

Update to Small-scale Technology Certificates Data Modelling for 2012 to 2014

FINAL REPORT

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Abbreviations

ACT	Australian Capital Territory
CER	Clean Energy Regulator
FiT	Feed-in Tariff
HPWH	Heat Pump Water Heaters
kW	Kilowatt
kWh	Kilowatt hour
NSW	New South Wales
ORER	Office of the Renewable Energy Regulator
PV	Photovoltaic
SGU	Small Generation Unit
SKM MMA	Sinclair Knight Merz - McLennan Magasanik Associates, the strategic consulting group within Sinclair Knight Merz resulting from the merger with McLennan Magasanik Associates in 2010
STC	Small-scale Technology Certificate
STP	Small-scale Technology Percentage
SWH	Solar Water Heaters

Executive Summary

The Clean Energy Regulator (CER) has engaged SKM MMA to conduct a mid-cycle review of the number of small-scale technology certificates (STCs) expected to be created for the balance of the 2012 calendar year, and for the 2013 and 2014 calendar years. The result of this work will feed into the CER's process for providing a revised 2013 non-binding estimate of the small-scale technology percentage (STP).

Updated STC creation data was supplied by the CER to the end of September 2012, and this was used to update SKM MMA's monthly time series model. The time series model projects expected STC creation into the future based on the historical uptake time series and assumptions on the evolving cost of the installation of small photovoltaic (PV) and solar water heater (SWH) systems, having regard to the relevant government subsidies and programs.

Exec Table 1 shows projected STC creation volumes for the 2013 and 2014 calendar years. The declining numbers for the PV component reflect the reduction in the Solar Credits multiplier from 2 to 1 on 1 July 2013.

- [Exec Table 1 Projections of STC creation for 2013 and 2014 calendar years](#)

	2013	2014
PV	16,326,000	12,429,000
SWH	2,138,000	2,057,000
Total	18,464,000	14,485,000

Exec Table 2 shows the projected STC overhang for the 2012 calendar year, which was calculated by subtracting the total 2011 and 2012 STP targets¹ from the total number of valid certificates created in the 2011 and 2012 calendar years². Adding the 2012 overhang to the projected 2013 certificate creation total gives an STC target of 34.457 million certificates for 2013.

- [Exec Table 2 STC Projections for 2013 calendar year](#)

	2013
2012 projected overhang	15,993,000
2013 projected STC creation	18,464,000
Total 2013 target	34,457,000

¹ The 2011 target was 28 million certificates and the 2012 target was 44.8 million certificates.

² The number of valid certificates created in 2011 was 52.6 million, and the number for 2012 is projected by the current modelling to be 36.2 million certificates.

1. Background

The Office of the Renewable Energy Regulator (ORER) engaged SKM MMA in 2011 to undertake a modelling to project the number of small-scale technology certificates (STCs) likely to be generated in the calendar years of 2012, 2013 and 2014.

Since the modelling was done in December 2011, there have been several changes in the market of small scale renewable generation that are likely to alter the projections:

- Early closure of the federal Renewable Energy Bonus Scheme for solar water heaters (SWH) and heat pump water heaters (HPWH)
- Early reduction in feed-in tariffs (FIT) for eligible solar photovoltaic (PV) systems in Victoria and Queensland
- Reduction of the Solar Credits multiplier
- Introduction of a carbon price

As a result ORER (who joined other government agencies in April 2012 to form the Clean Energy Regulator (CER)) has engaged SKM MMA to update its forecast for calendar years 2012 and 2013. The forecast is intended to assist the CER to update the 2013 non-binding Small-scale Technology Percentage (STP), which includes estimating the overhang of certificates at the end of calendar year 2012.

This update was carried out using the time series model, which determines the uptake of renewable technologies based on trends in historical data, also having regard to the historical and projected evolution of the net cost of system installation.

This report outlines these changes and where relevant, provides a comparison to the assumptions underpinning the previous modelling that was conducted in December 2011. Consequently, it would be convenient to read this document in conjunction with the 2011 report³.

³ SKM MMA. *Small-scale Technology Certificates Data Modelling for 2012 to 2014: FINAL DRAFT REPORT*, 13 December 2011

2. Updated assumptions

This section will detail the changes in assumptions and inputs to the model as a result of market developments that occurred in 2012. Unless specified here, the assumptions for the model in this update are the same as those used in December 2011.

2.1. Rebates

2.1.1. Renewable Energy Bonus Scheme - Solar hot water rebate program

The federal government offered a rebate of \$1,000 for eligible SWH systems and \$600 for eligible HPWH systems. This scheme has been in place since 20 February 2011 and was scheduled to end on 30 June 2014.

On 28 February 2012, the government announced that the scheme would close on 30 June 2012, however to be able to lodge on time, systems must have been purchased on or before 28 February 2012. This means that the market had no time to react to this early closure.

2.1.2. Solar Credits

This is not a change to the previous assumption since the multiplier has always been planned to reduce from three to two on 1 July 2012. However based on past experience, the market is likely to undergo a 'rushed' buying phase to take advantage of the higher multiplier before its scheduled reduction. This effect is very hard to predict but has an impact on the projection since the starting level of the historical time series data will change.

2.2. Feed-in tariff

2.2.1. Queensland

Net feed-in tariff of 44 c/kWh commenced in Queensland in July 2008. In 8 June 2011, eligibility was changed so that only systems up to 5kW in size are eligible.

In June 2012, the state government announced that the FiT in Queensland will be reduced to 8 c/kWh from 10 July 2012. However, electricity retailers will contribute a further 8 c/kWh to bring the total to 16 c/kWh. This arrangement is to be reviewed by 1 July 2013 but scheduled to end on 1 July 2014.

2.2.2. Victoria

Net feed-in tariff of 60c/kWh commenced in Victoria in November 2009 and ended on 30 September 2011. A net transitional feed-in tariff of 25c/kWh was in place from 1 January 2012 and was planned to be available until 31 December 2016.

The state government recently announced that the 'premium' FiT will be replaced by the 'standard' FiT of around 8 c/kWh (reflective of the cost of electricity) from 1 January 2013. To

be eligible for the 25 c/kWh rate, customers must have purchased an eligible system on or before 30 September 2012.

2.3. Carbon price

The carbon price assumption was present in the December 2011 modelling and is unchanged for this update. However, similar to the Solar Credits multiplier, the reality of a carbon price is expected to induce 'rushed' buying of systems in an attempt to pre-empt the effect of the rising electricity price.

2.4. Historical data set supplied by CER

The CER supplied a comprehensive historical data set of small-scale renewable generation installations as well as installation of solar water heaters and heat pump water heaters. There were just under 920,000 records in the SGU dataset, with the data spanning 2001 until September 2012. The information supplied included:

- date of installation;
- date of REC/STC registration;
- post code of installation address;
- state of installation address;
- technology type (PV, wind or hydro);
- capacity of the system;
- number of RECs/STCs registered by the system;
- number of RECs/STCs that passed/failed the validation audit

The data showed that the number of STCs created by small-scale PV systems was significantly greater than STCs produced by small-scale wind and hydro. As such, certificate projections for small-scale wind and hydro will not be carried out as their contribution to the total would be negligible.

The dataset comprising SWHs and HPWHs contained over 791,000 records covering the same time span as the SGU dataset. Supplied information included:

- date of installation;
- date of STC registration;
- post code of installation address;
- state of installation address;
- technology type (SWH or HPWH);
- number of STCs registered by the system; and
- whether the system capacity was over 700 litres.

These records were used to construct the historical time series data aggregated to monthly resolution, thus enabling the utilisation of time series analysis techniques for forecasting.

It is important to note that even though the September 2012 data supplied by the CER contained a significant number of records that were pending validation, we used the entire dataset in order to capture the very latest information, which implicitly assumes that all certificates pending validation would actually pass the audit process. This creates a very slight distortion in the modelling results, but it also means that the projected monthly STC creation numbers are the final expected number to be created⁴. This is an issue with respect to the 2012 overhang calculation because from a legal perspective, only certificates that have actually been validated qualify to be included in the overhang number. SKM MMA adjusted for this by subtracting the number of certificates pending validation on 29th September 2012 from the final 2012 certificate creation projection, which was just over 2,754,000 certificates. The certificates pending validation time series has been quite stable in 2012, and therefore no further adjustment was deemed to be necessary since any trend in this time series from September 2012 to December 2012 would be small.

