Updated STC Forecast 2020 - 2024

Report to the Clean Energy Regulator

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Executive Summary

The Clean Energy Regulator (CER) has engaged Green Energy Markets Pty Ltd (GEM) to provide updated forecasts of the Small-scale technology certificates (STCs) likely to be created during the 2020 calendar year, and for the years 2021 to 2024.

In developing our projections for small generating units (SGUs) and solar water heater (SWH) we have updated and expanded our models and databases used in developing our STC forecasts previously undertaken for the CER in 2019. We have also made extensive use of the registry data provided by the CER and interviewed a range of solar industry participants.

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

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

In making projections for installations of solar PV and SWH we have aimed to isolate the key factors that have influenced the historical uptake of systems. In the case of solar PV the predominant factor influencing uptake is financial attractiveness. We have developed a state-based payback model as a proxy for financial attractiveness for the residential and commercial sectors and then incorporated the expected impact of market saturation in each state. To incorporate non-financial factors we also account for changes in customer awareness and solar industry competitiveness and marketing which are informed by industry interviews.

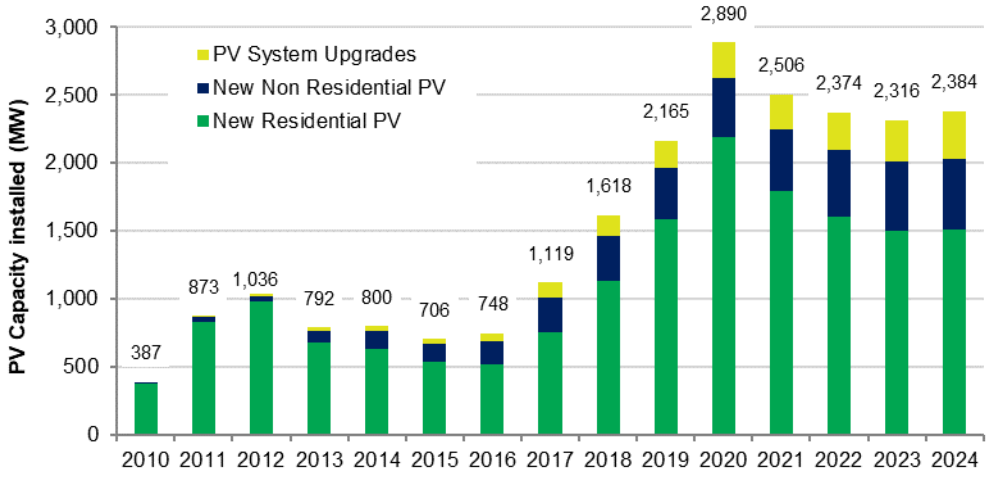
The following factors have been influential in the development of our estimates of the level of future solar installations:

- Daytime wholesale power prices are expected to continue to decline which will flow through to lower feed-in tariffs. The reduction in feed-in tariffs is not as dramatic as our past projections as retailers are expected to continue to offer tariffs exceeding the daytime wholesale price as part of customer retention and acquisition strategy.
- The Victorian Solar Program is expected to underpin increasing levels of installations in the state over the forecast period with parameters of the program assumed to be adjusted to deliver on the policy commitment of 650,000 PV systems over 10 years;
- The average system size for residential installations is expected to continue to increase and is expected to exceed 7 kW (DC) which we had assumed to be a soft constraint in our previous projections (equivalent to 5kW AC inverter limit);
- We are now starting to see some technical and market challenges with the significant levels of roof-top PV being installed. These include low levels of minimum demand creating grid management issues, increasing levels of curtailment, moving to time of use tariffs as well as potential charges for PV exports. We have incorporated additional costs (or loss of revenue) in our payback model to account for these;
- The number of non-residential (commercial) PV system installations is expected to increase over the forecast period as these systems are typically not dependent on exporting electricity and system paybacks remain at reasonably attractive levels; and
- The number of SWH systems installed in new homes is expected to decline over the forecast period in line with declines in the expected rate of new home

commencements. We expect a progressive increase in the replacement market as increasing numbers of SWH systems installed in 2009 and 2010, where the market surged due to expanded government grants, start to be replaced.

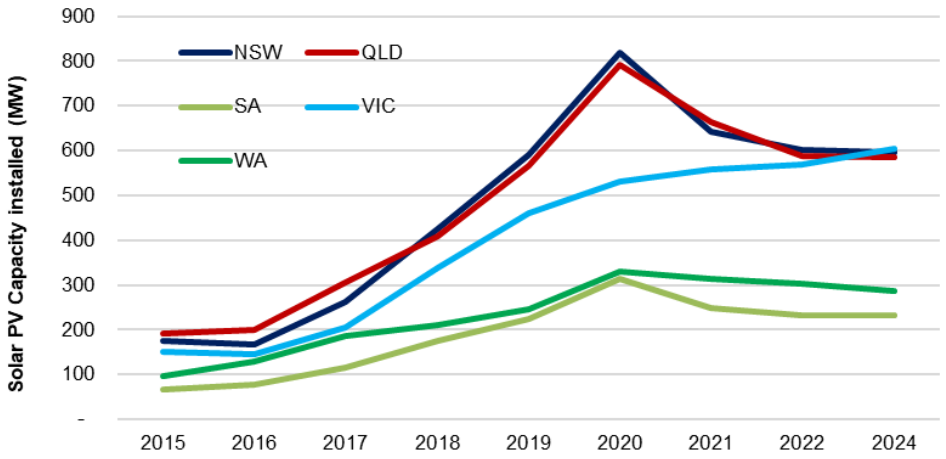
We estimate that 2,890 MW of solar PV will be installed in 2020 which is a 33% increase on 2019 levels. We expect that the capacity installed in 2021 will fall by 13% to 2,506MW and then modestly decline to 2024.

PV Capacity installed by sector



The Victorian market underpinned by the government's solar program will continue to increase over the forecast period as other states decline. Victoria's share of capacity in 2024 is expected to be 27.5%, significantly higher than its 18.4% share in 2020.

PV Capacity installed by state



We expect that 44.9 million STCs will be submitted for registration in 2020. Summary of results are as follows:

'000 STCs	Actual 2018	Estimate 2019	Estimate 2020	Forecast 2021	Forecast 2022	Forecast 2023	Forecast 2024
STCs for installations in year							
Solar PV	28,165	34,815	42,732	33,499	28,500	24,677	22,226
SWH	2,003	2,200	2,099	2,068	1,956	1,826	1,723
Total	**30,167**	**37,015**	**44,831**	**35,567**	**30,456**	**26,502**	**23,949**
Less							
STCs submitted following year (lag)	3,357	3,735	3,619	2,584	2,213	1,925	1,740
Add							
Previous year installs created this year	2,580	3,357	3,735	3,619	2,584	3,619	2,584
STCs submitted for creation	**29,390**	**36,637**	**44,947**	**36,602**	**30,827**	**28,196**	**24,793**

