AUSTRALIAN ENERGY COUNCIL

SOLAR REPORT

QUARTER 1, 2022

Australian Energy Council

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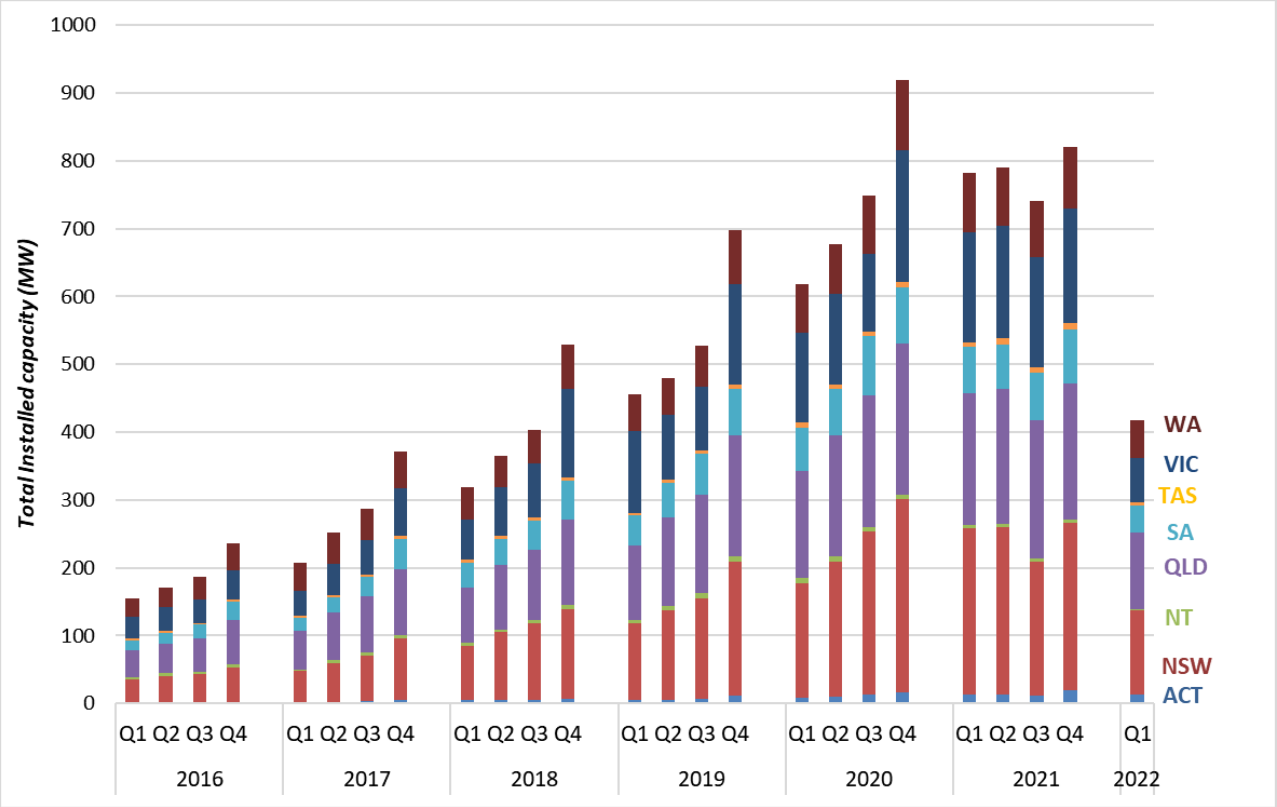
SECTION I: STATE OF SOLAR IN AUSTRALIA

The latest data from the Clean Energy Regulator (CER) shows a marked drop in rooftop solar installations in the first quarter of this year – the lowest level in about the last three years[i]. The CER[ii] data shows more than 52,000 new installations of rooftop solar PV was added in the first quarter of 2022, increasing capacity by 417 megawatts (MW).

However due to the 12-month lag in reporting[iii], it is anticipated the number of new monthly installations actually exceeds 78,000 (which could increase the new capacity to more than 600MW) for the January to March 2021 quarter.