2.5. Net cost model

The net cost for SGUs, SWHs and HPWHs is a key exogenous variable in explaining the uptake of these systems for the time series and analysis, and was central to the uptake forecasts using the time series model. The net cost is defined as follows:

- Sum of capital cost including installation
- Less
 - Value of any available government rebates
 - Revenue from the sale of RECs⁵ and/or STCs, including the effect of the Solar Credits multiplier
 - Net present value of future feed-in tariff revenue
 - Net present value of the avoided cost of electricity

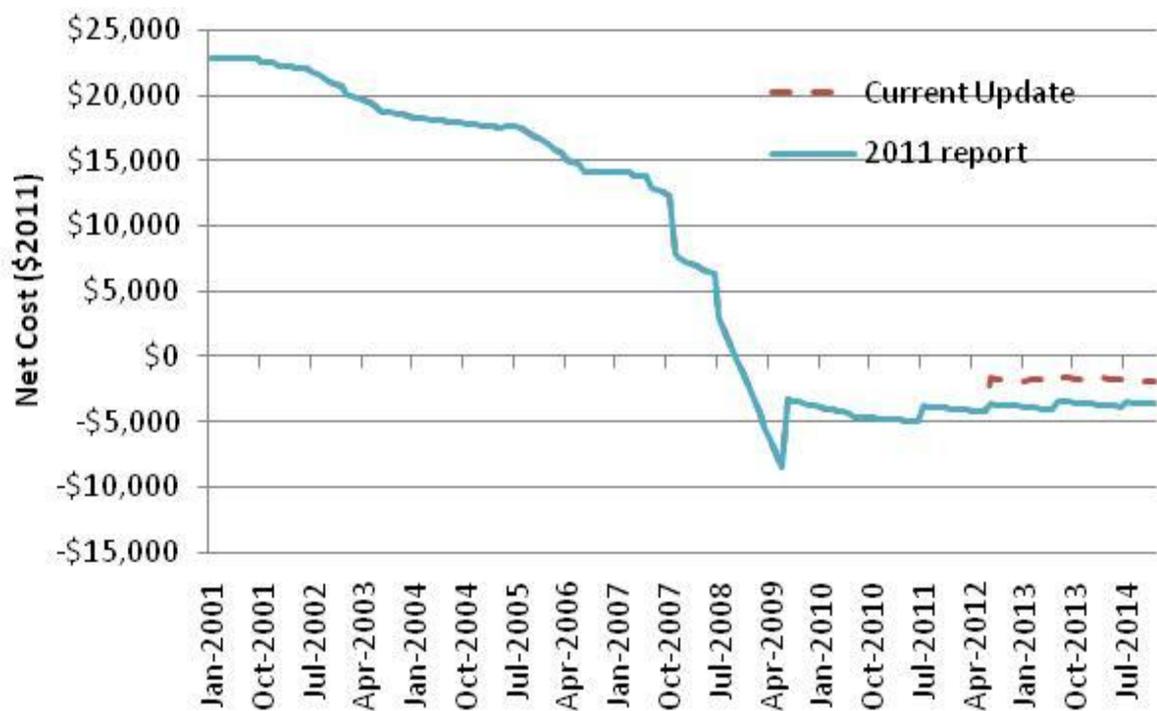
2.5.1. Net cost for PV

Figure 2-1 shows the net cost for a 1.5 kW PV system installed in Queensland. It also highlights the difference as a result of change in FiT for this update.

⁴ That is, the creation numbers do not exclude certificates pending validation at any given point in time.

⁵ Prior to 2011

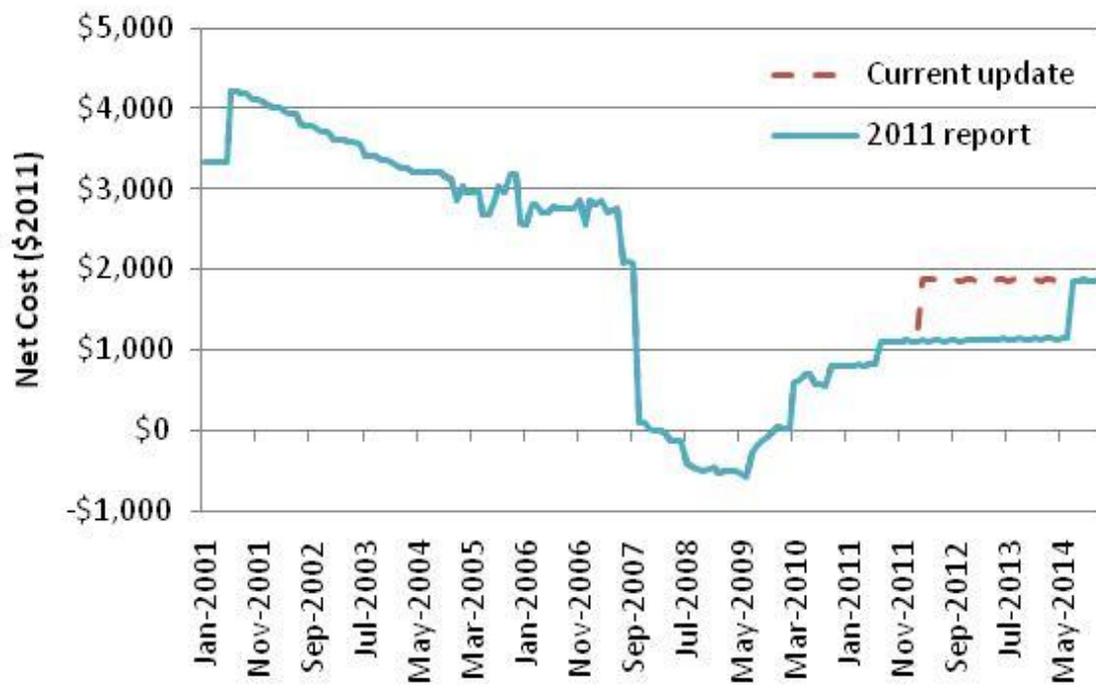
■ Figure 2-1 Net cost for typical PV system installed in Queensland



2.5.2. Net cost for water heaters

Figure 2-2 shows the net cost for a typical domestic SWH system installed in NSW, which is representative of the net cost trends in all Australian States and Territories. The main change occurs in March 2012 to June 2014, and this is the result of the early closure of the hot water rebate.

■ Figure 2-2 Net cost for typical domestic SWH installed in NSW



3. Updated modelling results

This section presents the results of the modelling for the time series model for the calendar years 2012 to 2014. The results from the time series modelling of PV are in the form of projected installed capacity, which are then translated into STC volume projections. The modelling of water heaters from the time series are presented as the number of STCs created.

3.1. Time series projections

3.1.1. Installed PV Capacity

The results of the time series modelling for all states are presented below. The solid black line on the left of the graphs represents the historical monthly time series, extending to July 2012 upon which the projection is based. The green dotted line on the left gravitating around the solid black line is the model's fit to the historical data. The model's predicted monthly PV uptake capacity is represented by the solid red line on the right hand side of the graphs, and the two dotted lines encompassing the projection represent the prediction plus and minus the standard error.

Figure 3-1 shows the time series projection for the installed monthly PV capacity in Queensland. The model's fit to historical data is quite good. The historical data showed that Queensland experienced another spike around June 2012, which is higher than the previous year's spike. A likely explanation for this is the upcoming reduction in the Solar Credits multiplier as well as the introduction of the carbon price. This combination creates 'rushed' buying, where consumer's motivation is to offset rising electricity prices by reducing their demand from the grid and also earn revenue from energy exported to the grid. Shortly after the June spike the FiT in Queensland was closed and according to the projection, the monthly installed capacity of new PV systems will be trending downwards.