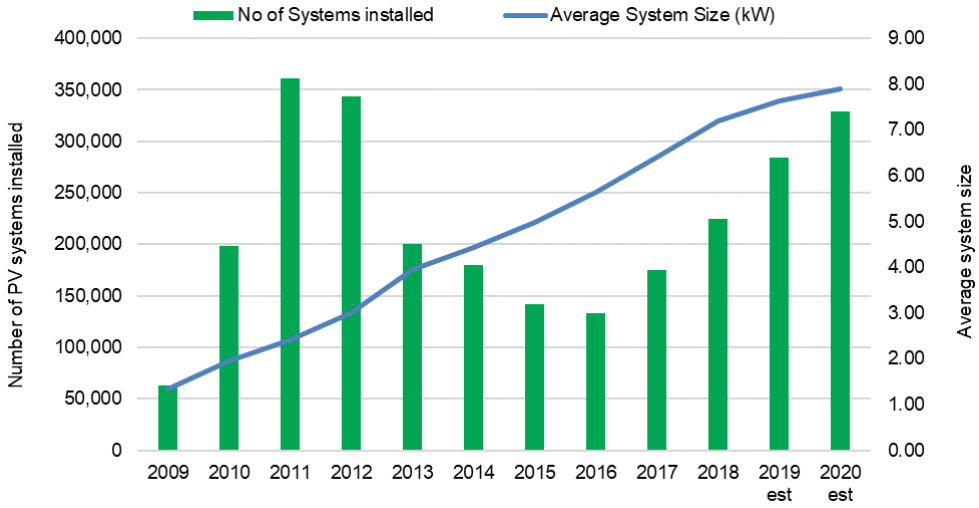
1. Introduction

The Clean Energy Regulator (CER) has engaged Green Energy Markets Pty Ltd (GEM) to provide an updated and revised Small-scale technology certificates (STCs) forecast to reflect recent data and trends.

The Small-scale Renewable Energy Scheme (SRES) creates financial incentives for investment in eligible small-scale renewable energy systems. Small-scale renewable energy systems are defined as solar PV systems with a capacity no more than 100kW and solar hot water installations. Solar PV dominates the creation of STCs accounting for 95% of STCs.

The growth in the number of solar PV installations has been primarily due to the surge in the demand from households and businesses as power prices have increased and solar PV has become a more financially attractive proposition. The average system size has continued to increase which has resulted in a significant expansion in the capacity installed and subsequent STC creation.

Figure 1.1 Number of solar PV systems installed and average system size (kW)



As part of its report GEM is required to:

- model expected small-scale technology installations and provide updated STC forecasts for 2020-2024. This will include forecasts of the number of STCs and installed capacity for the five compliance years from 2020 to 2024;
- identify key factors affecting the type, number and size of small-scale systems installed and the trends in STC creation by various categories including residential and commercial uptake across state and territories in Australia; and
- update prior years' modelling and estimates. This will include reviewing the current STC dataset and remodelling prior estimates for STC creations in light of any identified changes to circumstances. Variance between the prior and revised estimates is to be analysed and clearly specified.

This report is set out in 4 sections

Section 2. Methodology and approach – summarises the approach that GEM has taken in developing its STCs estimates for each solar market sub-sector.

Section 3. Assumptions – summarises the key assumptions that have been made in the models used to develop the estimates

Section 4. Updated STC forecasts for Solar PV – summarises the number of PV systems expected to be installed together with the expected capacity and resultant STCs created.

Section 5. Updated STC forecasts for SWH – summarises the number of SWH systems expected to be installed together with the resultant STCs created.

2. Methodology and Approach

We have segmented the solar market into the following sub-markets, which tend to have different characteristics and consumer drivers:

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

Residential and commercial installations have been segmented based on the "property installation type" classification in the registry data provided by the CER. We have used the CER's delineation from 2015 when a full years data was available. For systems installed prior to 2015 we have assumed that systems greater than 10 kW were commercial and those less than 10kW were residential. This approach has been consistent with industry conventions at the time and was supported by detailed review by one of the largest certificate creators at the time. With the continued increase in average system size the notional capacity cut-off between residential and commercial has also increased and we expect it is now closer to 15 kW.

1. Modelling new residential PV system installations

Our projections for new residential PV systems are based on isolating the factors that have influenced the historical uptake of PV. The predominant factor influencing uptake is financial attractiveness. We use a simple payback calculation as the proxy for financial attractiveness.

Forecasting PV payback periods

Payback period is modelled using Green Energy Markets payback model. The payback (in years) in the year of installation is determined by dividing the expected savings in the year of installation into the installed system cost (refer to Attachment 2).

- The expected savings in the year of installation is determined by the sum of (i) the value of avoided electricity purchases in the year of installation and (ii) the value of electricity exports in the year of installation.
- The installed system cost is derived by the total cost of the system less the value of STCs less and any other rebates available.

The assumptions used in the model are summarised in Section 3.

PV Demand

We forecast the level of demand for each state with reference to the following four factors:

- Relative financial attractiveness - as represented by simple payback adjusted for changes in interest rates since 2015;
- Relative level of saturation – represented by scaling factor that reduces as saturation increases, we have calibrated this as being 1.0 (no discount) at saturation levels of 20% or less and then reduces to 0.5 (50% discount) at saturation levels of 80%. This is then also converted into an index with 2015 as the base. We have made a further enhancement to exclude the saturation

impact with regard to the level of new homes built over the last 15 years (refer to Section 4 for further details);

- Relative customer awareness – heightened media concerns over high power prices has been demonstrated (through market interviews) to be a major contributing factor to customer preparedness to consider solar. We have developed a scaling factor that considers the impact in each year and then convert this into an index with 2015 as the base; and
- Relative solar industry competitiveness and marketing – the level of new market entrants (and exit), general industry competitive environment together with the level of marketing and promotion will also have an impact on solar PV uptake. We have developed a scaling factor that considers the impact in each year and then convert this into an index with 2015 as the base.

The last two factors (customer awareness and industry competitiveness and marketing) are extremely subjective but have clearly impacted on the level of demand particularly over the last two years (refer to Figure 4.1).

The six years from 2015 to 2020 provide a reasonable timeframe and cover new residential installations rising from 124,000 systems in 2015 to 316,000 systems in 2020. This now represents 6 years of reasonable data that is not complicated by solar credits multipliers or extremely attractive feed-in tariffs. The residential market sector can be seen to be mature and enables us to have confidence in this approach, albeit with some subjective factors. Interviews with industry participants have been a key component in gauging factors and issues that are actually working on the ground influencing customer purchasing decisions, beyond just financial attractiveness.

We have developed linear equations that represent the relationship between the level of installation and the adjusted payback in that year.

Our approach can be represented by the following formula:

Demand (year) = Systems derived from Payback equation (year) x Relative Level of Saturation (year) x Relative Customer Awareness Index (year) x Relative Solar Industry Competitive Index (year)

2. Modelling new non-residential (commercial) PV systems

The commercial or non-residential sector continues to be seen as an attractive market by the solar industry, now representing over 20% of installed capacity.

This market sector is not as mature as the residential market and we use 2019 installations as our base level of demand. Forecast installations are based on relative financial attractiveness (relative to the 2019 base year) we have also incorporated a scaling factor to reflect improved industry attractiveness as more solar businesses target this sector.

3. Modelling upgrades and expansions of residential and commercial systems

This market sector is increasing albeit from a very low base. Many small systems (less than 1.6 kW) were installed over the 2010 to 2013 period and a number of the customers are expanding their` systems in response to higher power prices and lower panel prices. While this market sector is still relatively small we expect it to continue to grow and become a much more important feature of the industry in future years as saturation increases. The commercial upgrade market at an estimated 80 MW is probably not that material, however we believe it is worth separating as it has scope to grow in future and it is also important to exclude these systems when considering saturation levels.

4. 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 (particularly in the case of LPG) are also factors that may be considered.