Figure 1: Quarterly rooftop PV installations by states (unadjusted data)



Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 29 April 2022
Note: The most recent three months in figure 3 underestimates the data because of a time lag in collation of the data.[iv] Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 29 April 2022

A drop in installations this year has previously been flagged[v], but this is the first confirmation of the actual impact of factors such as higher systems costs stemming from higher panel and transport costs that emerged last year, supply chain issues, impacts of COVID, as well as the reduction in the small-scale technology certificates (STCs) for the 2022 deeming period. The STCs are created when

the solar system is installed (under 100kW). The number of certificates depends on system size as well as the location. The number of STCs reduces each year through to 2030 as shown below. In Victoria, for example, the number of certificates created for a 6.6kW system in south-east Melbourne is 70 this year, compared to 78 last year for the same system.

Year system installed	Deeming Period in years
2021	10
2022	9
2023	8
2024	7
2025	6
2026	5
2027	4
2028	3
2029	2
2030	1

We have previously looked at factors behind higher panel costs here, but a key reason was the increased cost of polysilicon, which is used to make solar cells.

Based on a 6.6 kW system costs increased from late last year and again in January and February according to solar system cost tracking indices, [vi] while prices began easing in most regions in March, although WA and NSW reported higher costs per watt.[vii]

In 2022 households are typically paying $1000 more for the same system than their neighbour had the year before,[viii] so the out-of-pocket expense increases is likely to have an impact on consumer decisions. Household hesitancy will also have been potentially fuelled by emerging cost of living pressures and economic uncertainty. In addition, the first quarter saw heavy rainfall and subsequent flooding events in Queensland and New South Wales over an extended period.

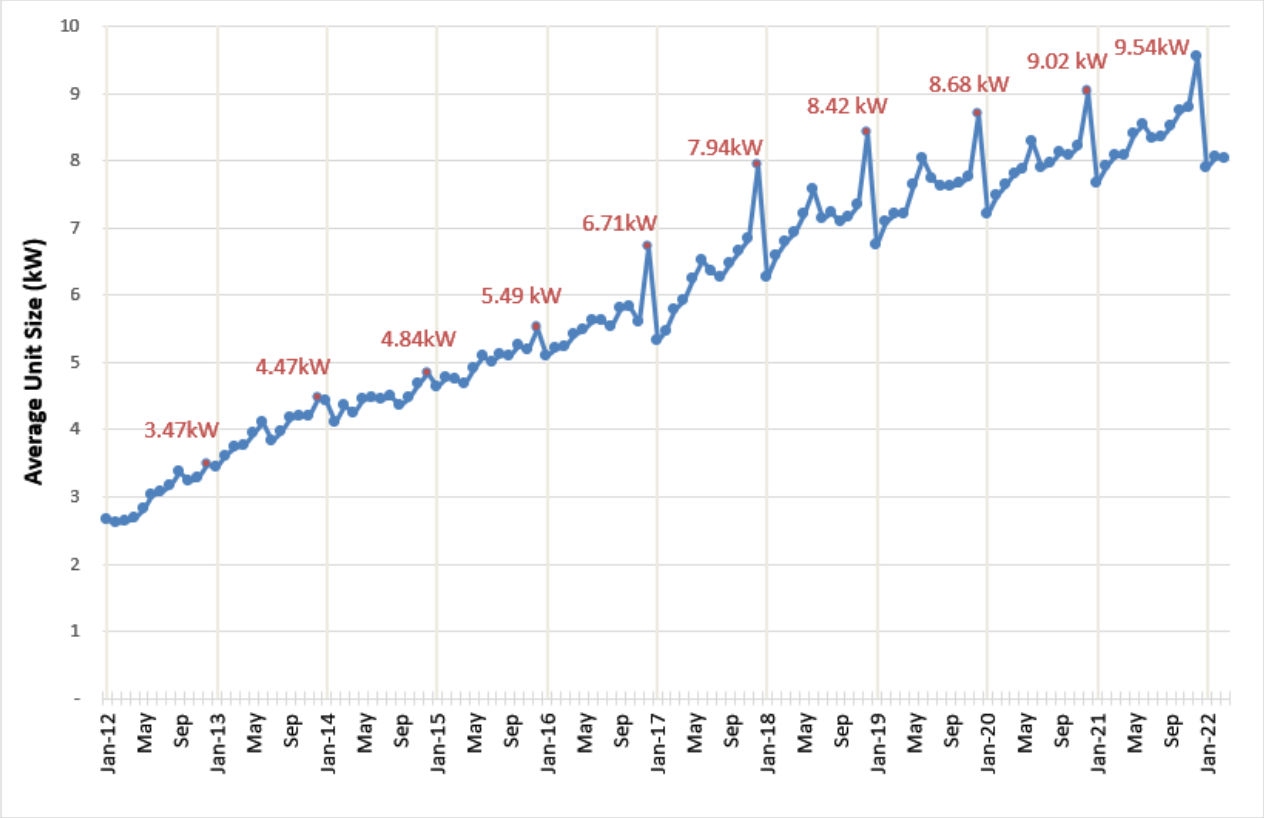
Figure 1 above shows the total capacity of solar PV installations by quarter. The National Electricity Market (NEM) states accounted for 86 per cent of total installed capacity in the first quarter of 2022, while Western Australia accounted for the remaining 14 per cent of total installed capacity.

