AUSTRALIAN ENERGY COUNCIL

SOLAR REPORT

QUARTER 3, 2022

Australian Energy Council

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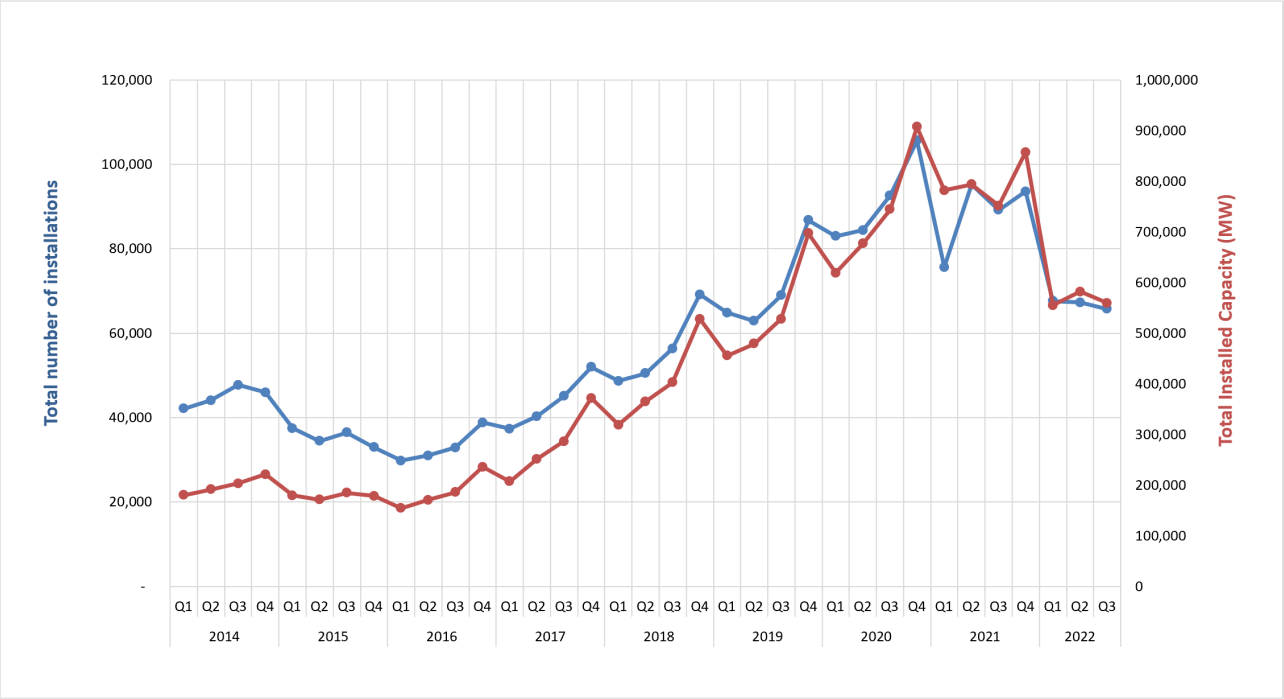
SECTION I: STATE OF SOLAR IN AUSTRALIA

The latest data released by the Clean Energy Regulator (CER) shows the rate of rooftop solar PV take-up continued to grow year on year, but at a slower rate. The rate of new rooftop solar installations has now dipped to 2019 levels with 65,765 new installations in the third quarter of 2022, as can be seen in Figure 1. Due to the lag in reporting new installations, the CER data takes up to 12 months to be finalised, so more than 80,000 installations are anticipated for the quarter, which is down from 89,190 in the corresponding period last year.

The dip in the rate of new rooftop solar installations can be attributed to a number of factors, including supply chain constraints, higher system costs and COVID-19 restrictions. These global and domestic headwinds continue to impact 2022 activity. In addition, multiple interest rate increases have put further pressure on household finances domestically.

Figure 1 also shows newly installed capacity reached a peak at the end of 2020 with a record of 908 MW added during Q4. While 2021 did not break this record, it is remarkable that an additional 857 MW was connecting to the grid in the last three months of that year despite a lower number of installations (12,000). Clearly households are opting for larger systems as they look to reduce their reliance on the grid and their energy bills. In 2022, the decline in the number of new installations also lowered the cumulative installed capacity, with only 560 MW capacity added to the grid during the third quarter of 2022.

Figure 1: Quarterly installations and installed solar PV capacity since January 2014