The solar water heater (SWH) market (including heat pump water heaters) has two key sub-markets which are each subject to different incentives and regulations – these are the new building market (residential) and the replacement market (for existing water heaters in residences). The commercial market which had been important previously 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 will include building forecasts (new and total), system replacement rates and market shares for each water heater technology by year.

The model will consider relative market shares together with the following key factors largely impacting future installations:

- State regulations for new/replacement systems
- Relative financial and market attractiveness
- Other state and federal government incentives (if any)

SWH system installation forecasts will be combined with average system certificate creation (based on recent data) to estimate total certificate creation in each state and each submarket.

5. Modelling other small generation unit certificates

Certificate creation for small wind and hydro power systems are presently not material and are not included.

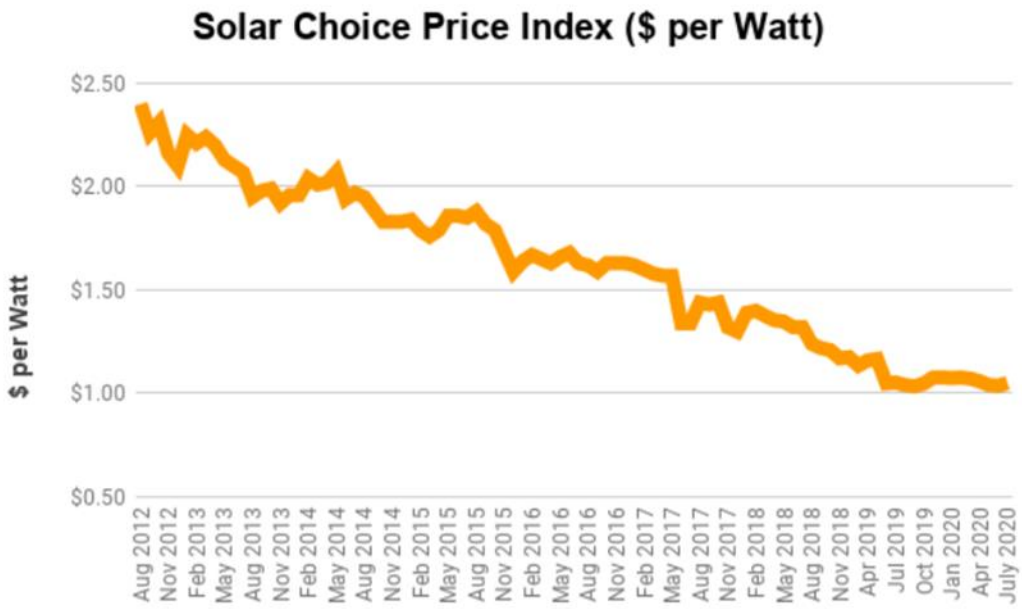
3. Assumptions

We have updated our assumptions and slightly refined our modelling approach in developing our STC forecasts for the 2020 to 2024 period. Key assumptions used are outlined in this section.

3.1 Forecasting Installed PV costs

Installed system costs (prior to STCs) have drifted lower during 2020. The most recent Solar Choice analysis shows that net system prices have levelled out over the last nine months (Figure 3.1). This equates to a reduction in gross system costs as the value of STCs generated has reduced from the start of 2020 with a reduction in the number of years deeming.

Figure 3.1 Installed system Costs (after STCs) ($/Watt) (Solar Choice, Aug 2020)



https://www.solarchoice.net.au/blog/solar-power-system-prices

We estimate that the average installed system cost (pre STCs) in 2020 will average $1.48 per Watt which is slightly lower than the $1.60 per estimate for 2019. We have calibrated this cost based on the reported Solar Choice estimate of the average cost for a 7kW system of $7,110 after STCs (September 2020).

Cost reductions to date have been due to a combination of factors including; declines in module prices, lower labour and balance of system equipment costs per watt installed through gains in solar module conversion efficiency and increasing system size. In addition, the increasing number of systems installed has meant fixed administration and sales and marketing costs have been easier to cover.

We expect to see modest reductions in module prices and continued gains in conversion efficiency, we also expect that lead generation and sales and marketing costs will increase as saturation increases and financial attractiveness reduces.

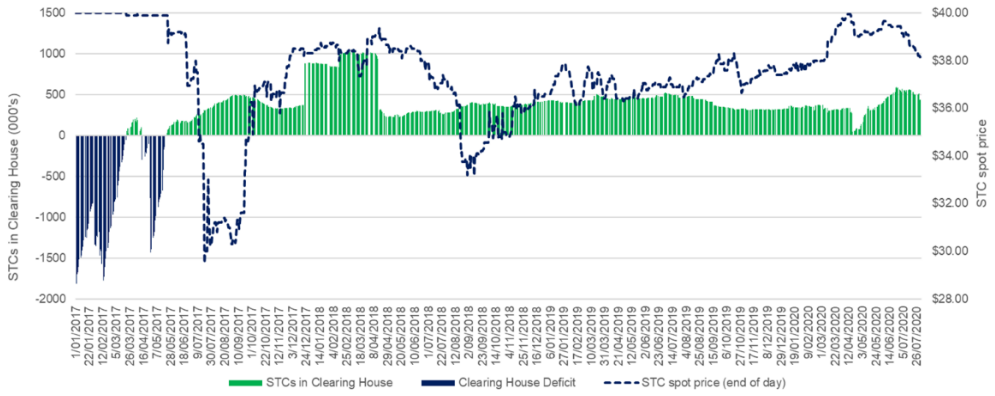
As a result, we expect to see only modest cost reductions over the next four years and as a result we assume that the current gross installed cost (prior to STCs) of $1.48 reduces to $1.39 per Watt by 2024 (nominal terms). The assumed cost reduction for equipment (modules and inverter etc) is consistent with CSIRO cost projections developed for AEMO (GenCost 2019-20, December 2019). For non-equipment related

costs (ie. sales, marketing, administration and logistics) we have assumed that these remain constant in nominal terms.

3.2 Forecasting STC prices

Spot STC prices in 2020 have averaged $38.72 (to end August). Spot prices averaged $37.11 for 2019. Since mid-2017 the Clearing House has been in surplus with more STCs created than required by Liable Parties to meet their STC surrender needs (other than for a brief period in April 2020). The resulting surplus of STCs in the market has meant that STCs have traded at a discount to the $40 Clearing House Price (Figure 3.2).

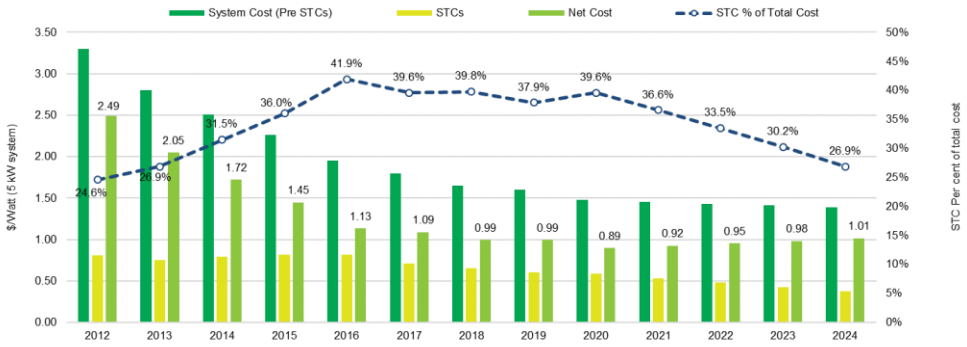
Figure 3.2 Spot STC prices and Clearing House Surplus/ Deficit



We assume that over the forecast period the STC market comes in to better balance and that the Clearing House does not go into deficit. We are forecasting an underlying STC spot price of $39 from 2020 to 2023 and after allowing for 47 cents registration cost we have used $38.53 per STC to incorporate into our payback model.