■ Figure 3-1 PV installed capacity projections for Queensland

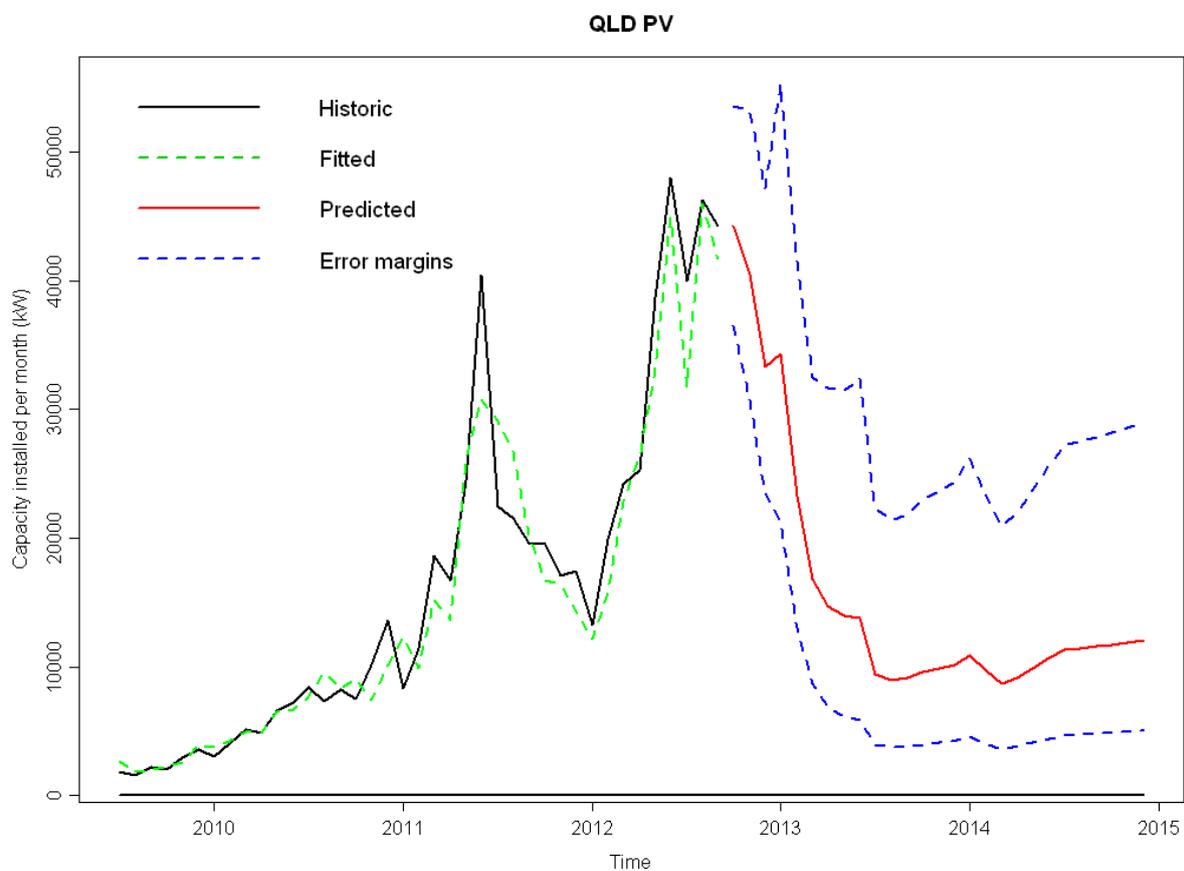


Figure 3-2 shows the time series projection for the installed monthly PV capacity in New South Wales. Similar to Queensland, there is another spike around June 2012 that is caused by the reduction in Solar Credits multiplier and the introduction of the carbon price. The observed effect is less pronounced in NSW because the FiT had already been greatly reduced at the time.

■ Figure 3-2 PV installed capacity projections for New South Wales

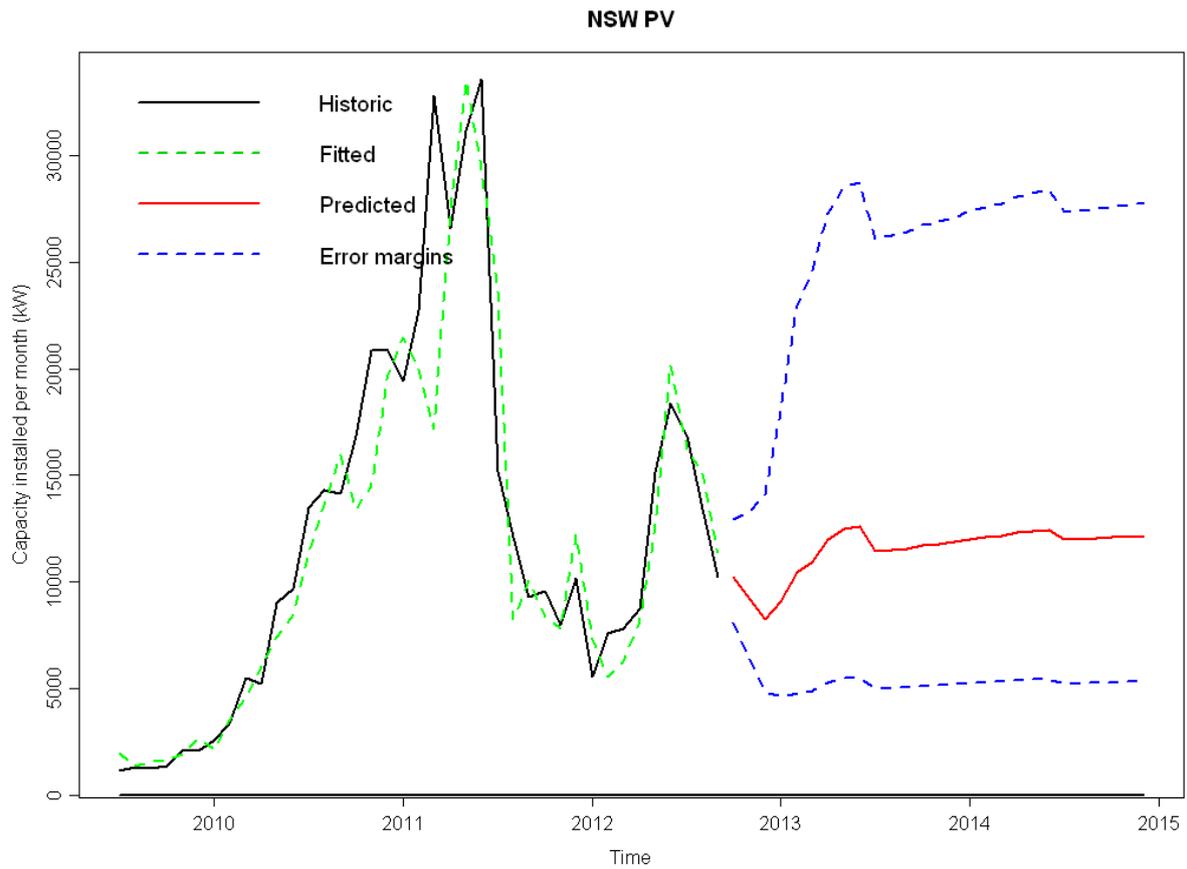


Figure 3-3 shows the time series projection for the installed monthly PV capacity in Victoria. Similar to Queensland, there's a second higher spike around June 2012, although capacity is projected to drop rapidly from October 2012 onwards.

