Victoria and Western Australia have held up better than some other states.

**Figure 2.3 SWH systems creating certificates by state**



### 3. STC prices and the market in operation

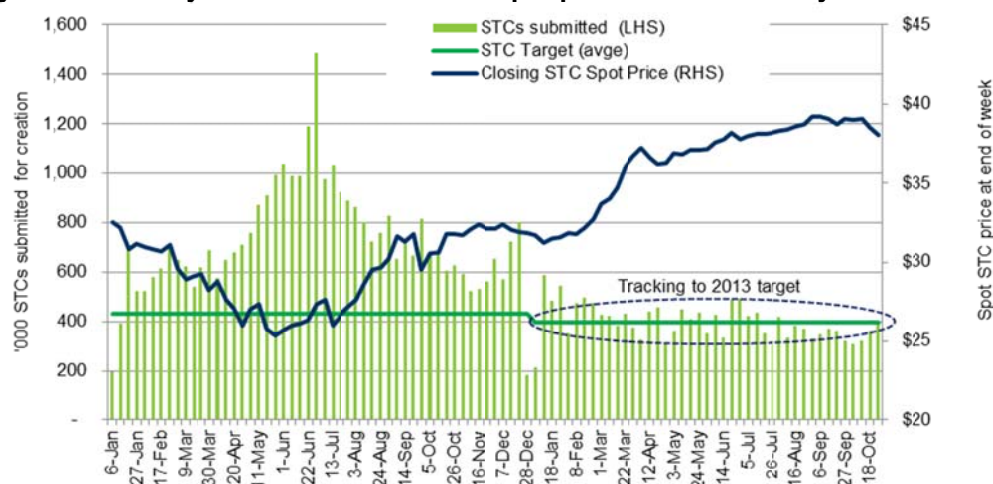
The SRES imposes a liability on electricity retailers and other liable parties to purchase a defined level of Small-scale Technology Certificates (STCs) and surrender these each quarter. This creates the demand for STCs which can be produced by small-scale solar PV and SWH installations. The target and the proportion of liable parties electricity sales that needs to be met by the surrender of STCs is set by the Clean Energy Regulator each year.

The cost of the scheme is not borne by the Government and taxpayers, but rather by electricity consumers. Electricity consumers will also benefit as the installation of solar reduces electricity demand which results in lower wholesale power prices and removes pressure for more network investment.

The level of solar systems being installed and creating certificates has fallen considerably in 2013. This is demonstrated in Figure 3.1, where we can see weekly certificate creation throughout 2013, tracking closely to the required average weekly target. Weekly creation in 2012 by comparison, was consistently above the weekly target.

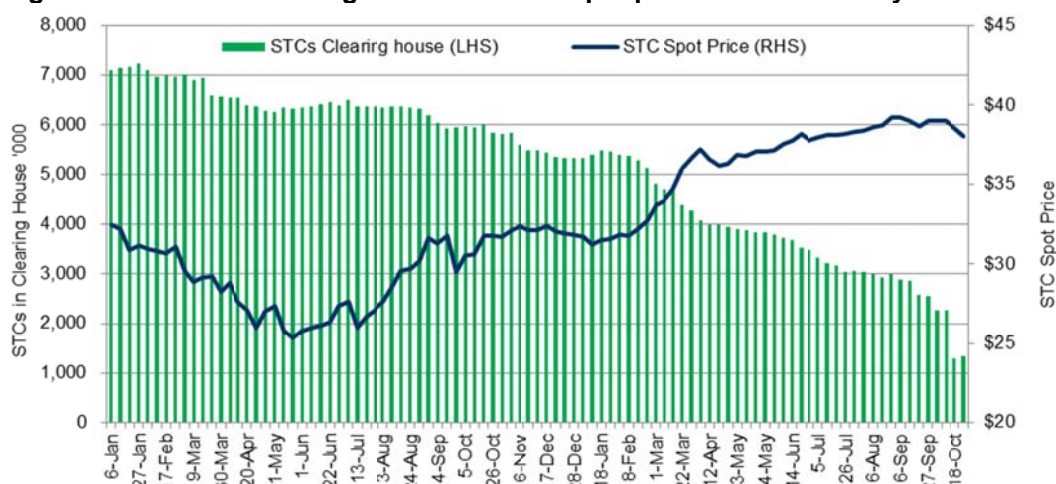
The STC spot price has progressively increased through 2013 as the level of certificate creation has fallen and come into line with the target for the year (Figure 3.1). The spot price reached a high of \$39.40 in early September, just below the Clearing House Price of \$40. As liable parties completed their purchasing for third quarter surrender the STC price started to fall reaching \$38 by end October.