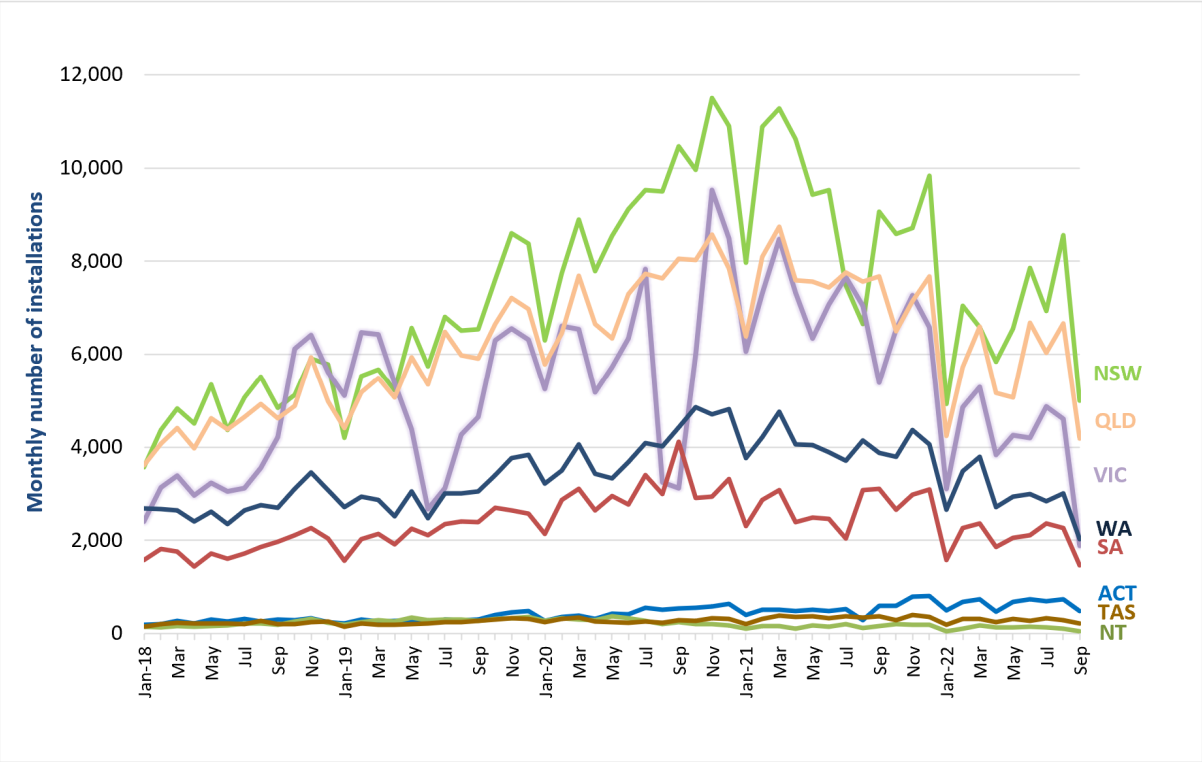


Note: The most recent three months in figure 3 underestimates the data because of a time lag in collation of the data.[1] Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 25 October 2022

Drilling further into the data allows us to consider how uptake is shifting in each state and territory. Figure 2 shows the proportion of each month's solar PV number that has been installed in each state. New South Wales remains the most popular location for solar PV installations, accounting for nearly 33 per cent of the new national installations. Victoria, which had overtaken Queensland to be in second place for installations once the state came out of lockdown in 2020 (largely thanks to its Solar Homes Program) has gradually fallen back to third place in terms of installation uptake. It is interesting, however, to note that more Victorian householders are opting to install both solar and battery together which we will discuss further below.(these statistics are not included in figure 2).

[1] Solar PV system owners have up to 12 months to report their data to the Clean Energy Regulator.,

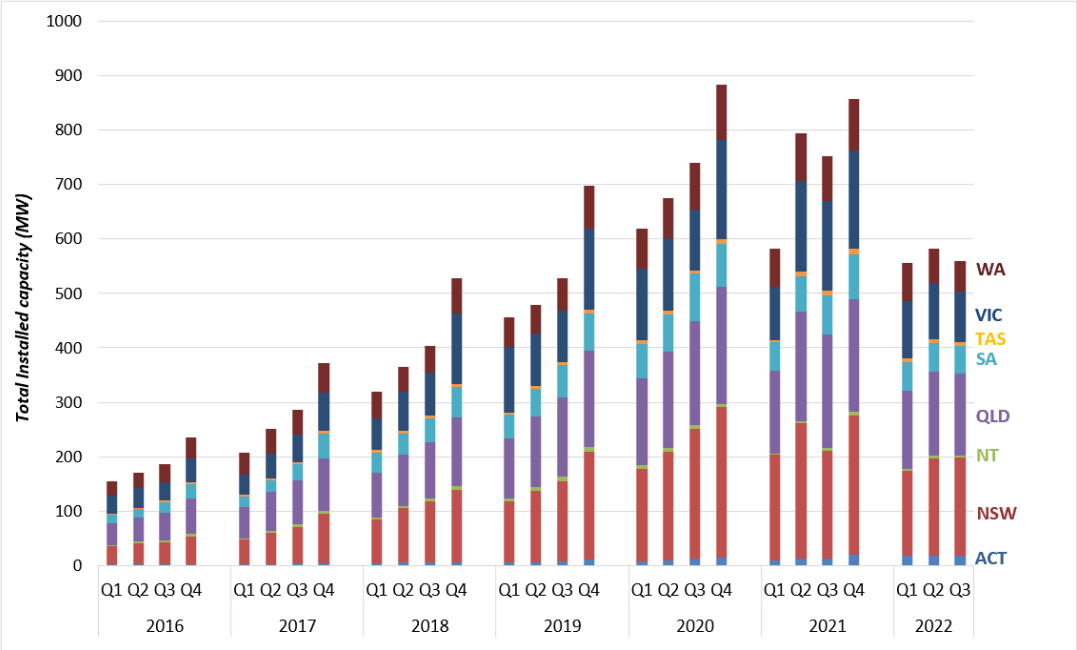
Figure 2: Australia monthly installations by states



Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 25 October 2022.