■ Figure 3-3 PV installed capacity projections for Victoria

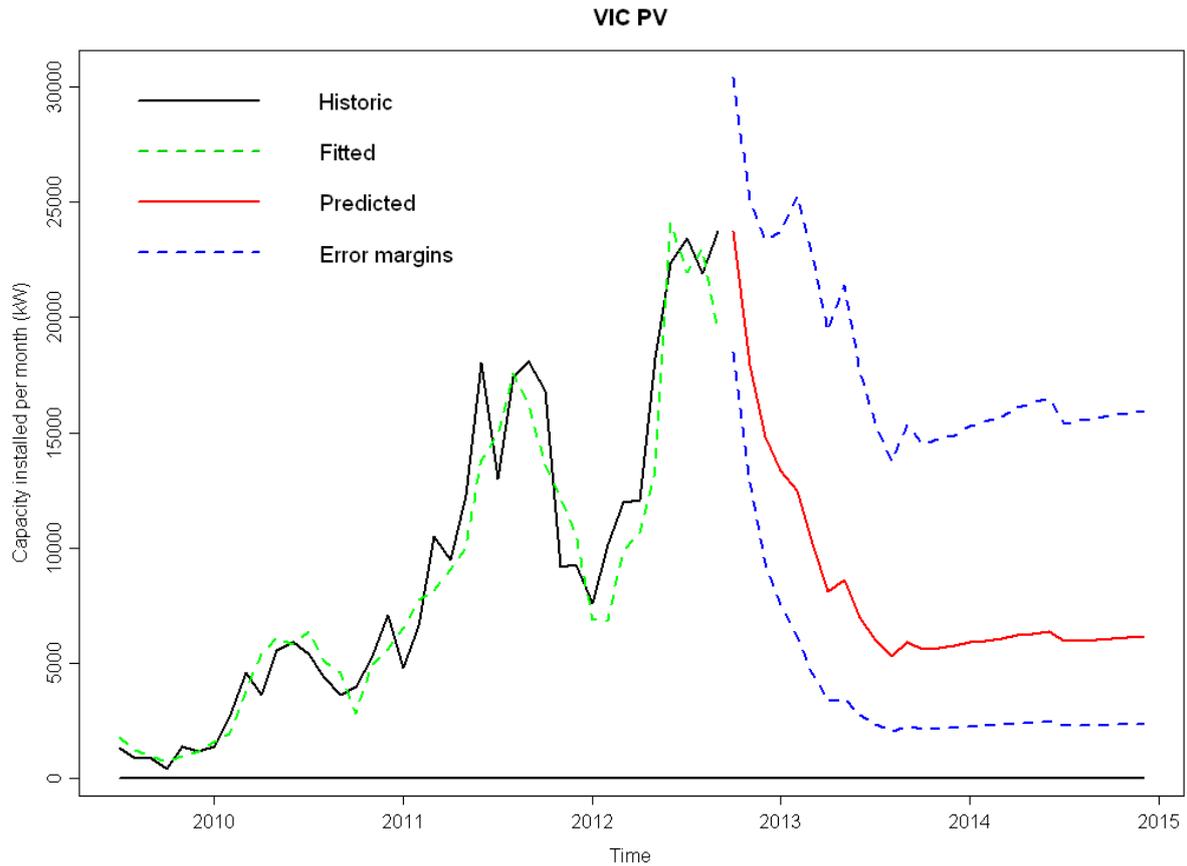


Figure 3-4 shows the time series projection for the installed monthly PV capacity in Tasmania. The June 2012 spike is significantly higher than the June 2011 spike, suggesting that awareness of the benefits of PV in Tasmania has increased. The projection exhibits similar trends to the other states, with a rapid decline in uptake, followed by a stepped decrease in uptake at the financial year boundary reflecting the net cost projection and reduction in the Solar Credits multiplier.

■ Figure 3-4 PV installed capacity projections for Tasmania

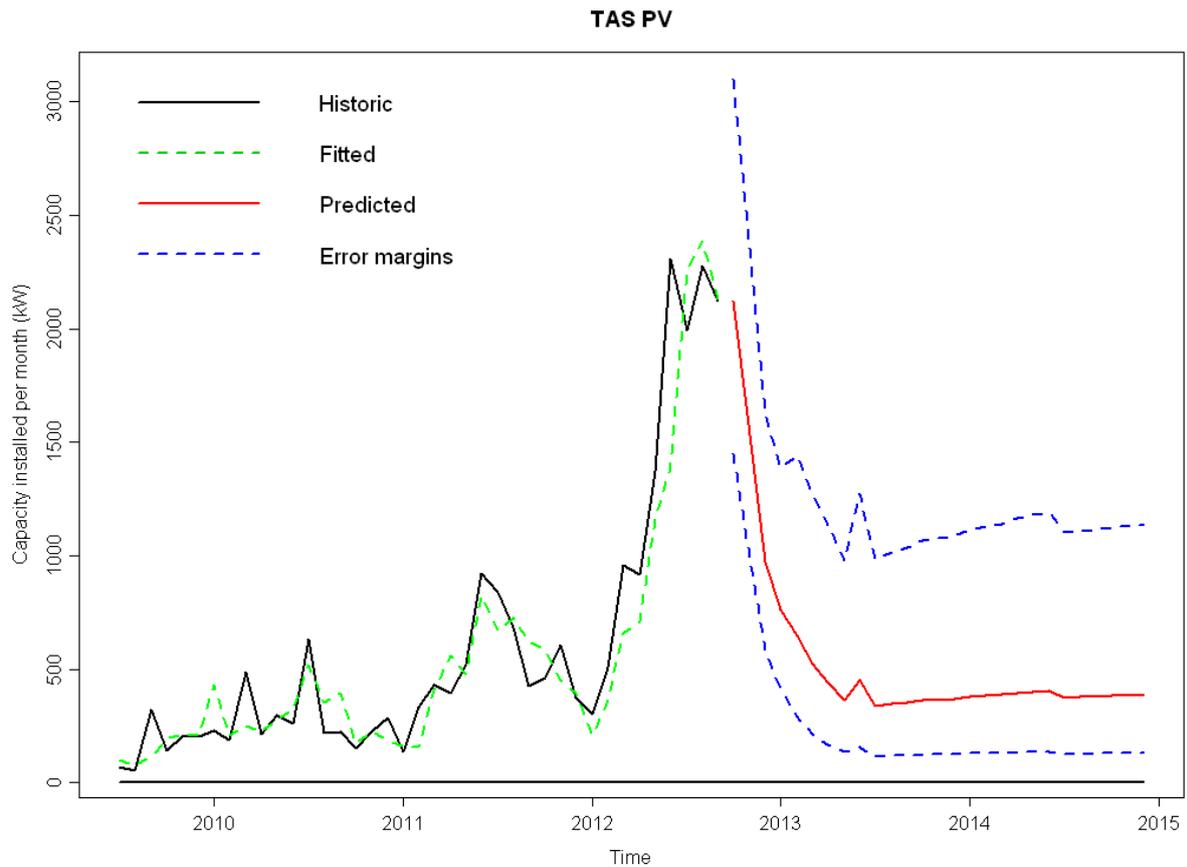


Figure 3-5 shows the time series projection for the installed monthly PV capacity in South Australia, and the model fit to the historical time series appears to be quite good. The 2012 peak in South Australia is not quite as high as the 2011 peak, and this probably reflects the fact that the South Australian FiT is in place until 30 September 2013, albeit at a much lower rate than the original FiT.