**Figure 3.1 Weekly STC creation and STC spot price since 1 January 2012**



The number of STCs queued in the Clearing House has fallen dramatically over the course of 2013. There were around 5.5 million STCs in the Clearing House at the beginning of 2013 and this has dropped to 1.3 million by end October (Figure 3.2). As the STC price has increased it has become financially attractive to remove certificates from the Clearing House and sell them on the market now rather than wait for a slightly higher price later.

**Figure 3.2 STCs in Clearing House and STC spot price since 1 January 2012**



After the third quarter surrender there were a total of 5.1 million registered STCs available in the market of which 1.3 million were in the Clearing House. The STC surplus at the beginning of 2013 was 16.5 million certificates which comprised 15 million surplus that was carried forward into the 2013 target and 1.5 million that was not surrendered for 2012 due to lower than expected electricity sales. The 16.5 million surplus is slowly being absorbed, and if it had not been for the 1.5 million under-surrender for 2012, the surplus may well have been fully absorbed by the fourth quarter surrender on 14 February 2014.

Whether or not any certificates are sold through the Clearing House at the next surrender depends on several factors:

- The level of weekly certificate creation. If we continue at the rate we have been creating certificates to date then the Clearing House might well come into play.
- The level of the STC price. If the STC price reaches a point where people are indifferent to selling on the market or waiting for the Clearing House price then they may remove certificates from the Clearing House and it might not come into play until we have a deficit of certificates (this could happen by end April 2014).

It appears that there will be only a modest level of surplus certificates carried forward into next year's target. This will mean that the first quarter surrender for 2014 of 35 per cent of the total target becomes much more challenging and we might have a deficit of certificates which may mean that the Clearing House will be well and truly operational by end April 2014.

While the Clearing House has not come into play in any meaningful way to date, the STC scheme is starting to work as expected. The surplus of certificates that has hung over the market has slowly been absorbed and the market price for certificates has become less volatile and has moved towards the \$40 Clearing House price. In the final analysis, it may not matter that much to the solar industry whether \$40 is obtained through the Clearing House or slightly less than \$40 is obtained through the market a little earlier.

#### 4. Solar Industry outlook and impact of Million Solar Roofs Program

A detailed forecast of the solar PV and SWH markets has not been undertaken. We have relied on the non-binding targets released by the Clean Energy Regulator in early 2013 as a basis for projections in 2014 and 2015. As we have largely tracked to target for 2013 this seems a reasonable assumption.

The Government has announced a program to support an additional million solar systems. The detailed program design is yet to be finalised, however it is understood to have the following key features:

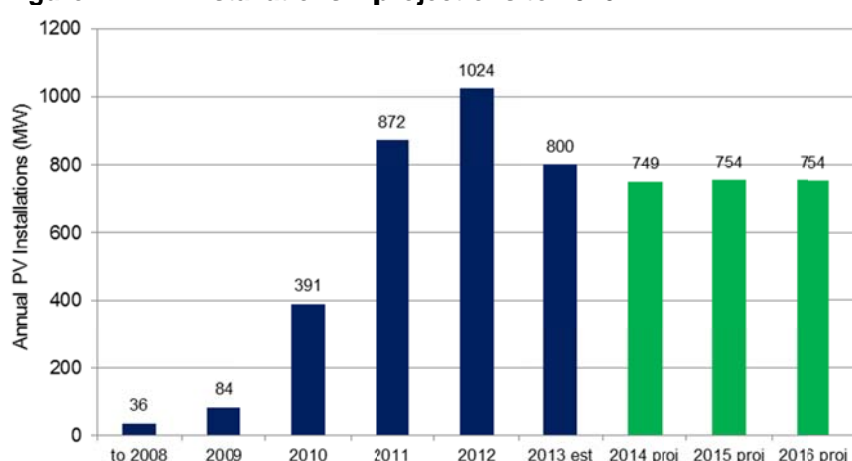
- A maximum of 100,000 solar systems to be eligible for a rebate each year;
- Maximum rebate of \$500 per system (solar PV or SWH);
- Eligibility limited to Commonwealth concession card holders; and
- Scheme to start on 1 July 2014.