Figure 3 shows the total solar capacity installed by quarter. National Electricity Market (NEM) states accounted for 89 per cent of total capacity in the third quarter of 2022, while New South Wales and Queensland accounted for 59 per cent of the nation's total quarterly installed capacity.

Figure 3: Quarterly rooftop PV installed capacity by states (unadjusted data)



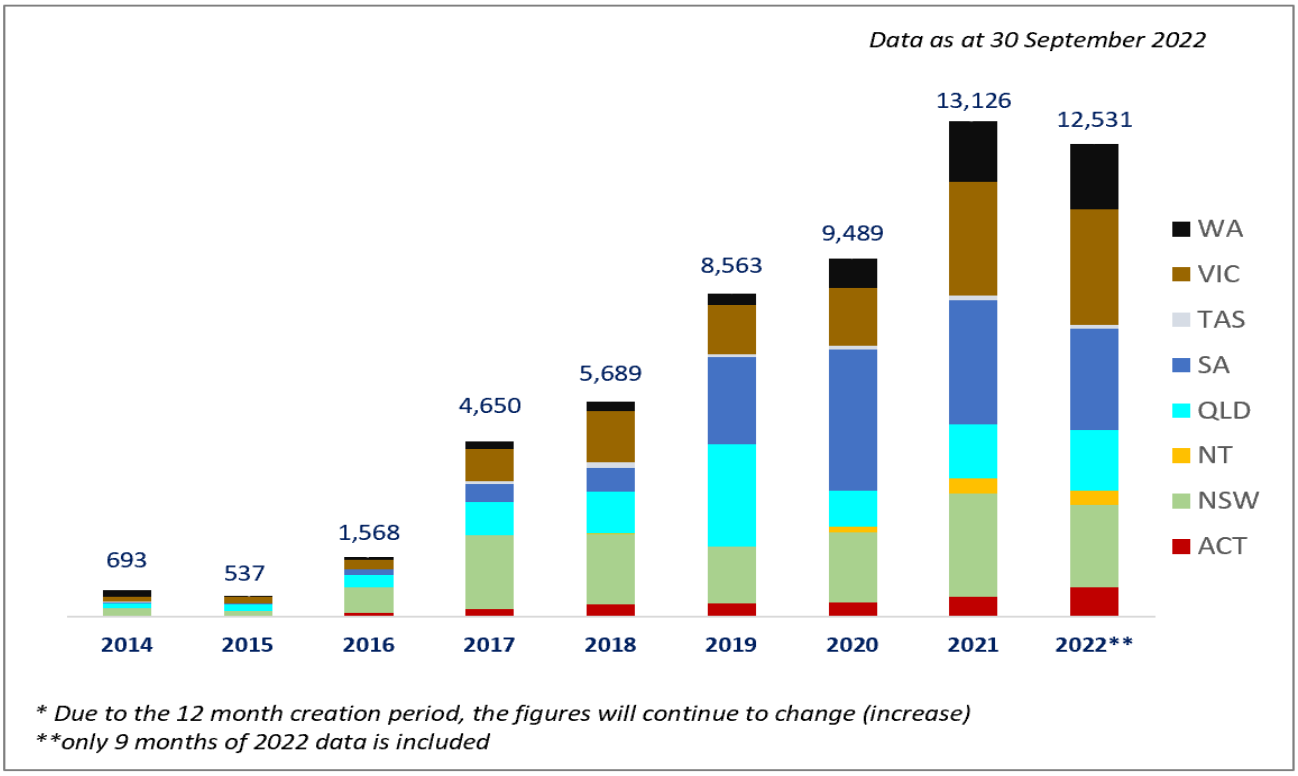
Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 25 October 2022

Battery installations with rooftop solar

Despite 2022 showing a steep decline in the installation of rooftop solar PV systems without a battery, rooftop solar PV systems with a battery increased year on year. The trend through 2022 indicates that adoption of storage technology is being supported by more households and 2022 is expected to beat 2021's record 13,126 combined system installations (figure 4).

When comparing the uptake of rooftop solar PV with battery installations with rooftop solar PV by states (figure 4), South Australia has been overtaken by Victoria as the state with highest share of battery with rooftop solar installations. During the first nine months of 2022, Victoria and South Australia accounted for 24 and 21 per cent of national installations of rooftop solar with a battery respectively.

Figure 4: Number of solar with concurrent battery installations per state since 2014



Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 25 October 2022

Since the last Solar Report, there have been new updates on State Government schemes or rebates on battery storage installation with solar systems from 1 July 2022.