STCs accounted for nearly 38% of the total cost of the system in 2019 and this is expected to drop considerably to 27% by 2024 as the number of years deeming reduces (Figure 3.3).

Figure 3.3 Forecast Installed system costs for residential system ($/Watt)



3.3 Forecasting Electricity prices

There are two components to electricity prices that we incorporate into our payback model:

- Import replacement price: this is the variable electricity price that can be avoided by that level of solar generation that is consumed by the household or business; and
- Export price: this is the variable electricity price that is received through the export of electricity to the grid.

Our payback model time series generally incorporates the Australian Energy Market Commission's (AEMC) latest projections (December 2019 Report) and is adjusted for standing charges utilising AEMC demand estimates. The electricity price that is assumed to be avoided by solar customers for the amount of electricity that they generate and consume on site is summarised in Figure 3.4.

A significant amount of large-scale solar generation capacity (8,000 MW) will be added over the 2017 to 2022 period. This is on top of even greater levels of roof-top solar PV and a further 7,000 MW of wind generation. As a result, we expect that wholesale market prices (during daytime hours when PV is generating) will drop considerably over the period to 2024.

These lower daytime wholesale power prices will not fully spill over into lower export prices for solar PV (Feed-in tariffs) as retailers are expected to continue to offer tariffs exceeding the daytime wholesale price as part of customer retention and acquisition strategy. The price that is assumed to be paid for electricity that is exported to the grid is summarised in Figure 3.5.

We are now starting to see some technical and market challenges with the significant levels of roof-top PV being installed. These include low levels of minimum demand creating grid management issues, increasing levels of curtailment, moving to time of use tariffs as well as potential charges for PV exports. We have incorporated additional costs (or loss of revenue) in our payback model equivalent to $30 per annum per kW from 2022 for the mainland NEM states to account for these.

Figure 3.4 Avoidable electricity price (variable cents per kWh nominal)

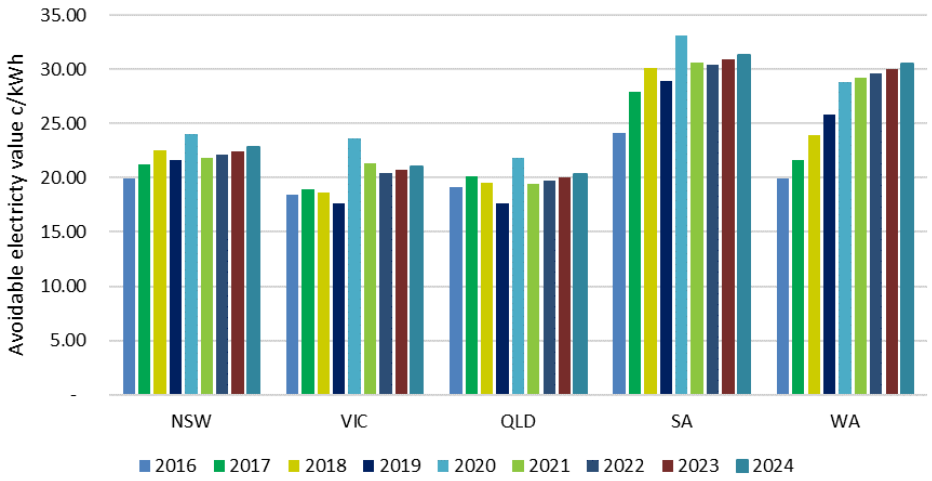
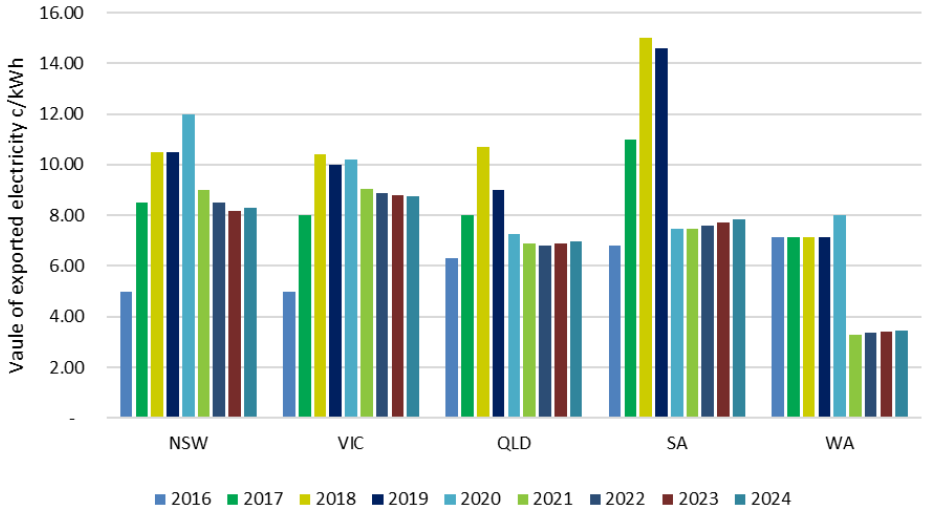


Figure 3.5 Value of exported electricity for key states (cents per kWh nominal)



3.4 Forecasting new residential and commercial PV payback periods

We adopt 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. In addition to the installed system cost, STC price and electricity price assumptions covered above we have also incorporated the following assumptions:

For residential systems:

- For payback modelling purposes we have used a generic average system size for each state that is typical of what is currently being installed and is assumed to be generally 7.0 kW; and
- Electricity exports are determined by state and are linked to the average system size and the average consumption levels in each state. Export levels range from 65% in the NT to 75% in NSW and Victoria.

For commercial systems:

- Most business sites consume less than 160 MWh of electricity per annum and pay electricity tariffs that are broadly similar to residential customers. The average system size is assumed to be 20 kW which is consistent with the average system size installed over the last few years; and
- We assume that most of the power generated is consumed on site and that 20% of the electricity generated has no value (either not exported or exported at zero value).

Average system paybacks dropped dramatically in most NEM states since 2018 due to high wholesale prices. With the expected reduction in the value of exported electricity and lower avoided import prices combined with reducing STC value, paybacks across all states are expected to increase over the forward period.