To estimate the impact of this measure on the market we have assumed:

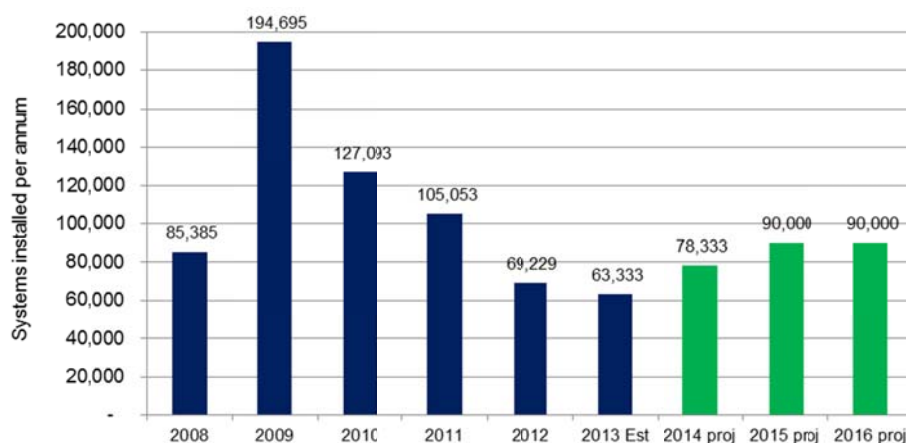
- 80 per cent of systems funded by the Million Solar Roofs Program are additional to what would have otherwise been implemented;
- Two thirds of systems are solar PV and one-third SWH; and
- All the funding is assumed to be utilised in the year the budget is available

The expected level of solar PV and SWH installations to 2016 is summarised in Figures 4.1 and 4.2.

**Figure 4.1 PV installations – projections to 2016**



**Figure 4.2 SWH installations – projections to 2016**



## 5. Cost impact of the SRES

Based on the assumed level of activity outlined in Section 4 which includes the Million Solar Roofs program, we have developed estimates of the cost pass-through to customers (Table 5.1).

**Table 5.1 Cost impact on customers**

|   | 2012          | 2013          | 2014          | 2015          | 2016          |
|---|---------------|---------------|---------------|---------------|---------------|
| STC Target for year ('000 STCs)                   | 22,317        | 20,700        | 17,869        | 18,328        | 18,328        |
| Surplus carry forward ('000 STCs)                 | 22,479        | 15,000        | 1,500         | 0             | 0             |
| <b>STC Target for Surrender ('000 STCs)</b>       | <b>44,796</b> | <b>35,700</b> | <b>19,369</b> | <b>18,328</b> | <b>18,328</b> |
| Total Liabile Electricity Sales (GWh)             | 186,962       | 181,218       | 185,969       | 186,101       | 186,101       |
| Small-scale Technology Percentage (STP)           | 23.96%        | 19.70%        | 10.42%        | 9.85%         | 9.85%         |
| Estimated STC cost (certificate price)            | \$29.47       | \$36.76       | \$38.50       | \$38.50       | \$38.50       |
| Cost pass-through to customers (\$m)              | 1,320         | 1,312         | 746           | 706           | 706           |
| <b>Cost pass-through to customers (cents/kWh)</b> | <b>0.706</b>  | <b>0.724</b>  | <b>0.401</b>  | <b>0.379</b>  | <b>0.379</b>  |
| Average household electricity price (cents/kWh)   | 26.70         | 27.65         | 28.45         | 29.30         | 30.18         |
| STC cost pass-through (% of customer bill)        | 2.6%          | 2.6%          | 1.4%          | 1.3%          | 1.3%          |

STC Target for 2013 of 35.7 million = 15 million surplus + 20.7 million for 2013

2014 and 2015 Targets are based on non binding targets released by the CER 15 Mar 2013, 2016 target same as 2015

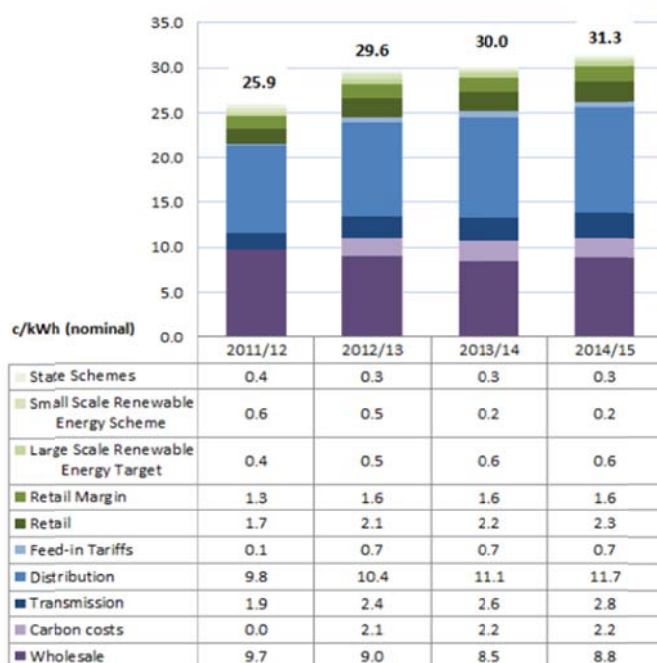
The STP represents the proportion of a Liabile Parties sales that needs to be surrendered to meet the STC Target.