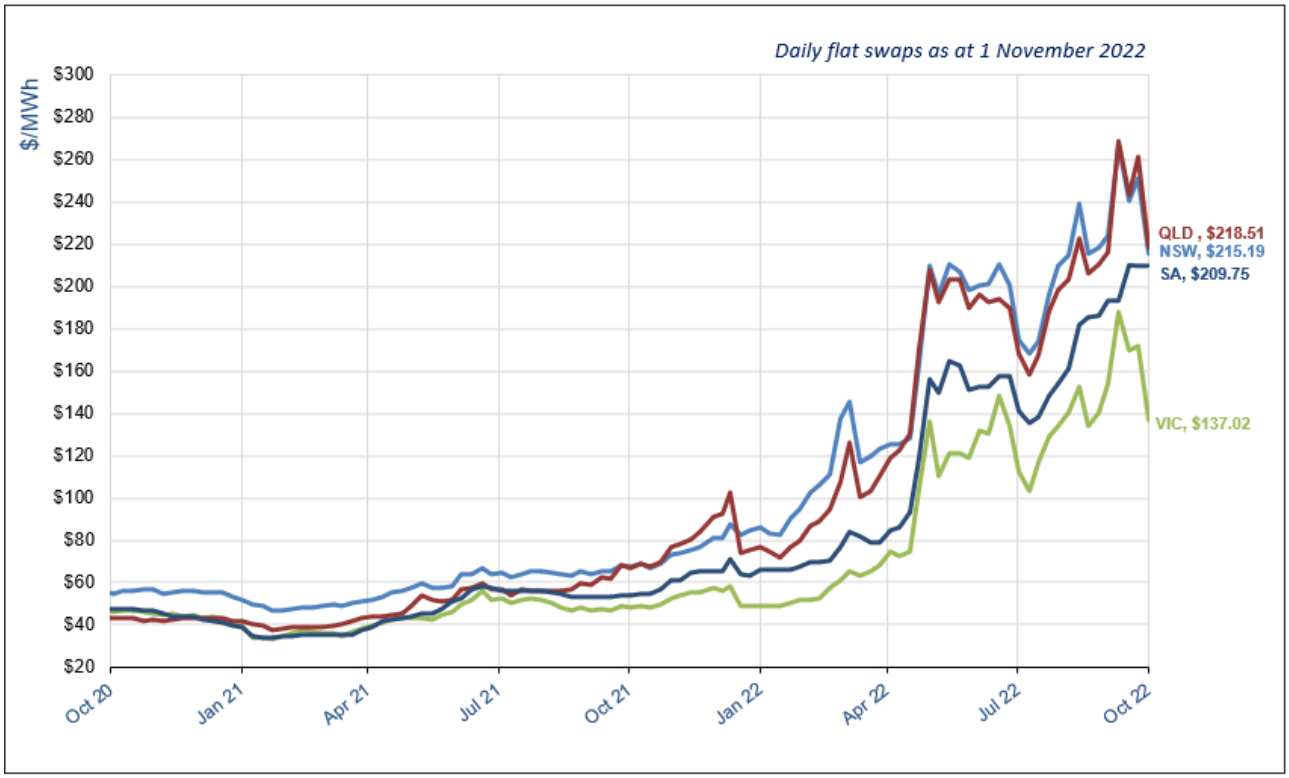
Schemes and rebates around the country include:

- Victoria: The Solar Battery Rebate Program offers a rebate of up to $2,950 for a solar battery system starting 1 July 2022[i], yet the number of rebates for each month is still being confirmed.
- South Australia: The state's Home Battery Scheme has closed to new applications after nearly four years of supporting more homeowners to access residential battery energy storage systems.
- Australian Capital Territory: The state's Next Generation Energy Storage Program offers a rebate of $3,500 (excluding GST) or 50 per cent of the battery price (excluding GST) – whichever is lowest[ii].
- Northern Territory's Home and Business Battery Scheme allows residents to buy and install batteries and inverters with a maximum grant of $6,000[iii].

SECTION II: THE SOLAR BOOM IS NOT OVER

Higher energy prices have been a key topic of discussion in the context of the Albanese Government's 2022 budget, given its forecast that prices will rise by 56 per cent in the next two years. Figure 5 shows electricity prices across the states in the NEM over the last two years. It shows price rises occurring from May onwards, when the energy crisis took hold in the NEM, adding $30 to $40/MWh to costs on some days.

Figure 5: Future baseload electricity prices by states



Source: Australian Energy Council analysis on NEM Futures, data as of 1 November 2022

In previous instances, increases in wholesale electricity prices have meant an increase in feed-in tariff (FiT) for people with rooftop solar PV, but that has not been the case in 2022. As of 1 July 2022, the default Victorian minimum flat rate FiT is 5.2 cents per kWh while the minimum time-varying FiT ranges from 5.0 to 7.1 cents per kWh. These figures are 22 and 49 per cent lower than the 2021-22 (6.7 cents per kWh) and 2020-21 (10.2 cents per kWh) minimum single FiT. The new rates were set on 24 February 2022, the same day Russia commenced its the invasion of the Ukraine, putting pressure on energy markets globally.

The majority of energy providers in Victoria offer rates ranging between 5.2 and 10 cents. A handful of retailers are offering higher incentive rates. Figure 6 compares FiT offers in 2022 and 2020. In 2022, 17 out of 24 retailers (approx. 70 per cent) have a FiT rate higher than the default 5.2 cents on offer. Comparatively, in 2020 only 4 out of 29 retailers offered a rate higher than the default 10.2 cents.