- Figure 3-5 PV installed capacity projections for SA

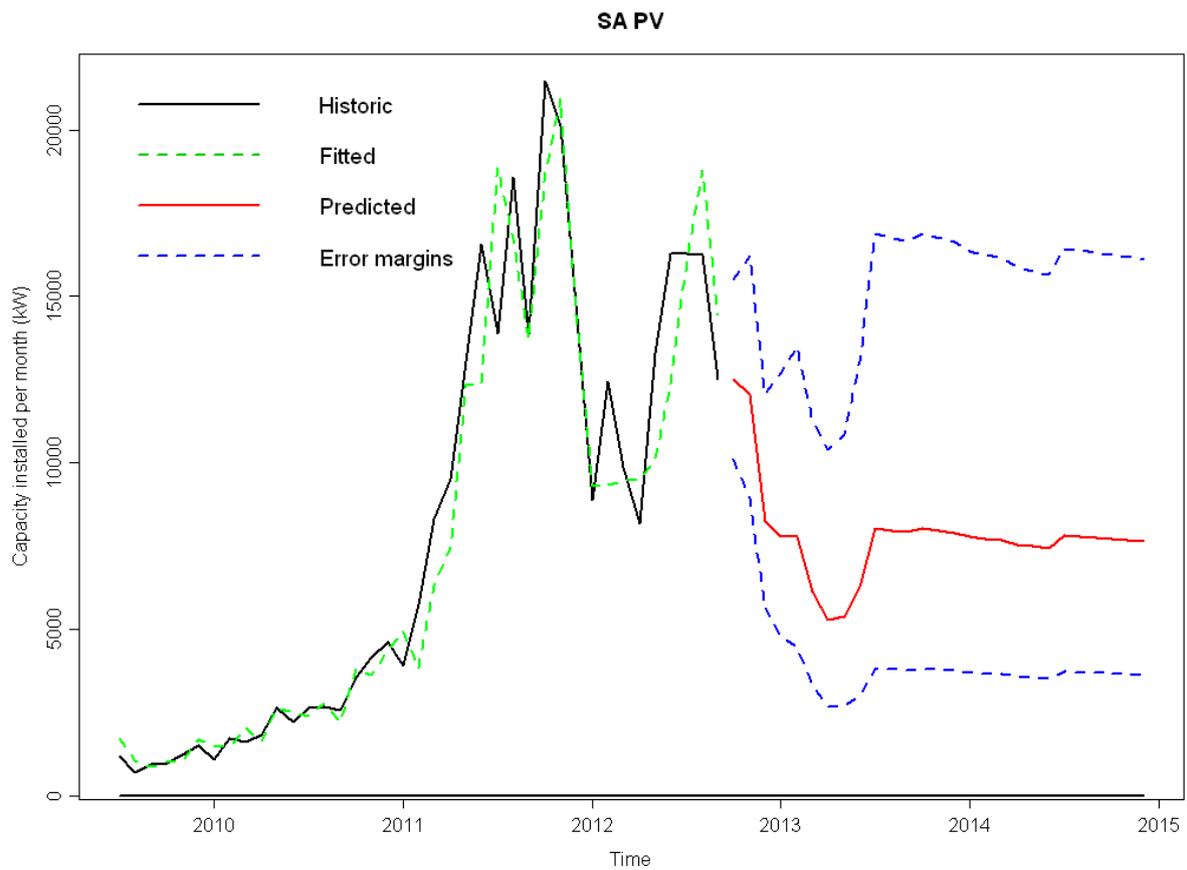


Figure 3-6 shows the time series projection for the installed monthly PV capacity in Western Australia. The model fit to the historical time series is excellent, and the historical data shows that capacity peaked in mid 2011. The mid 2012 spike in uptake is also present, although it's not as large as the 2011 spike. Projected years show a forecast decline in uptake with a stepped decrease at the end of the financial year.

■ Figure 3-6 PV installed capacity projections for Western Australia

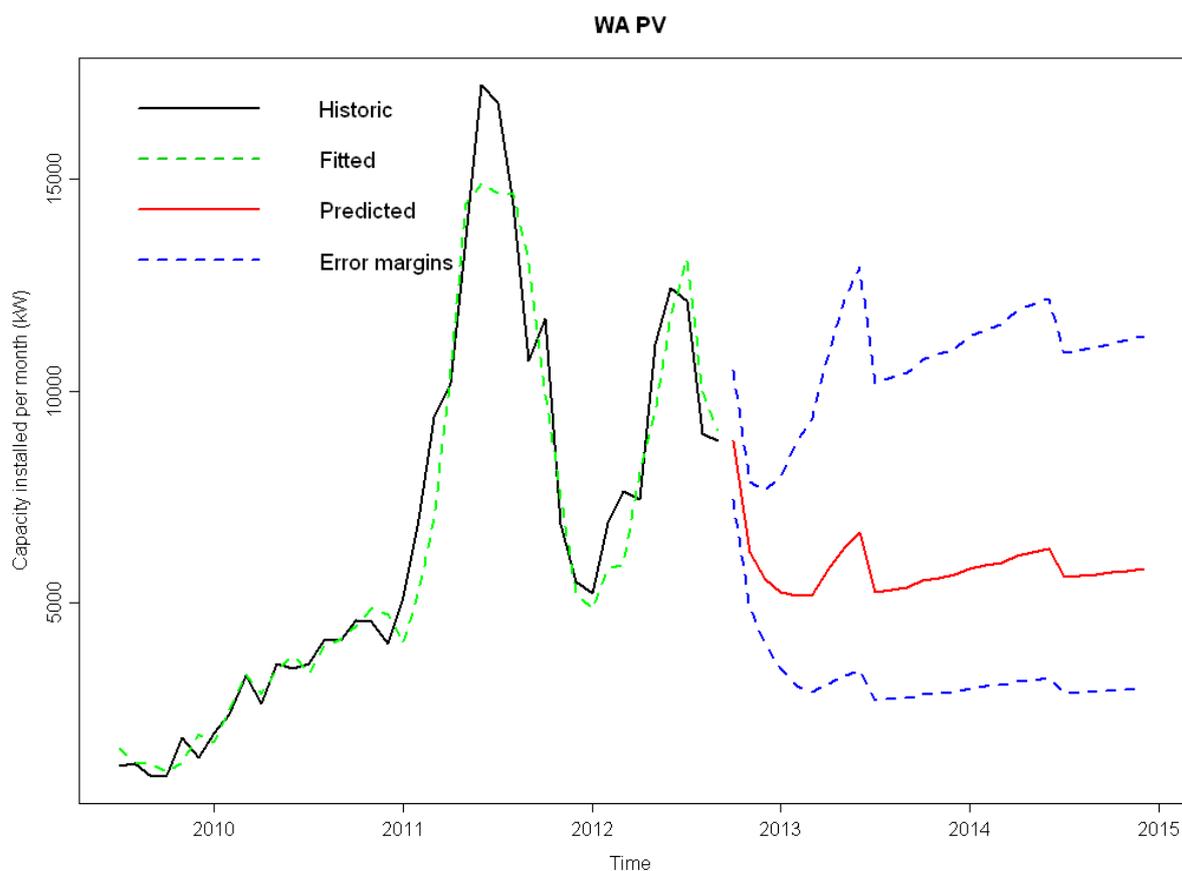


Figure 3-7 shows the time series projection for the installed monthly PV capacity in the Northern Territory, with the model fit appearing reasonable, given the noisiness of the uptake data. The historical uptake does not appear to have been as rapid as in the mainland states. The time series model is predicting a continuation of current uptake levels until mid 2013 where the final reduction in the Solar Credits multiplier causes it to drop. The large standard error is reflective of the relatively lower installations compared to other states.