Average household electricity price based on AEMC (excluding carbon price) and converted to calendar year. Prices assumed to increase by 3% per annum in 2015 and 2016.

The cost impact of the SRES works out at a cost pass-through of 0.4 cents/kWh in 2014 and falling to 0.38 cents/kWh in 2015 and 2016. This equates to just 1.3 per cent of residential retail prices of 29.1 cents estimated by the Australian Energy Market Commission (AEMC) assuming no carbon price. This means that the SRES makes up 1.3% of the average power bill. On the basis of a typical average quarterly bill of \$500 the SRES pass-through impact is \$6.50 per quarter.

**Figure 5.1 Extract of AEMC Report on outlook for electricity prices**

Nominal electricity prices (before GST)





The AEMC released a report in March 2013 on possible future electricity price movements. On the basis of a national average, including carbon price, residential electricity prices were expected to increase from 25.9 cents/kWh in 2011/2 to 31.3 cents/kWh in 2014/15 (Figure 5.1).

Of particular interest is the breakdown of the total electricity cost into its different components, including the cost pass-through of meeting the requirements of the SRES and LRET. The AEMC slightly understates the cost of the SRES from 2012/13 due to their use of a lower non-binding STC target.

The SRES cost pass-through by electricity retailers to customers is only one part of the equation and to determine the total cost impact on customers we need to account for the reduction in the wholesale price that is caused by the reduction in demand caused by solar. By reducing electricity demand higher cost fossil fuel generators do not need to be dispatched which means that the wholesale power price paid by all customers is lower. As an example, the AEMC project that the wholesale price will fall from 9.7 cents/kWh in 2011/12 to 8.5 cents/kWh by 2013/14. This is a reduction of 1.2 cents/kWh or 12 per cent. A component of the price reduction will be as a result of the reduction in electricity demand caused by solar PV and SWH supported by the SRES.

SKM undertook extensive modelling of the cost impact of the Renewable Energy Target (RET) for the Climate Change Authority in December 2012<sup>1</sup> and found that wholesale prices could be up to \$7.90/MWh lower to 2022 due to the impact of the RET (refer to Figure 5.2). The average over the modelling period was \$6.70/MWh.

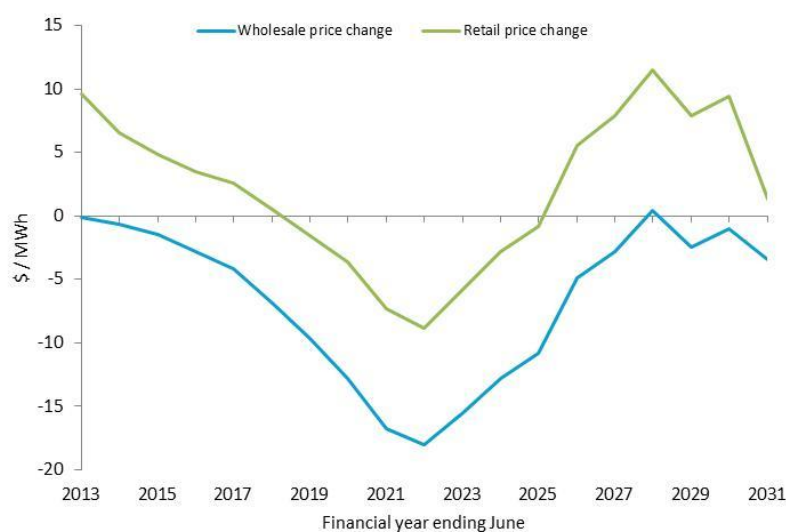
### Wholesale prices

In the current electricity market environment with surplus capacity and low demand growth, a higher RET and higher renewable development is expected to lead to lower wholesale prices, as prices are further suppressed by this additional supply. The wholesale price reductions offset the additional RET certificate cost associated with a higher RET in the short term. In the "No RET" case the difference in wholesale prices peaked at \$18.1/MWh and then reduced once renewable development recommenced post 2023. In the "Updated 20% Target", the modelling shows that wholesale prices could be up to \$7.9/MWh higher than under "Reference Case 1" prior to further renewable generation development post 2022.