New South Wales continued to lead the states with more than 15,200 new installations and 124MW of total installed solar capacity added in the first quarter of 2022 despite the challenges created by severe weather conditions for part of the period.

Figure 2 below shows the average installed solar system size for residential and small businesses; the average size steadily increased from 2.65kW in January 2012 to a peak of 9.54kW in December

2021. Historically, December, the last month in a deeming period, has been the peak month for each calendar year in terms of a rise in average installed system size, followed by a seasonal fall in January.

Figure 2: Monthly average system size (kilowatts) since 2012



Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 29 April 2022

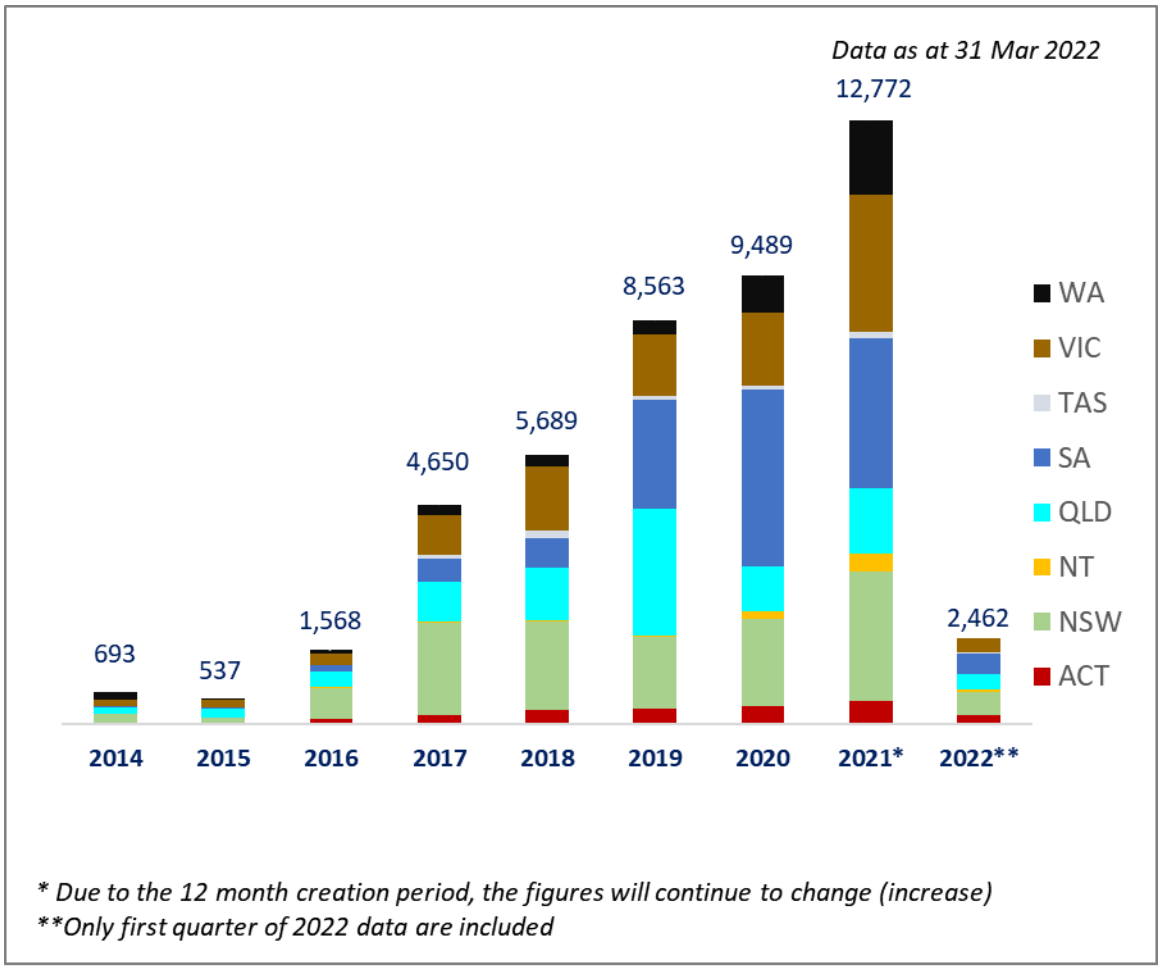
Battery installations with rooftop solar