Figure 3.6 Simple Payback for typical residential PV system

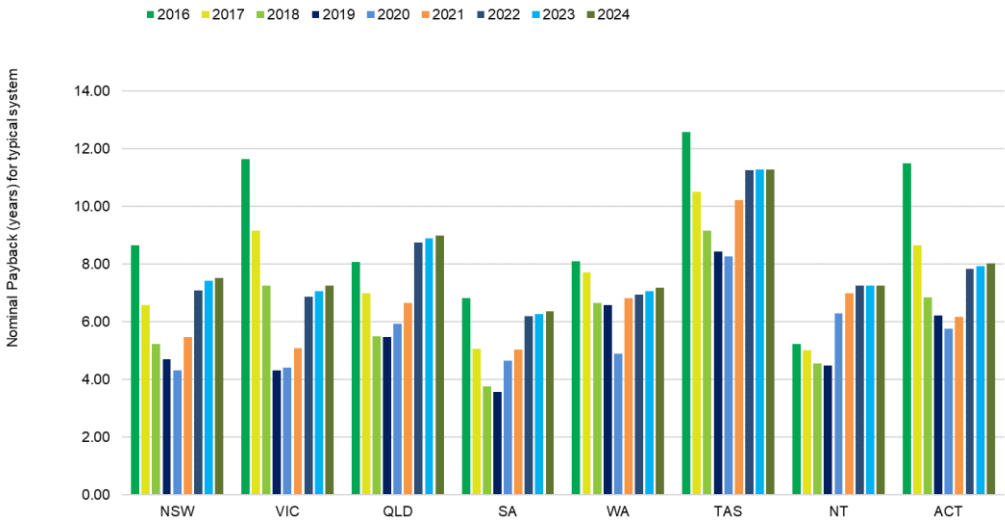
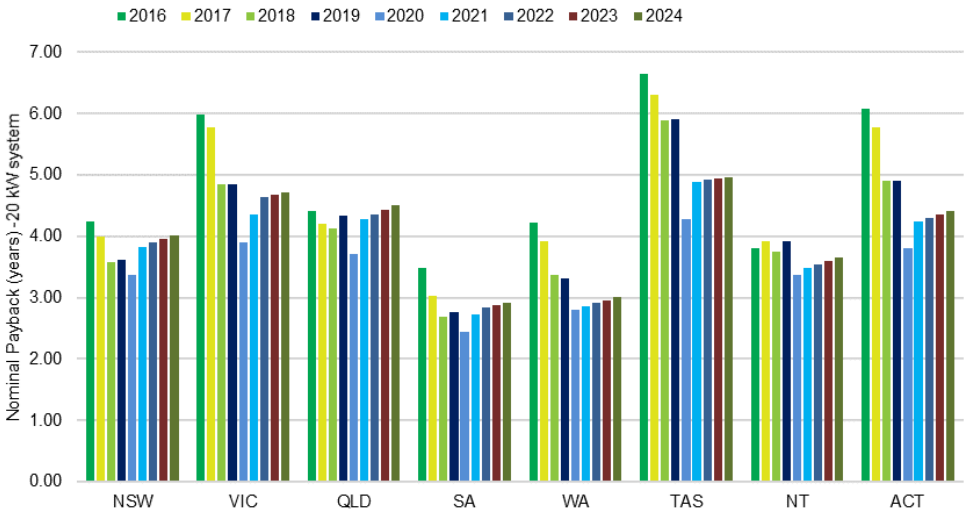


Figure 3.7 Simple Payback for typical Commercial PV system



4. Updated STC Forecasts for solar PV

We have updated our assumptions and slightly refined our modelling approach in developing our STC forecasts for the 2020 to 2024 period.

4.1 Solar industry participant interviews

We have undertaken a series of informal interviews with a cross section of solar market participants to obtain their views on the current market for solar installations and expected activity over the coming years. This has informed our judgements on the non-financial factors that impact on consumers purchasing decision.

Some key observations that have informed our assumptions used in the modelling are set out below:

- Still quite strong interest from households for solar PV as its performance (from both technical and financial perspective) is now well understood and accepted;
- Covid-19 and the resultant economic downturn has had the impact of shrinking solar retailers work pipeline and potentially bringing sales and installations forward. Covid-19 has had a greater impact on the commercial market with sales taking longer to close and the uncertain economic outlook means many businesses are taking a “wait and see” approach;
- Concerns are starting to arise regarding additional costs or constraints being placed on solar PV (ie. new South Australian inverter standards requiring remote disconnection and voltage ride-through) and potential impact of curtailment. This may mean that battery systems become more attractive;
- Battery systems are still too expensive however there is an expectation that bundled with PV they may get within reasonable paybacks in the medium term;
- Cost of generating sales leads is increasing, and conversion taking longer with higher levels of saturation; and
- Panel prices tend to have stabilised with recent strong Australian dollar offsetting some increase in equipment costs.

4.2 Estimated STCs to be created for 2020 Installations

We have analysed the level of STCs that have been submitted for creation on a weekly basis by year of installation for the key market sectors. We have assumed that the average lag in 2020 creation will be similar to that experienced in 2019 with adjustments for the following:

- Observed quicker submittal of STC claims to the CER with the increasing use of Serial Panel Number Verification;
- Likely quicker turnaround by solar businesses to better manage cash flow needs with slowdown caused by Covid-19;
- Impact of Lockdown stage 4 in Victoria where installations have ground to a halt over an eight week period; and
- Impact of new proposed inverter standards for PV in South Australia that may slow the market over the medium term.

The lag in creation for all market sectors is summarised in Attachment 9.

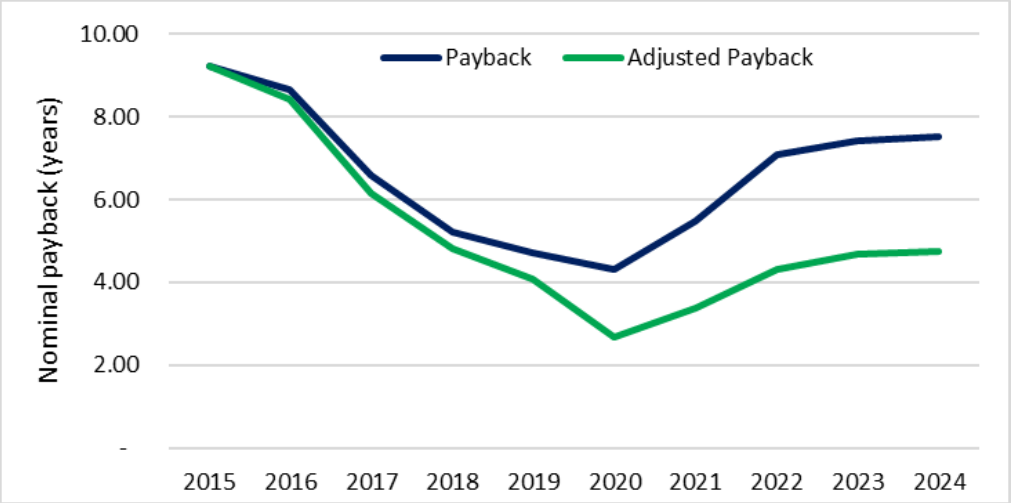
4.3 Forecasting new residential PV installations and STCs created

We have adopted the same approach as we have in our previous modelling exercise in developing demand for new residential solar PV systems (refer to Section 3). We have made a number of revisions to improve the accuracy of our projections including:

- With the reduction in interest rates over the last eight years customers will have modified their views as to what an acceptable payback is for solar. We have therefor scaled paybacks to incorporate the impact of lower interest rates. This enables the development of a more effective time series where historical paybacks and volumes can be related to and mapped against current financial parameters (refer to Figure 4.1)
- We have also incorporated the impact of the significant level of new homes that are expected to be built (approximately 100,000 per annum). We have done this by removing the saturation impact on the level of PV expected to be built on new homes built over a 15 year period. This has the impact of adding a further 6,000 installations across Australia in 2021 increasing to 9,400 by 2024.