Extract from SKM Report, Page 5

**Figure 5.2 Extract from Climate Change Authority Report on RET Review**

**Figure 35 Change in wholesale and retail prices – no RET compared with reference case 1**



Source: SKM MMA and Climate Change Authority, 2012.

Note: A positive number indicates the value is higher in the *reference case 1* scenario than in the *no RET* scenario.

<sup>1</sup> SKM – Modelling the Renewable Energy Target for the Climate Change Authority, December 2012

The SRES is estimated to account for 40 per cent of the total RET impact from 2012 to 2020 and as result might account for an average reduction in wholesale prices of \$2.70/MWh. This is equivalent to 0.27 cents/kWh or 71 per cent of the cost pass-through impact.

Once we allow for the positive wholesale impacts, the real impact on residential prices of the SRES is less than one-third of the cost pass-through component and results in an increase in household electricity bills of only 0.11 cents/kWh equivalent to 0.3 per cent or \$1.90 increase on a typical quarterly electricity bill.

The reduction in energy demand also reduces the pressure on network investment and we would expect that less investment will be required in distribution and transmission investment over time. Regulated transmission and distribution account for half of the delivered cost of electricity to households (Figure 5.1). These costs have blown out dramatically over the last five years with unprecedented levels of investment. This has been the key reason for the electricity price pain endured by households and businesses, not the cost of the RET that have been claimed by some commentators.

There has been considerable concern that domestic gas supplies may not be sufficient in the short term and that prices will increase dramatically as we align with international liquid natural gas (LNG) prices.

Due to higher gas prices and potential gas shortages in some states, we can expect that gas will be diverted from the power generation market increasing prices (and the emission intensity) of our electricity. Gas supplied 12.5 per cent of electricity in the National Electricity Market (interconnected south east Australian market, excluding Western Australia and the Northern Territory) in 2012, so the impact could be material.

The reduction in demand caused by the SRES creates some protection for electricity consumers so that higher-priced gas will not necessarily equate to higher-priced electricity.

Distributed energy such as solar PV and SWH provide competitive pressure to network investment and fossil fuel electricity generation. As a result they will need to play an increasingly important role in protecting customers against future rises in these – the most significant segments of a customers' bill<sup>2</sup>.

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<sup>2</sup> According to the AEMC (Figure 5.1) regulated networks account for 50 per cent of a customer's bill and wholesale energy accounts for 30 per cent.



## 6. Impact of the SRES on reducing electricity demand

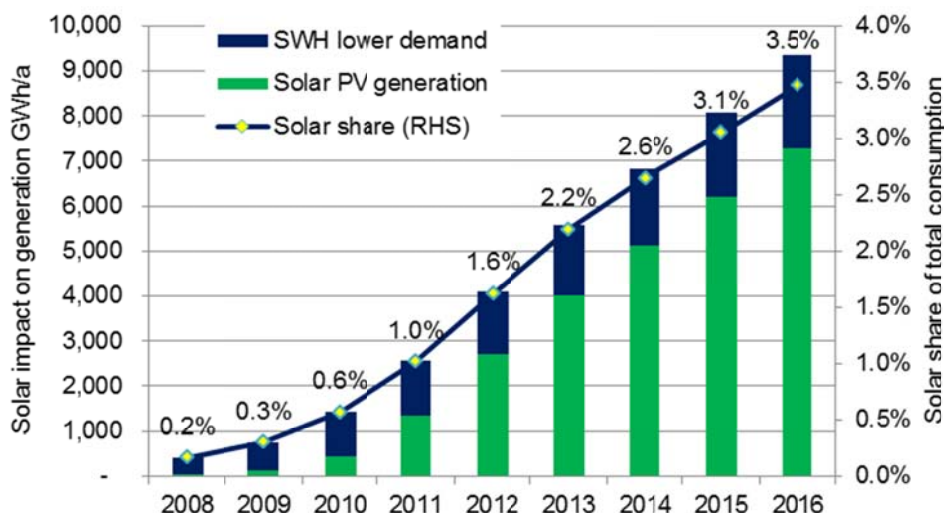
The contribution of small-scale solar to energy supply is seen as a reduction in electricity demand. This results in less generation being required from fossil fuel generators and less carbon pollution. Demand reduction and its contribution will continue to increase even though the cost to consumers declines.