■ Figure 3-7 PV installed capacity projections for Northern Territory

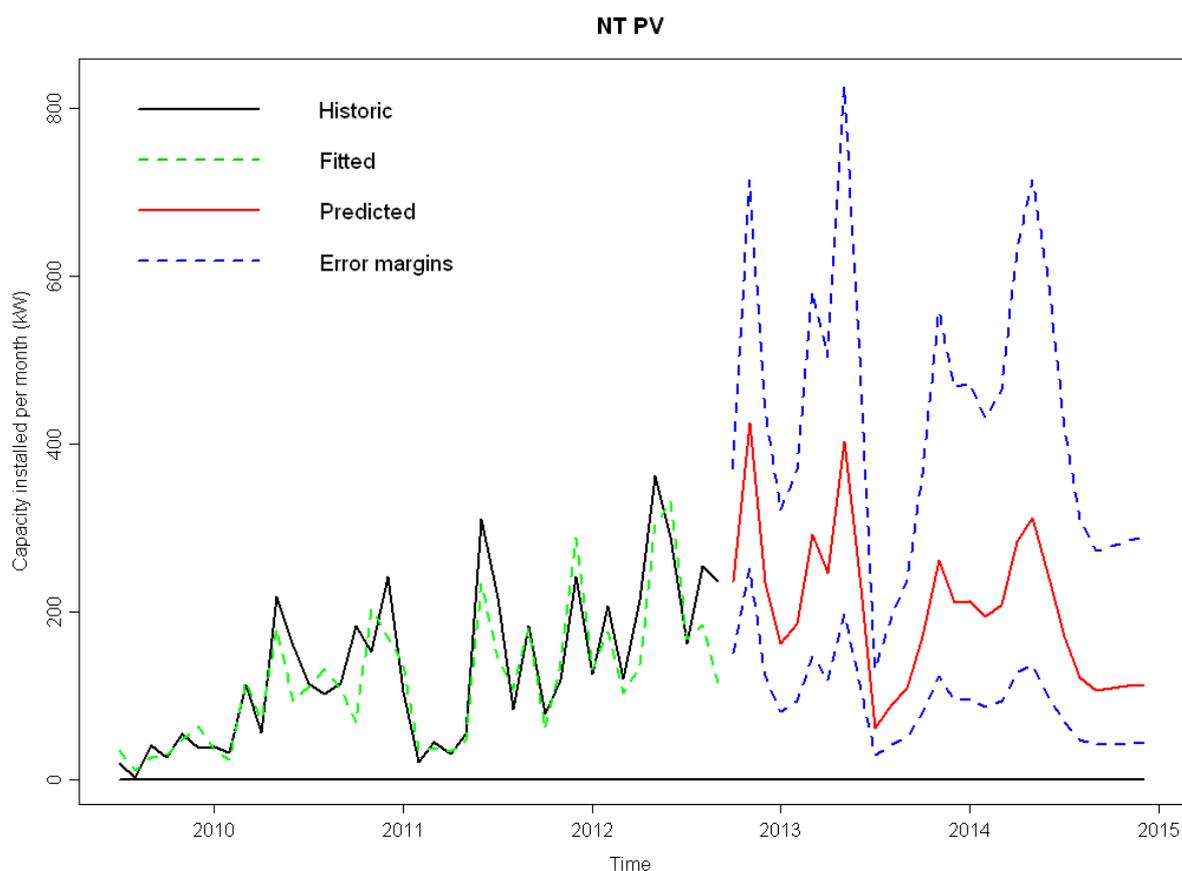


Figure 3-8 shows the time series projection for the installed monthly PV capacity in the Australian Capital Territory. The model fit to the historical time series is very good. Both the historical time series and the model projections indicate that the peak uptake of capacity has already occurred in mid 2011. The model is predicting a fairly steady continuation in uptake for the next nine months, followed by a shallow decline from mid 2013 onwards.

■ Figure 3-8 PV installed capacity projections for Australian Capital Territory

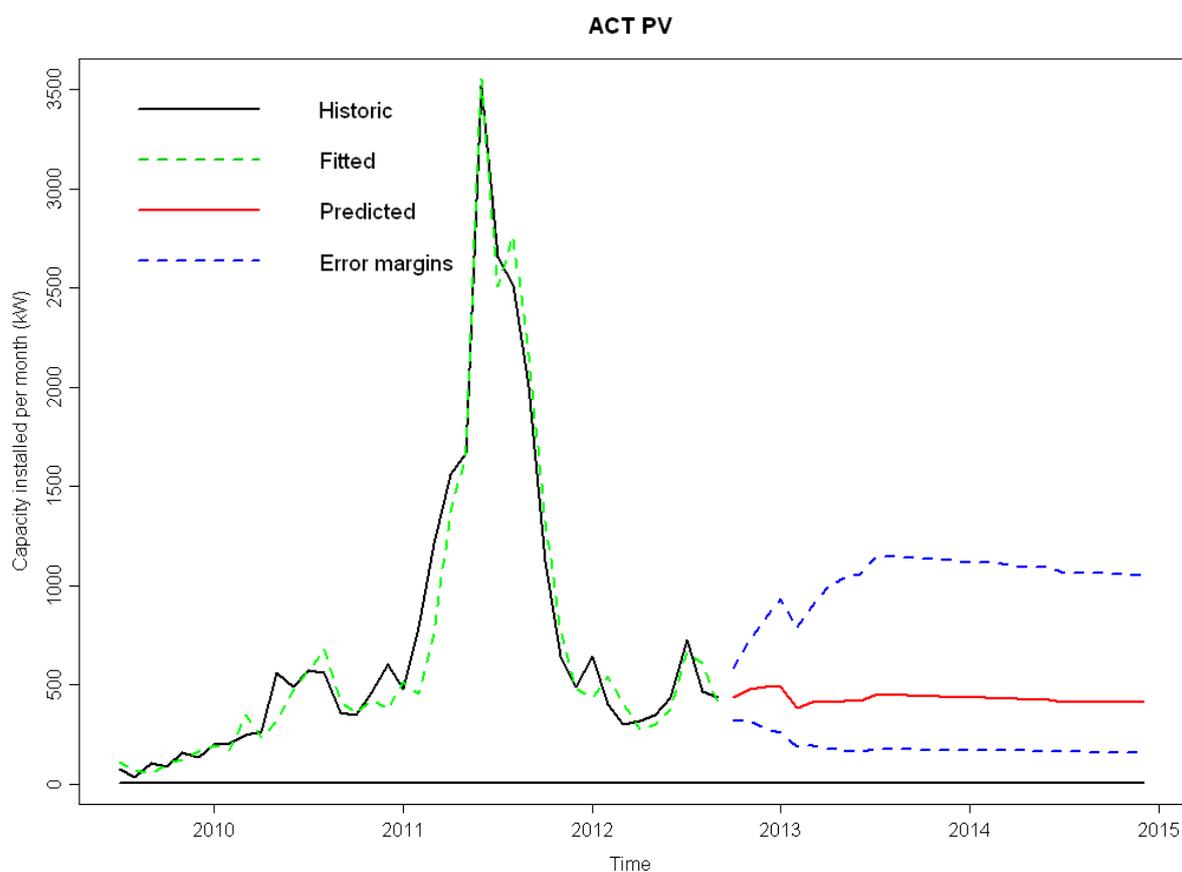
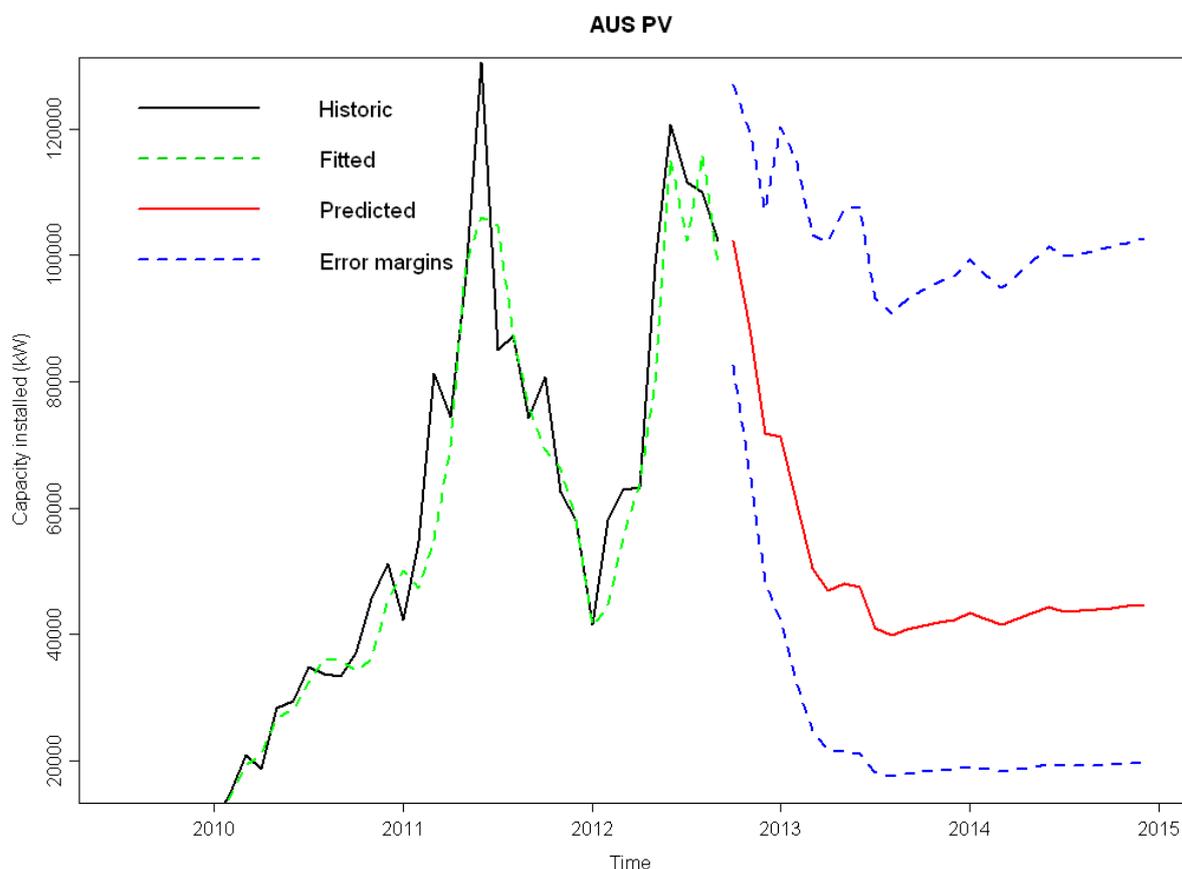


Figure 3-9 shows the sum of the state projections, which is effectively the projected PV installed capacity across Australia. The common trends across all states including the drop in capacity installed as well as a 'step' coinciding with the final reduction in the Solar Credits multiplier are evident in the chart. Moreover, the projected rate of decline of the 2012 spike is similar to that of the 2011 spike, although the minimum uptake rate projected to be reached after the 2012 spike is just slightly lower than the 2011/12 minimum uptake level. This probably reflects the fact that many of the supporting subsidies still present when the 2011/12 minimum occurred have now been removed. Nevertheless, the uptake rate is projected to reach a minimum in mid 2013 and then slowly start increasing again.