Figure 6: Victorian feed-in tariff offers as of September 2022 and 2020

Source: Australian Energy Council analysis

As mentioned in section one, the rate of rooftop solar installation dipped back to 2019 levels this year. The dip can be attributed to a number of factors, including supply chain constraints, higher

system costs and COVID-19 restrictions. Since May 2022, energy prices have increased in Australia. This increase may precipitate a larger number of households looking to become more energy independent. Households with solar can still continue to benefit from solar FiTs, with many retailers in the market are currently offer higher FiT rate for rooftop owners.

2021 census data shows that more than half of Australia's private dwellings do not yet have rooftop solar PV. Specifically, there are 10,852,208 private dwellings which includes separate houses, townhouses and apartments with shared rooftops, while rooftop solar PV has currently only been installed on 3,330,764 rooftops. This means 30.7 per cent of total private dwellings are having rooftop solar installed. ABS data also shows that 66 per cent of private dwellings are owned (either outright or owned with a mortgage)[iv]. Past trends indicate that homeowners tend to seek energy independence through rooftop solar PV, while those who rent are less likely to be in a position to be able to take advantage of a solar system.

SECTION III: LEVELISED COST OF ENERGY

The Levelised Cost of Energy (LCOE) is the cost of energy per kilowatt hour (kWh) produced. When this is equal to or below the cost consumers pay directly to suppliers for electricity, this is called grid parity. Table 1 shows the LCOE for solar in Australia's major cities, indicative retail prices and current Feed-in tariff (FiT) rates. The detailed methodology can be found in the Appendix.

The retail comparison rates are representative variable rates and do not include supply charges. For all capital cities, excluding Perth and Hobart, retail prices are based on the implied usage charges from St Vincent de Paul's tracking of market offers, which was last updated in July 2022. Perth prices are regulated and obtained from Synergy. Hobart prices were obtained from Aurora Energy's Tariff 31. The last holdout for high FiT was the Northern Territory, with state-owned electricity retailer Jacana Energy offering around 26c a kilowatt hour for solar energy exported to the mains grid. A new standard FiT of 8.3 cents per kWh was introduced for home and commercial solar installations up to 30 kilowatts capacity as of 1 July 2022[v]. Tables 1, 2 and 3 show the LCOE across major cities at different discount rates.

Table 2: Central estimate: 4.96 per cent discount rate (ten-year average mortgage rate)

All figures in $/KWh	System Size						Retail prices	FIT
	3 kW	4 kW	5 kW	6 kW	7 kW	10 kW		
Adelaide	$0.09	$0.08	$0.08	$0.07	$0.07	$0.08	$0.38	$0.09
Brisbane	$0.10	$0.09	$0.08	$0.08	$0.08	$0.08	$0.23	$0.10
Canberra	$0.10	$0.09	$0.08	$0.08	$0.08	$0.07	$0.28	$0.08
Darwin	$0.11	$0.10	$0.10	$0.10	$0.09	$0.09	$0.27	$0.08
Hobart	$0.13	$0.11	$0.11	$0.11	$0.10	$0.10	$0.28	$0.09
Melbourne	$0.11	$0.10	$0.09	$0.09	$0.09	$0.09	$0.21	$0.08
Sydney	$0.10	$0.09	$0.09	$0.08	$0.08	$0.08	$0.35	$0.11
Perth	$0.08	$0.07	$0.07	$0.07	$0.07	$0.07	$0.30	$0.03

Source: Australian Energy Council analysis, October 2022

Table 3: Low cost of capital sensitivity: 5.50 per cent discount rate (low current standard variable rate)

All figures in $/KWh	System Size						Retail prices	FIT
	3 kW	4 kW	5 kW	6 kW	7 kW	10 kW		
Adelaide	$0.09	$0.09	$0.08	$0.07	$0.08	$0.08	$0.38	$0.09

Brisbane	$0.10	$0.09	$0.09	$0.08	$0.08	$0.08	$0.23	$0.10
Canberra	$0.10	$0.09	$0.08	$0.08	$0.08	$0.07	$0.28	$0.08
Darwin	$0.11	$0.11	$0.10	$0.10	$0.09	$0.09	$0.27	$0.08
Hobart	$0.13	$0.12	$0.11	$0.11	$0.10	$0.10	$0.28	$0.09
Melbourne	$0.11	$0.10	$0.09	$0.09	$0.09	$0.09	$0.21	$0.08
Sydney	$0.10	$0.09	$0.09	$0.08	$0.08	$0.08	$0.35	$0.11
Perth	$0.08	$0.07	$0.07	$0.07	$0.07	$0.08	$0.30	$0.03

Source: Australian Energy Council analysis, October 2022

Table 4: High cost of capital sensitivity: 14.37 per cent discount rate (indicative personal loan rate)

All figures in $/KWh	**System Size**						**Retail prices**	**FIT**
	3 kW	**4 kW**	**5 kW**	**6 kW**	**7 kW**	**10 kW**		
Adelaide	$0.13	$0.12	$0.11	$0.10	$0.10	$0.11	$0.38	$0.09
Brisbane	$0.14	$0.13	$0.12	$0.11	$0.12	$0.11	$0.23	$0.10
Canberra	$0.16	$0.13	$0.12	$0.11	$0.11	$0.10	$0.28	$0.08
Darwin	$0.17	$0.16	$0.15	$0.14	$0.14	$0.14	$0.27	$0.08
Hobart	$0.19	$0.17	$0.16	$0.16	$0.15	$0.15	$0.28	$0.09
Melbourne	$0.16	$0.14	$0.13	$0.13	$0.13	$0.12	$0.21	$0.08
Sydney	$0.15	$0.13	$0.12	$0.11	$0.11	$0.11	$0.35	$0.11
Perth	$0.11	$0.10	$0.10	$0.10	$0.10	$0.10	$0.30	$0.03

Source: Australian Energy Council analysis, October 2022

Small and Large business - Levelised Cost of Electricity

Tables 5 and 6 show the estimated cost of electricity production for commercial-sized solar systems. As businesses look to reduce overhead costs, installation of larger-scale solar systems continues to increase.