In 2012 small-scale solar PV generated 2700 GWh of electricity equivalent to 1.1 per cent of total generation in Australia (including off-grid generation).<sup>3</sup> This is expected to expand to 7300 GWh by 2016 and represent 2.7 per cent of total generation. Energy produced from SWH systems has displaced 1400 GWh in 2012 (0.6 per cent) increasing to 2100 GWh in 2016 (0.8 per cent)

Assumptions used to develop these estimates include:

- Solar PV output based on the zone rating figures used by the Clean Energy Regulator eg. Sydney, Brisbane, Perth and Adelaide of 1.382 MWh per kW
- It is assumed that 70% of SWH systems installed replace an electric water heater
- Average avoided electricity for a SWH of 3 MWh per annum

**Figure 6.1 Energy produced from solar PV and SWH and share of total generation**



Residential power consumption accounts for approximately 28% of final power consumption.<sup>4</sup> As solar is predominantly installed in residential homes it is making an even more material contribution to reducing residential electricity consumption – by 5.7 per cent in 2012 increasing to 12.5 per cent by 2016.

<sup>3</sup> Bureau of Resources and Energy Economics, Energy in Australia, May 2013

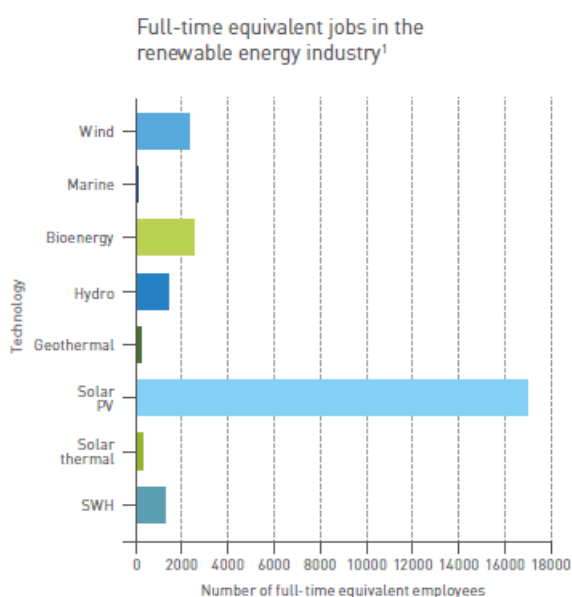
<sup>4</sup> Bureau of Resources and Energy Economics, Energy in Australia, May 2013

## 7. Employment in Australia's solar industry

According to the Clean Energy Council more than 24,300 people are employed in the renewables industry in Australia (Figure 7.1). The solar industry (solar PV, solar thermal, and SWH) accounted for 18,450 jobs or 76 per cent of total renewables employment. The solar PV industry employed 17,000 people with the SWH and Solar thermal industries employing an additional 1450.

Employment in solar PV has grown dramatically over time as the level of installed capacity has increased. It is estimated that more than 4200 businesses were involved in the solar PV industry in 2012<sup>5</sup>, predominantly small and medium sized enterprises.

**Figure 7.1 Employment in Australia's renewable energy industry in 2012**  
Extract from the Clean Energy Council's Clean Energy Australia Report 2012



The contraction in the small-scale solar PV industry in 2013 will see a 22 per cent reduction in installed capacity from over 1024 MW to 800 MW. The 22 per cent reduction in capacity in 2013 is expected to result in more than a 20 per cent reduction in solar PV jobs from 17,000 to 13,600, a loss of 3,400 jobs.

<sup>5</sup> SolarBusinessServices report for clients

## 8. Notes on the Analysis

- Data on certificate creation and systems creating certificates has been sourced from the REC-Registry
- Data on actual installations has been sourced from the Postcode data that is released regularly by the Clean Energy Regulator
- There are lags in the creation of certificates whereby it might take several months from the date of installation for the certificates to be created
- Not all solar systems installed create certificates. The SWH market in particular sees 10 to 15 per cent of systems fail to create certificates<sup>6</sup>.
- STC prices used in developing cost impacts are based on the average spot prices in 2012 and 2013 (to end October) and \$38.50 for 2014 onwards.

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<sup>6</sup> Green Energy Markets – STC Data Modelling Report for Clean Energy Regulator (February 2013)