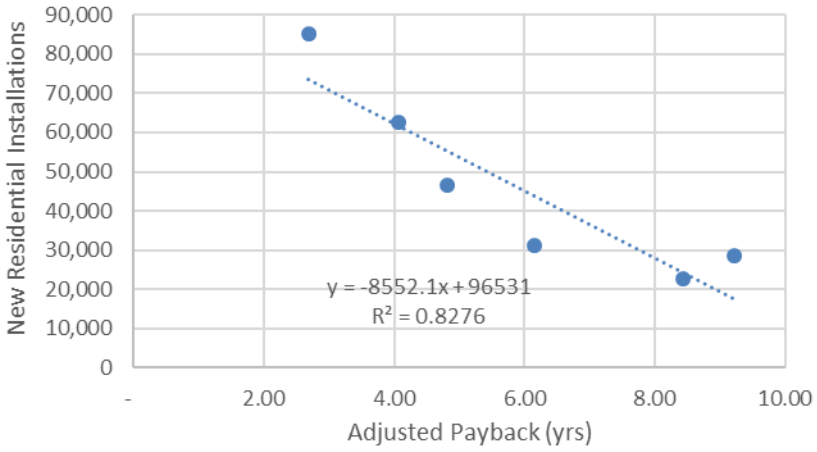
The results from our system payback model are summarised in Attachment 2 and shown in graphical form in Figure 3.6. Nominal paybacks have been adjusted to incorporate the impact of falling interest rates so that they can more meaningfully be compared to historical paybacks. The impact on paybacks for NSW installations is shown in Figure 4.1.

Figure 4.1 Nominal Payback adjusted for lower interest rates (NSW)



The adjusted payback each year for each state has been mapped against the level of installations each year to arrive at an equation that expresses the relationship between payback and the level of installations. The equation derived for NSW is shown in Figure 4.2.

Figure 4.2 NSW system installations as a function of Adjusted payback

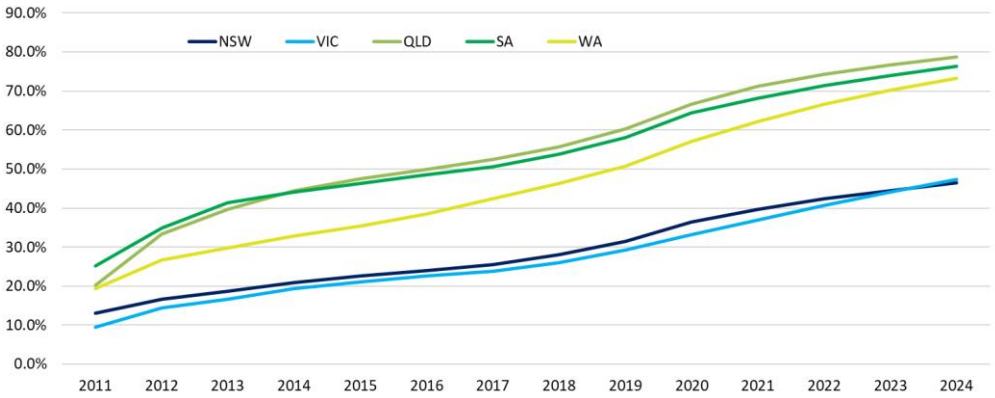


In our modelling we have assumed that the enhanced industry competitiveness and customer awareness remains in place for 2020 and 2021 similar to 2019 levels and then proceeds to get back to more normal levels by 2022.

We have assumed that the level of new residential installations in Victoria will be governed by the Victorian Solar Program with the desire to support 650,000 residential PV systems over 10 years. We have assumed that the program parameters will be adjusted to ensure that the policy commitment of 650,000 solar PV systems will be achieved.

The level of projected system installations by state is outlined in detail in Attachment 3 together with expected penetration levels. Penetration level by state is summarized in the following chart.

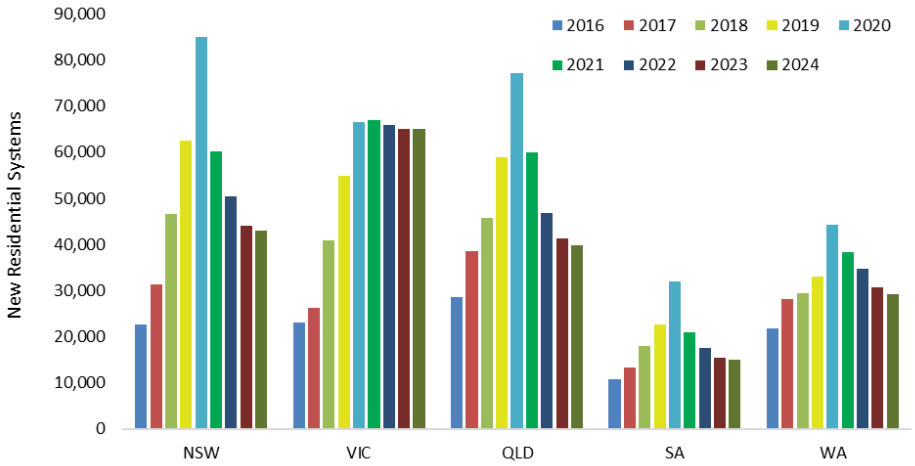
Figure 4.3 Penetration level by key state



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

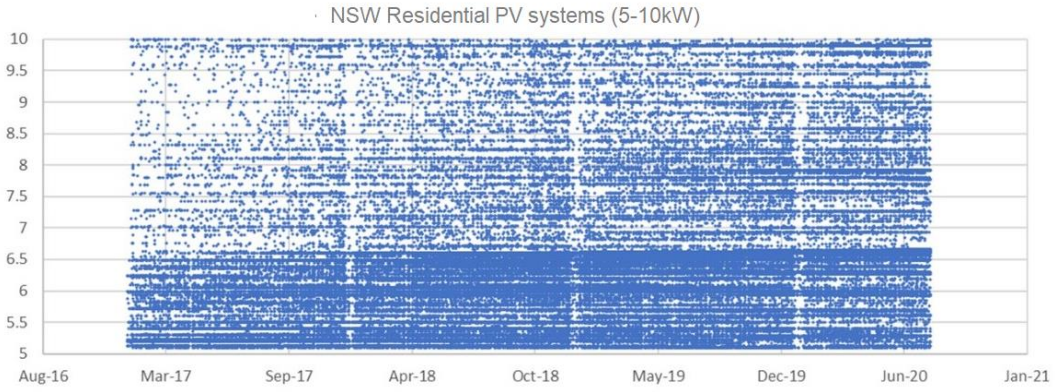
New residential system installations are expected to decline over the next four years as financial attractiveness deteriorates. The only exception is Victoria where installations are supported under the solar program (Figure 4.4)

Figure 4.4 New residential installations by key state



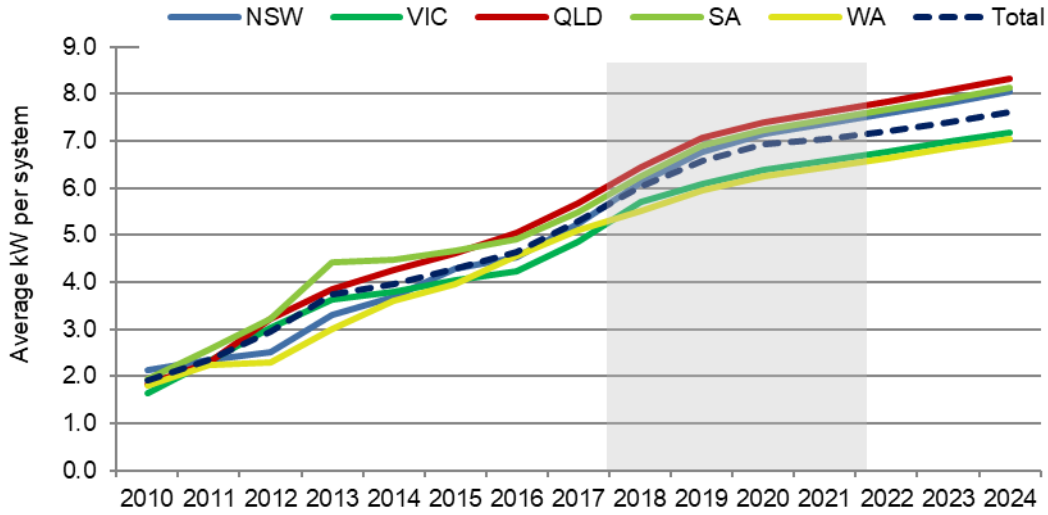
We are expecting only a modest slowdown in the increase in the average system size that has been experienced over the last few years. The soft electricity network constraint we had assumed in the past (limiting system size to between 6.5 to 7 kW) appears to no longer be the case. We have mapped the size of system installation for a number of states which shows that there are a larger number of much bigger systems being installed (refer to Figure 4.5).