Business tariffs differ to residential retail tariffs. Depending on the size of the customer and the amount of energy used, businesses have the ability to negotiate lower prices. If a business was to consume all electricity they generate onsite, the electricity prices in Tables 4 and 5 would represent the cost per kWh of consumption from the energy generated from the different system sizes listed. For businesses, installation occurs if the benefits of installation outweigh the cost. As a baseline figure, the average electricity bill for industrial businesses in 2014-15 was 10.72 c/kWh[vi].

Table 5: Central estimate: 4.45 per cent discount rate, ten-year average small business interest rate

All figures in $/KWh	**System Size**				
	10kW	**30kW**	**50kW**	**70kW**	**100kW**
Adelaide	$0.08	$0.08	$0.08	$0.08	$0.08

Brisbane	$0.08	$0.08	$0.08	$0.08	$0.07
Canberra	$0.08	$0.08	$0.08	$0.08	$0.08
Hobart	$0.10	$0.09	$0.09	$0.09	$0.09
Melbourne	$0.09	$0.09	$0.09	$0.09	$0.09
Sydney	$0.09	$0.08	$0.08	$0.08	$0.08
Perth	$0.09	$0.07	$0.08	$0.07	$0.07

Source: Australian Energy Council analysis, October 2022

Table 6: Central estimate: 4.89 per cent discount rate, ten-year average large business interest rate

All figures in $/KWh	System Size				
	10kW	**30kW**	**50kW**	**70kW**	**100kW**
Adelaide	$0.08	$0.08	$0.08	$0.08	$0.08
Brisbane	$0.08	$0.08	$0.08	$0.08	$0.08
Canberra	$0.08	$0.08	$0.08	$0.08	$0.08
Hobart	$0.10	$0.09	$0.09	$0.09	$0.09
Melbourne	$0.09	$0.09	$0.09	$0.09	$0.09
Sydney	$0.09	$0.08	$0.09	$0.08	$0.08
Perth	$0.09	$0.08	$0.08	$0.08	$0.07

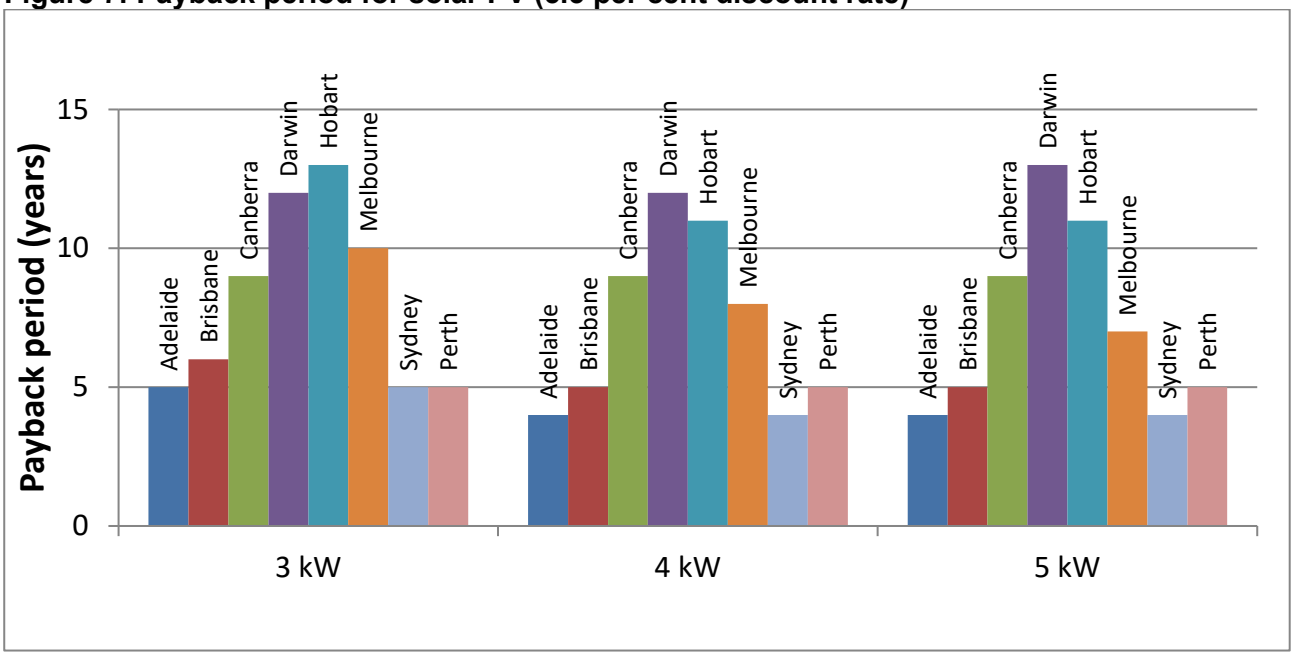
Source: Australian Energy Council analysis, October 2022

SECTION IV: PAYBACK PERIOD, DETAILED MODEL

The payback period is defined as the year when the cumulative savings are greater than the cumulative costs of a solar PV system. Savings represent the avoided cost of consumption and any revenue received from FiTs. The cumulative cost incurred represents the initial investment and the time value of money. A detailed methodology is contained in Appendix 2.