■ Figure 3-9 PV installed capacity projections aggregated for all Australia



3.1.2. Water heater STC projections

The results of the time series modelling for domestic and commercial water heater STCs projections are presented below. In both cases uptake has been weaker than projected in the December 2011 modelling, which showed a stabilisation in uptake levels. Instead, uptake levels have slowly tapered off since the end of 2011, and this would in part be explained by the sudden closure of the federal hot water rebate on 28 February 2012, where the abruptness of the announcement did not allow the possibility of the 'rushed' buying that has been observed in the PV market.

Figure 3-10 shows the time series projection for STC volumes created by commercial water heaters for the whole of Australia. The model is predicting a stabilisation in uptake which would be driven by rising expected electricity prices, especially since the carbon price has now taken effect.

■ Figure 3-10 Commercial water heater STC volume projections for Australia

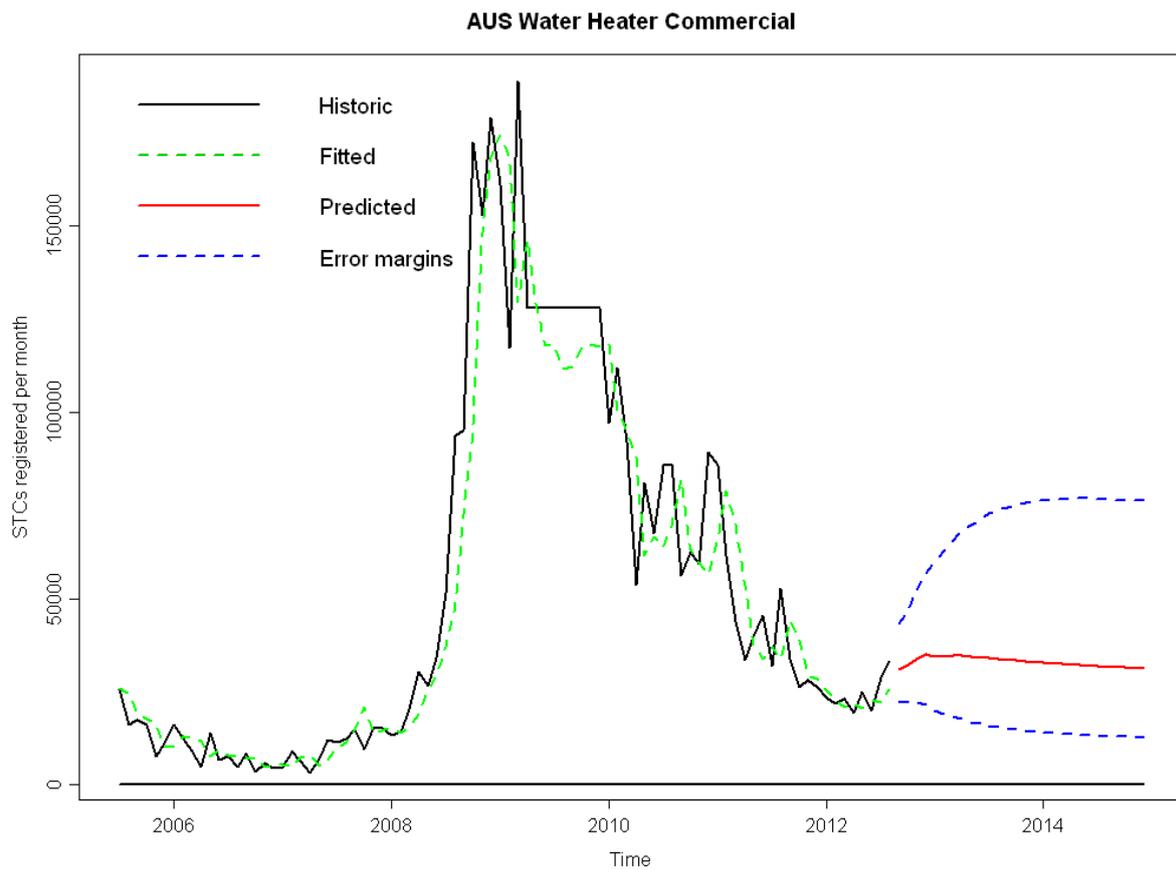
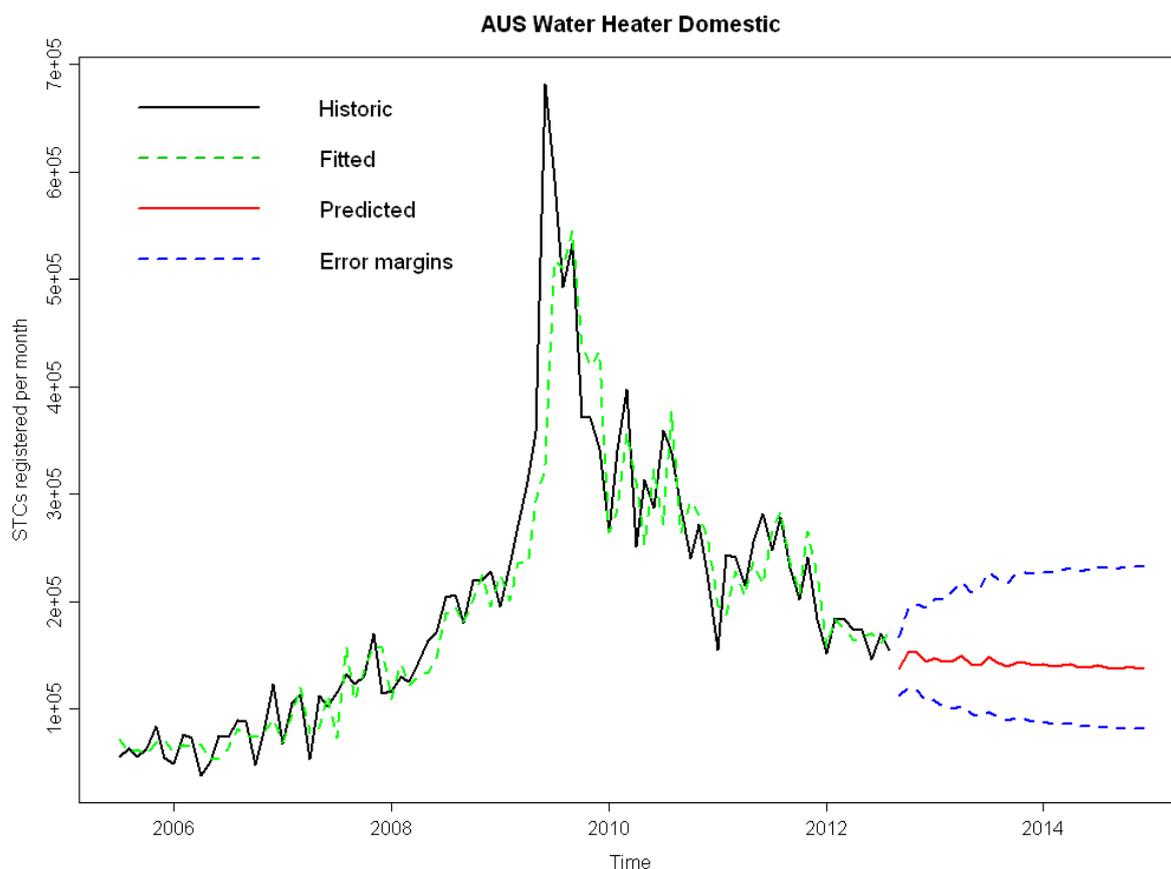


Figure 3-11 shows the time series projection for STC volumes created by domestic water heaters for the whole of Australia. The projection trend is similar to that of the commercial sector, with a slight negative bias. This is driven by expectations of rising electricity prices, which in the short term is due to the known rises in the fixed carbon price.