Figure 4.5 Plot of residential system installations in NSW by size



We have assumed that the average system size increase by approximately 3% per annum increasing from 6.93 kW per system in 2020 to 7.62 kW per system by 2024.

Figure 4.6 Average system size installed for NSW, Qld, SA, Vic and WA



The capacity installed and resultant STCs created by state are included in Attachment 4. A summary of results is outlined in Figure 4.7 below:

Figure 4.7 New residential solar installations and STC creation

Year of installation	Actual 2018	Estimate 2019	Estimate 2020	Forecast 2021	Forecast 2022	Forecast 2023	Forecast 2024
Number of Systems Installed	187,695	240,794	315,787	253,917	222,531	202,519	198,089
Avge kW/system	6.03	6.59	6.93	7.05	7.22	7.42	7.64
Avge Certificates/kW	17.4	16.1	14.7	13.3	11.9	10.6	9.2
MW Installed	1,131.5	1,585.7	2,188.0	1,790.7	1,607.7	1,503.6	1,514.3
Eligible Certificates ('000)	19,681	25,467	32,266	23,829	19,170	15,885	13,984

4.4 Forecasting new commercial PV installations and STCs created

We identified in Section 2 of this report, the CER has been collecting data on the type of premises that the system was installed since mid-2014. We have used the CER's delineation from 2015 when a full years data was available. For systems installed prior to 2015 we have continued to use systems greater than 10 kW as a proxy for non-residential systems.

We have adopted the same approach as previous modelling exercises in developing our estimates for new commercial PV installations. As opposed to residential installations demand is not significantly constrained by high levels of saturation. The commercial sector therefore is expected to be an attractive market for the solar industry as the residential market declines.

Assumptions used and methodology are summarised in Sections 2 and 3. The expected reduction in wholesale prices combined with a reduction in the contribution of STCs will see a modest increase in payback periods from 2020 (Figure 3.7).

For the forecast period, we have assumed that the system size in each state over the 2019 and 2020 years applies in future.

The total number of systems installed, and associated certificates created for the non-residential PV market is detailed in Attachment 5 and summarised in Figure 4.8.

Figure 4.8 New non-residential solar installations and STC creation

Year of installation	Actual 2018	Estimate 2019	Estimate 2020	Forecast 2021	Forecast 2022	Forecast 2023	Forecast 2024
Number of Systems Installed	14,617	17,170	21,129	21,890	23,211	23,909	24,658
Avge kW/system	22.92	22.18	20.93	21.05	21.04	21.05	21.04
Avge Certificates/kW	17.4	16.0	14.9	13.4	12.1	10.8	9.4
MW Installed	335.0	380.9	442.1	460.7	488.3	503.0	518.7
Eligible Certificates ('000)	5,825	6,105	6,572	6,213	5,932	5,430	4,899

3.7 Forecasting upgrade residential and commercial PV installations and STCs created

We have separately analysed the solar PV systems that have created certificates at an address that already had a system installed. These installations will either represent instances where a solar system has been upgraded (ie. the capacity has been increased) or where the previous system has been replaced. From 1 February 2018 replacement systems will no longer be eligible to create certificates. We have segmented these installations into residential and non-residential.

With rising penetration in the new residential market segment solar resellers and installers are increasingly targeting their existing customers to upgrade their systems. More than 600,000 solar PV systems were installed before 2012, the vast majority of which were less than 1.6 kW. With the average size of new residential system installed in recent years being above 6 kW there is enormous potential for the progressive upgrading of these systems. There is however a disincentive to upgrade systems where attractive feed-in tariffs are in place.

We have modelled upgrade systems using 2019 as a base and then applying recently observed growth rates moderated by changes in relative payback rates.

The total number of systems installed, and associated certificates created for the upgrade PV market is detailed in Attachment 6 and summarised in Figures 4.9 and 4.10.

Figure 4.9 Upgrade residential solar installations and STC creation

Year of installation	Actual 2018	Estimate 2019	Estimate 2020	Forecast 2021	Forecast 2022	Forecast 2023	Forecast 2024
Number of Systems Installed	20,459	23,636	27,975	27,235	29,262	32,189	35,407
Avge kW/system	5.11	5.81	6.27	6.43	6.61	6.43	6.61
Avge Certificates/kW	17.6	16.3	15.0	13.6	12.2	10.9	9.5
MW Installed	104.5	137.4	175.3	175.1	193.5	219.3	248.4
Eligible Certificates ('000)	1,844	2,244	2,633	2,381	2,368	2,384	2,364

Figure 4.10 Upgrade non-residential solar installations and STC creation

Year of installation	Actual 2018	Estimate 2019	Estimate 2020	Forecast 2021	Forecast 2022	Forecast 2023	Forecast 2024
Number of Systems Installed	2,085	2,408	2,430	2,707	2,873	3,064	3,509
Avge kW/system	22.32	25.55	34.64	29.25	29.29	29.25	29.29
Avge Certificates/kW	17.5	16.2	15.0	13.6	12.2	10.9	9.5
MW Installed	46.5	61.5	84.2	79.2	84.1	89.7	102.7
Eligible Certificates ('000)	815	999	1,261	1,077	1,030	977	979

5. Updated STC Forecasts for SWH

Overview

We estimate that nearly 69,400 SWH systems will be installed and create certificates in 2020 which is a 5% decrease on 2019 levels. The most important drivers of uptake have been the level of new home building and policy support measures such as building regulations and energy efficiency schemes.

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 (refer to Attachment 7). This is in sharp contrast to the replacement market.

The primary drivers behind purchase behaviour in the new home market segment is the number of new dwellings and building regulations.

SWH sales data, sourced from Industry, suggests that the number of SWH systems that create certificates is between 10 to 15% lower than the total number of systems sold. This is not a new trend, and we see no reason for this to change. The SWH systems that do not create certificates are generally thought to be the result of difficulties that home builders/renovators face when faced with the prospect of creating certificates. The difficulties arise from the confusion and uncertainty as to who has the right to create the certificates. Specifically, when the future owner of the home/building may not own the system at the time it was installed. This means that using SWH systems creating certificates will understate the real level of SWH installations in new homes by 20 to 25%.

Using the data provided by the CER we have isolated the SWH systems installed in new buildings and analysed historic trends. We use this analysis as the basis for forecasting SWH installations for the new-build submarket.