Figure 7 highlights the payback period for different system sizes across Australia. Note that electricity prices are subject to change with consumer price index (CPI) levels and therefore will affect the payback period. Some retailers offer higher solar FiTs, which help to offset the impact of higher prices in some states and deliver savings to customers with solar panels. The low payback periods across many cities further highlights the greater encouragement for customers to install solar PV.

Figure 7: Payback period for solar PV (5.5 per cent discount rate)



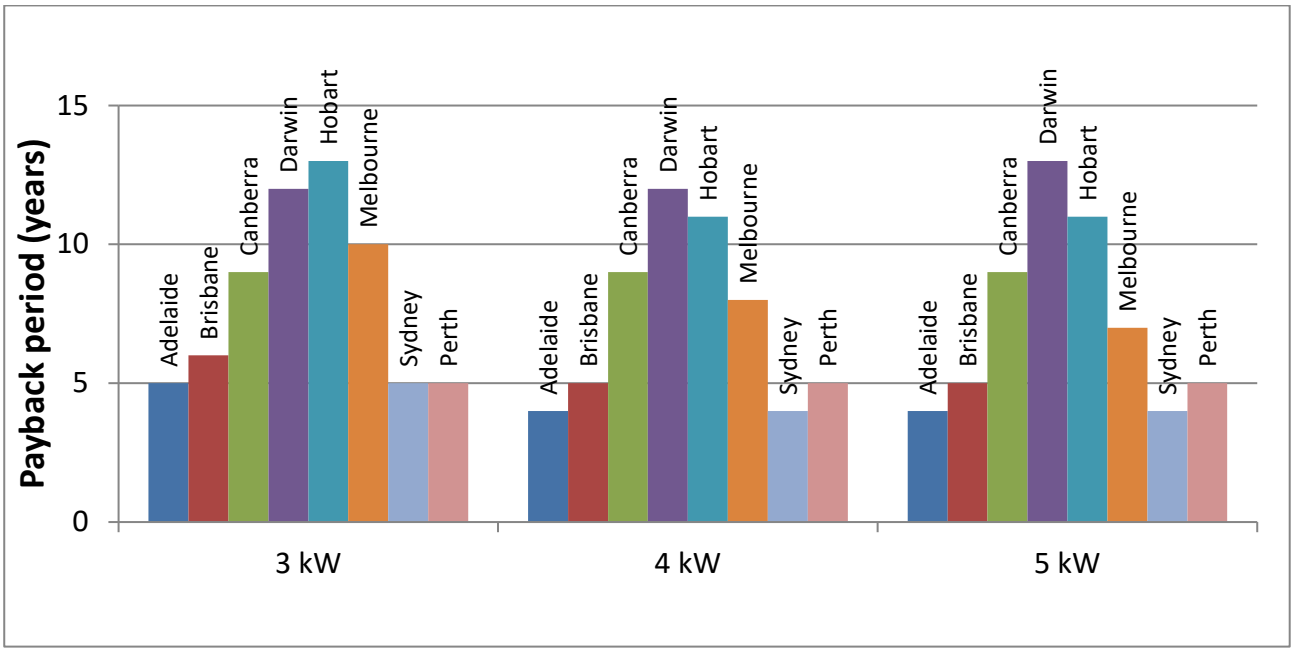
Source: Australian Energy Council analysis, October 2022

Darwin and Hobart are the two states have the highest cost of installations, resulting in the highest payback period of more than five years with a 3kW, 4kW and 5kW system.

Melbourne has lower solar radiation with an average generation of 3.6kWh per kW of rooftop system installed. Average output per kW installed is higher in Sydney, Adelaide and Perth, at 3.9 kWh,4.2 kWh and 4.4 kWh on average respectively. Consequently, Melbourne has the longer payback period than those states. Sydney has the lowest payback period of 4 years for a 4kW and 5kW systems.

Similarly, figure 8 shows the expected payback period for systems with a 14.37 per cent discount rate (10-year average personal loan rate). In Melbourne, it is makes economic sense to install a 5kW system rather than a 3kW or 4kW system as it may reduce the payback time by three years for a 5kW system compared to a 3kW system. Adelaide, Brisbane, Sydney and Perth see no change in payback periods with a higher interest rate.

Figure 8: Payback period for solar PV (14.37 per cent discount rate)



Source: Australian Energy Council analysis, October 2022

SECTION V: METHODOLOGY APPENDIX

1. Solar installations methodology

Analysis from the CER's monthly data allows us to estimate the amount of solar PV installed in Australia. Since November 2015, the CER has consistently released data dated as at the first of each month. The new consistent release date allows us to provide a more accurate estimate of the capacity of recent installations. Due to the lag in reporting of new installations, however, the CER data takes up to 12 months to be finalised.