■ Figure 3-11 Domestic water heater STC volume projections for Australia



3.2. Certificate projections

Table 3-1 shows the projected number of STCs created by small-scale PV technology by state for 2012, 2013 and 2014 calendar years. Table 3-2 shows the projections from the December 2011 modelling for comparison. The updated projections of STCs created from PV in 2012 are higher than that from 2011 (36.7 million compared to 18.5 million). The majority of this difference was driven by 'rushed' buying, which was induced by the introduction of the carbon price as well as the reduction in the Solar Credits multiplier. As stated previously, this phenomenon is driven by fear of missing out on the currently available subsidy, and emotions contribute greatly to the purchasing decision. The projections for STC creation from PV for the 2013 and 2014 calendar years are higher by 76% and 77% respectively than the previous estimate. This is mainly due to the nature of the time series model, which puts greater weight on more recent data. The data update has caused the

projections to start off from a higher base and even though the trend is clearly down, the resulting projections end up being higher.

- [Table 3-1 Projected STCs created from PV](#)

	2012	2013	2014
ACT	187,000	140,000	117,000
Queensland	14,680,000	5,123,000	3,138,000
New South Wales	5,015,000	3,860,000	3,373,000
Victoria	6,832,000	2,544,000	1,622,000
Tasmania	554,000	140,000	101,000
South Australia	5,243,000	2,425,000	2,281,000
Western Australia	4,136,000	2,028,000	1,742,000
Northern Territory	90,000	67,000	54,000
Total	36,736,000	16,326,000	12,429,000

- [Table 3-2 Projected STCs created from PV – December 2011 modelling](#)

	2012	2013	2014
ACT	475,000	293,000	362,000
Queensland	5,105,000	2,136,000	1,422,000
New South Wales	3,776,000	2,265,000	1,668,000
Victoria	2,661,000	1,313,000	1,124,000
Tasmania	116,000	91,000	84,000
South Australia	3,090,000	1,498,000	1,144,000
Western Australia	3,286,000	1,665,000	1,207,000
Northern Territory	40,000	30,000	26,000
Total	18,549,000	9,293,000	7,037,000

Table 3-3 provides the number of STCs created from PV for the first nine months of 2012, and computes the projection for the balance of 2012 by subtracting this estimate from the total 2012 calendar year number.

- Table 3-3 Estimate of STCs created from PV for year to date, and for the remainder of 2012 calendar year

	Up to September 2012	Balance of 2012
ACT	153,592	33,000
Queensland	10,824,343	3,856,000
New South Wales	4,184,343	831,000
Victoria	5,088,541	1,743,000
Tasmania	404,107	150,000
South Australia	4,090,241	1,152,000
Western Australia	3,374,016	762,000
Northern Territory	64,383	25,000
Total	28,183,566	8,553,000

Note: the total for 2012 might not add up to that in Table 3-1 due to rounding

SKM MMA examined the creation rate of STCs from PV for the seven months after the June 2011 spike relative to the peak and compared that to the projected creation rate for STCs after the 2012 spike. The two comparisons are charted side by side in Figure 3-12, which shows that the decay in uptake following the spikes generally has a similar profile in percentage terms. The biggest difference in these profiles occurs in the fourth month following the spike. This cross-check is reassuring and adds a degree of comfort to the PV forecast.

- Figure 3-12 Comparison of uptake rates relative to the spikes in 2011 and 2012

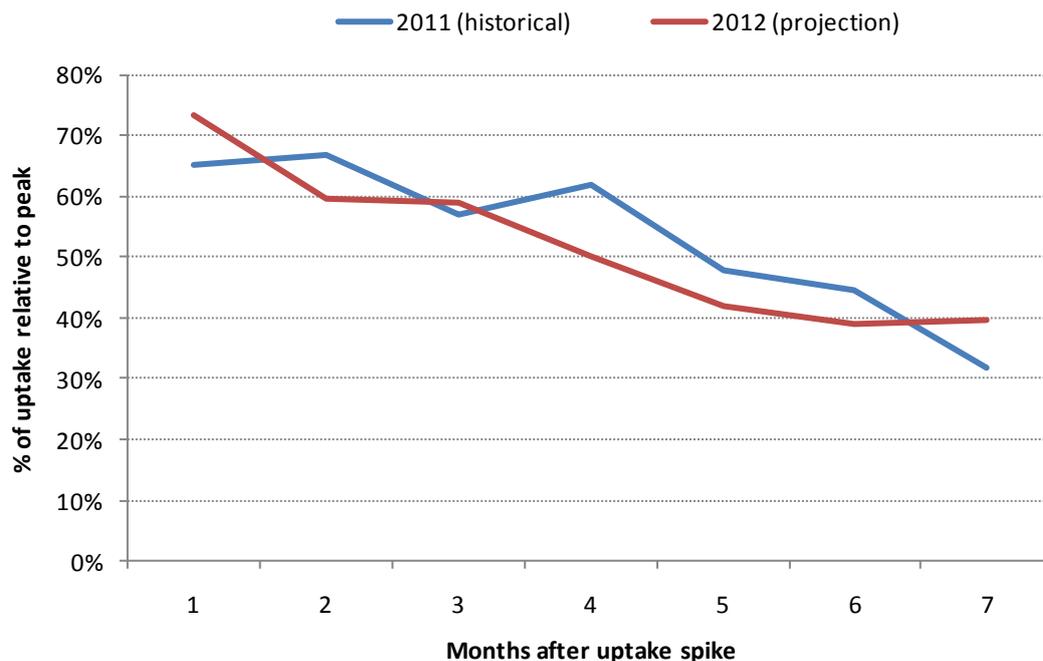


Table 3-4 shows the projected number of STCs created by water heaters by domestic/commercial classification. Table 3-5 shows the projections from 2011 modelling. The water heater forecast has reduced by about one third due to the sudden end of the federal hot water rebate.

- [Table 3-4 Projected STCs created from water heaters](#)

	2012	2013	2014
Commercial	326,000	408,000	383,000
Domestic	1,924,000	1,730,000	1,674,000
Total	2,250,000	2,138,000	2,057,000

- [Table 3-5 Projected STCs created from water heaters – December 2011 modelling](#)

	2012	2013	2014
Commercial	512,000	422,000	419,000
Domestic	2,826,000	2,808,000	2,620,000
Total	3,337,000	3,230,000	3,039,000

Table 3-6 provides an estimate of STCs created from water heaters for the remainder of 2012.

- [Table 3-6 Estimate of STCs created from water heaters for year to date, and for the remainder of 2012 calendar year](#)

	Up to September 2012	Balance of 2012
Commercial	227,172	99,000
Domestic	1,483,691	440,000
Total	1,710,863	539,000

Note: the total for 2012 might not add up to that in Table 3-4 due to rounding

The projection of total numbers of STCs created from solar PV and solar water heaters is shown in Table 3-7. The “Balance of 2012” projection has been adjusted down by 2,754,000 (see the end of section 2.4) to account for the expected number of certificates pending validation on 31st December 2012. These certificates do not legally qualify to be included in the 2012 overhang number even though their creation date would ultimately be recorded as being in the 2012 calendar year.

- [Table 3-7 Estimate of STCs created from water heaters and PV for year to date, for the remainder of 2012 calendar year and for 2013 calendar year](#)

	Up to September 2012	Balance of 2012	2013	2014
Total	29,894,429	6,338,000	18,464,000	14,485,000

Table 3-8 shows the projected STC overhang for the 2012 calendar year, which was calculated by subtracting the total 2011 and 2012 STP targets⁶ from the total number of valid certificates created in the 2011 and 2012 calendar years⁷. Adding the 2012 overhang to the projected 2013 certificate creation total gives an STC target of 34.457 million certificates for 2013.

- [Table 3-8 STC Projections for 2013 calendar year](#)

	2013
2012 projected overhang	15,993,000
2013 projected STC creation	18,464,000
Total 2013 target	34,457,000

⁶ The 2011 target was 28 million certificates and the 2012 target was 44.8 million certificates.

⁷ The number of valid certificates created in 2011 was 52.6 million, and the number for 2012 is projected by the current modelling to be 36.2 million certificates.