The level of new home commencements is expected to fall dramatically in all states as a result of Covid-19 and subsequent economic downturn. We have used the latest forecast by the Master Builders Association (updated in August 2020) which incorporates an assessment of the impact of the economic downturn (Figure 5.1), We have derived state figures in Figure 5.1 based on the MBA's February forecast and then applied an adjustment following their August revision.

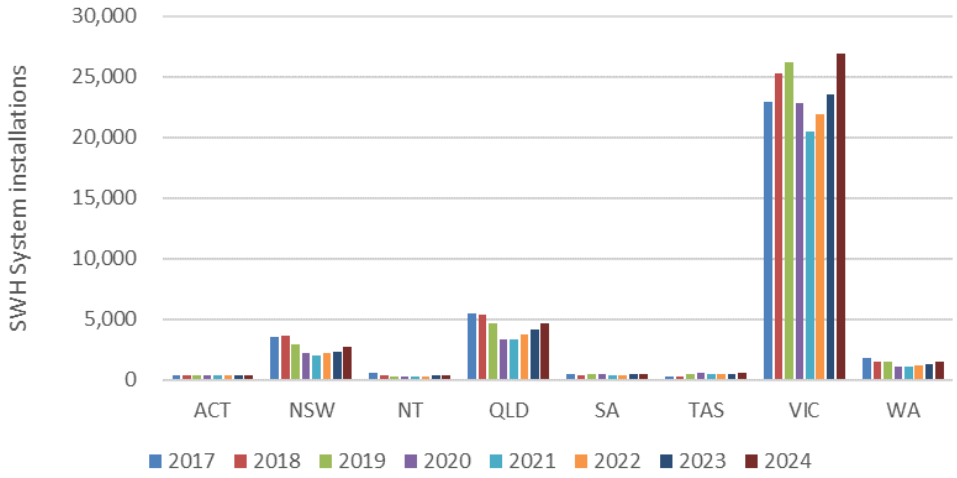
Figure 5.1 Master Builders Association (MBA) – New Home commencements

	2019	2020	2021	2022	2023	2024
ACT	0.97%	-12.97%	-2.13%	-0.82%	-7.52%	6.17%
NSW	-13.90%	-24.97%	-11.56%	5.88%	5.37%	13.16%
NT	-19.73%	-22.17%	-3.06%	17.47%	17.30%	20.69%
QLD	-15.59%	-17.61%	-1.61%	10.19%	6.25%	11.54%
SA	-9.51%	-19.47%	-18.13%	-2.20%	0.41%	11.06%
TAS	3.74%	-15.85%	-14.24%	-2.08%	-2.27%	8.84%
VIC	-9.04%	-19.76%	-12.68%	4.51%	4.95%	11.77%
WA	-12.26%	-16.11%	-3.20%	8.69%	7.02%	14.72%
	-11.71%	**-20.04%**	**-9.29%**	**6.00%**	**5.08%**	**12.29%**

We do not envisage any changes to new building regulations over the forecast period that will have a material impact on the level of SWH installations. We have not assumed any impact from any possible future measures from the National Construction Code 2022 Energy Efficiency project. We have used the MBA forecast of new home commencements as the basis for our projections. We have also incorporated a market growth factor of 2.5% per annum which is the observed growth in the level of SWH installations over the last four years beyond what would have been suggested by the level of new home starts.

The level of SWH systems creating certificates is summarised in Figure 5.2. Victoria which has the most progressive new building regulations remains the leading state for this segment.

Figure 5.2 SWH Systems installed claiming certificates for New Homes by state



Replacement submarket

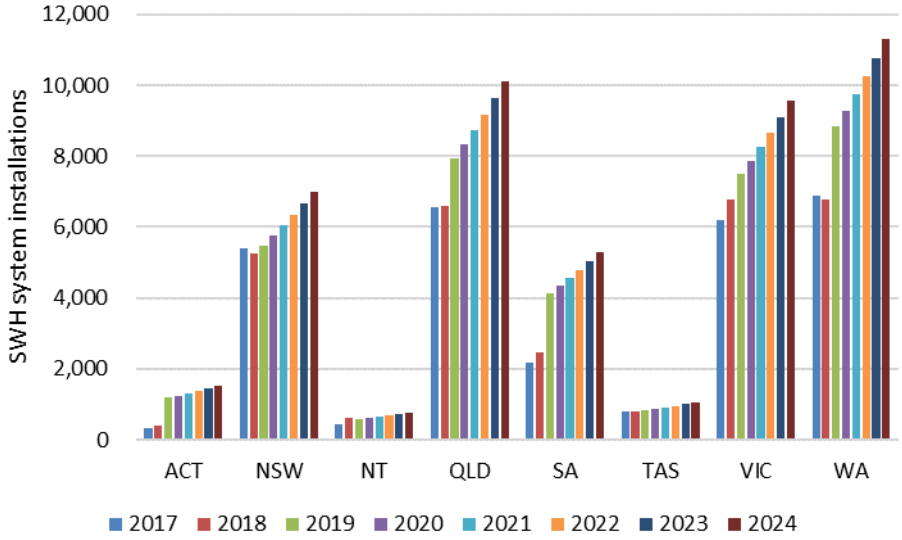
At the time of replacement, most hot water systems are replaced with the same or similar type of system. The dynamics of the replacement market, which are often dictated by a rush to replace a broken or failed water heater, mean there is little time and/or financial liquidity to make thoroughly researched decisions. Thus, historically, the majority of water heater replacements have been on a 'like-for-like' basis.

There have been a range of state-based schemes, incentives and/or regulations, particularly for the replacement of electric resistance water heaters (EWH).

The only material rebates that are currently available are in Victoria through the Victorian Energy Upgrade (VEU) which includes SWH as an eligible activity and the Governments new Solar Program. Under the VEU, a EWH system replaced by a SWH system can generate between 30 to 50 Victorian Energy Efficiency Certificates (VEECs). VEECs provide an added financial incentive of $400 to $1200 that helps drive extra SWH system installations in Victoria. Under the Solar Program a $1000 rebate will be available on the installation of a SWH.

We forecast that the replacement market will grow over the coming four-year period as increasing numbers of SWH systems installed in 2009 and 2010, where the market surged due to expanded government grants, will start to be replaced. We have factored in average growth rates of 5% per annum to reflect this development.

Figure 5.3 Replacement SWH Systems installed claiming certificates by state



Certificates created from the installation of water heater systems

We have assumed that the average certificates per system (on a state basis) for the 2020 to 2024 forecast period will be similar to the average levels achieved over the 2019 to 2020 period.

Figure 5.4 Certificate creation from SWH

Year of installation	Actual 2018	Estimate 2019	Estimate 2020	Forecast 2021	Forecast 2022	Forecast 2023	Forecast 2024
New Buildings							
Number of Systems Installed	37,330	36,871	31,109	28,464	30,670	32,968	37,725
Avge Certificates/System	29.7	29.7	30.4	30.1	27.1	24.1	21.0
Eligible Certificates ('000)	1,110	1,097	945	855	830	793	794
Replacement							
Number of Systems Installed	29,646	36,488	38,312	40,228	42,239	44,351	46,569
Avge Certificates/System	30.1	30.2	30.1	30.1	27.1	24.1	21.1
Eligible Certificates ('000)	893	1,103	1,154	1,212	1,145	1,069	982
Total							
Number of Systems Installed	66,976	73,359	69,422	68,692	72,909	77,319	84,294
Avge Certificates/System	29.9	30.0	30.2	30.1	27.1	24.1	21.1
Eligible Certificates ('000)	2,003	2,200	2,099	2,068	1,975	1,862	1,776