2. Payback period methodology

This methodology outlines our approach in calculating the payback period for solar panels installed across capital cities in Australia. Our analysis includes the following:

- Initial investment
- Discount rate
- Efficiency
- System degradation rate
- Export rate
- Avoided usage cost
- FiT

Initial investment, discount rate, efficiency and system degradation rate are described in appendix 1. Key difference to LCOE calculation is the payback period assumes no annual maintenance cost.

Calculation

Payback period occurs when $\sum$ savings > $\sum$ cost

Where:

Savings = (usage cost x $(1+ CPI)^t$ x consumption / 100) + (Export x FiT)

Cost = investment x $(1 + \text{real discount rate})^t$

t = years

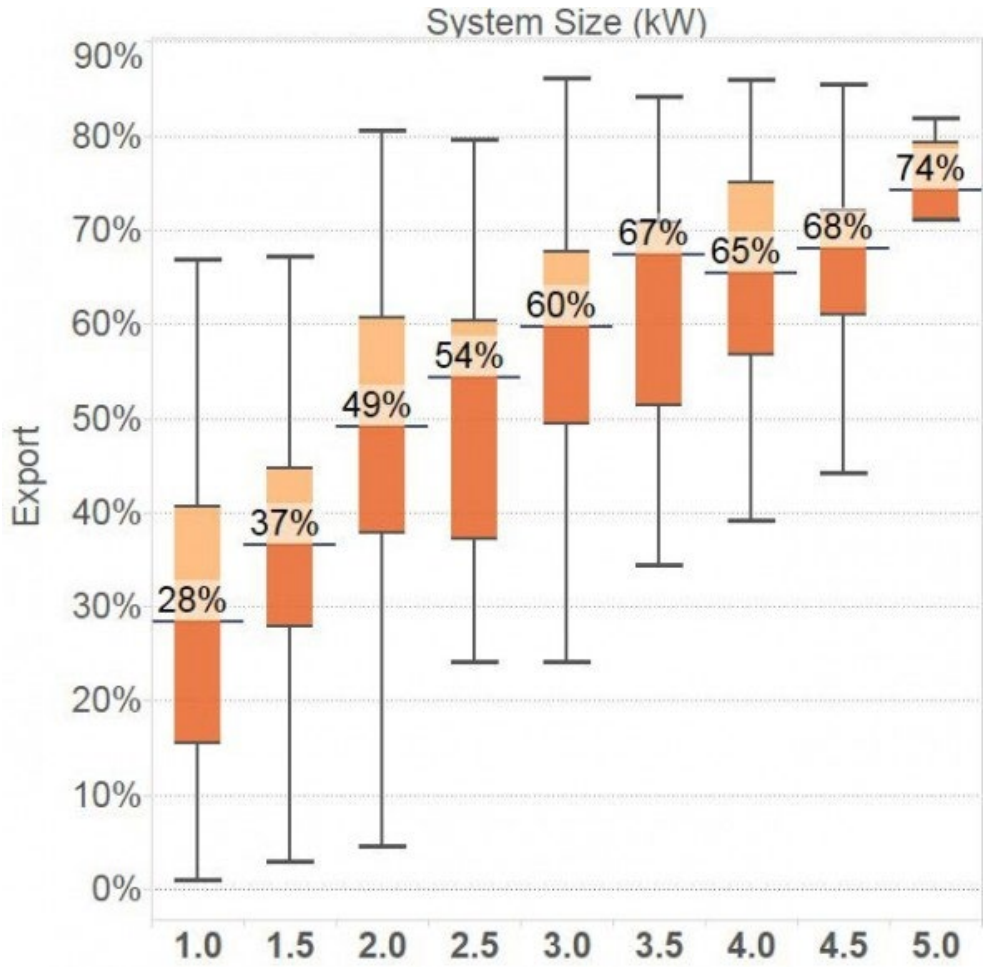
Avoided cost and FiT

The onsite consumption is multiplied by the retailer's usage charges. CPI has been applied to the usage charge to allow for growth in retail prices. The excess energy is exported to the grid and the customer is expected to receive the mandatory FiT or a realistic market offer where mandatory tariffs are not applicable.

Export rate

The percentage of onsite consumption and electricity which is exported to the grid is calculated using the median value from Sunwiz's analysis[vii]. See Figure 9 below.

Figure 9: Export rate of residential solar PV at different system sizes



Source: Sunwiz analysis, 2015

[i] https://www.solar.vic.gov.au/key-dates-solar-homes

[ii] https://www.energy.gov.au/rebates/solar-battery-storage-rebates

[iii] https://nt.gov.au/industry/business-grants-funding/home-and-business-battery-scheme

[iv] https://www.abs.gov.au/statistics/people/housing/housing-census/2021

[v] https://www.jacanaenergy.com.au/your-home/solar-power/solar-update

[vi] BCA, "Impact of Green Energy Policies on Electricity Prices", June 2014

[vii] Sunwiz, Solar Pays Its Way on Networks. Last accessed 17 June 2015.