Australia's rising share of rooftop solar continues to support the adoption of storage technologies.

When comparing the uptake of battery installations with rooftop solar by state (figure 3), South Australia and New South Wales lead, accounting for around 25 and 23 per cent of total installations respectively.

Even with a steady rate of rooftop installations, Queensland continues to see a slow uptake of solar with batteries, accounting for 11.8 per cent of the total solar-with-battery installations. The Queensland Government's incentive scheme for solar-with-battery installations was exhausted in 2019, highlighting the influence of state-based schemes in the adoption of storage technology.

Figure 3: Number of solar with concurrent battery installations per state since 2014



Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 29 April 2022

Since the last solar report, there has been no update on state government schemes or rebates for battery-with-solar installations.

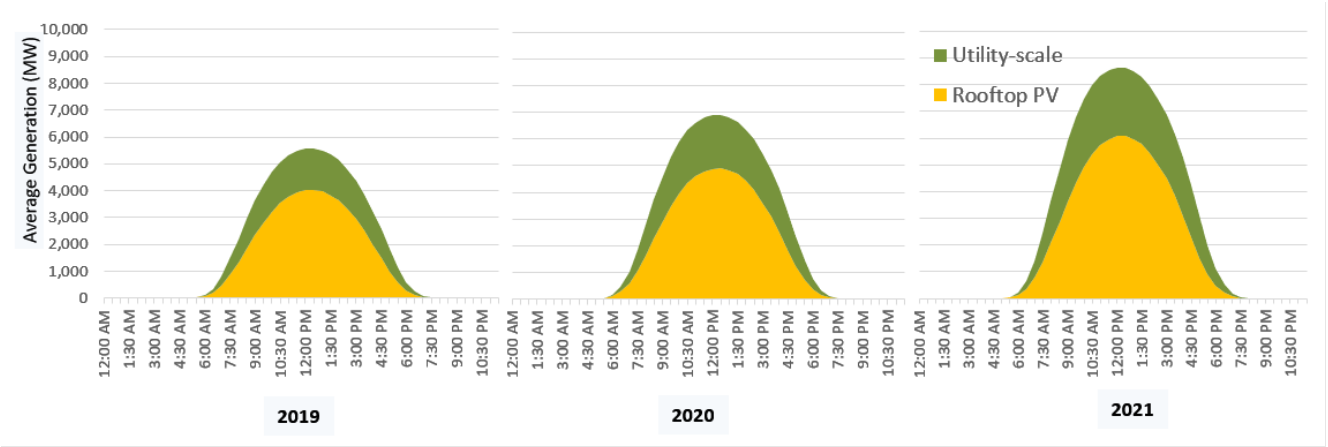
Schemes and rebates remain as:

- New South Wales: The Empowering Homes solar battery loan offer is a state government initiative designed to help eligible homeowners cut their power bills by transitioning to clean, renewable energy. There are two interest-free loans available:
    - up to $14,000 towards a solar PV and battery system (repayable over a range of terms up to 8 years)
    - up to $9000 towards retrofitting a battery system to an existing solar PV system (repayable over a range of terms up to 10 years) [iii]
- Victoria: The Solar battery rebate offers a rebate of up to $3,500 for a solar-battery system. Also there is Solar Victoria Virtual Power Plant (VPP) pilot program, which offers at higher value of $4,174[iv].

SECTION II: STATE OF UTILITY-SCALE SOLAR IN AUSTRALIA

Over the previous years, the NEM states saw a strong take up of PV energy resources (Figure 4). 2021 saw a peak of near 8,500MW of utility scale and rooftop generation during the 30-minute interval in the middle of the day; a profound acceleration in generation came from rooftop PV, accounting for 6,000MW of the total in 2021, increased from 4,900MW in 2020.

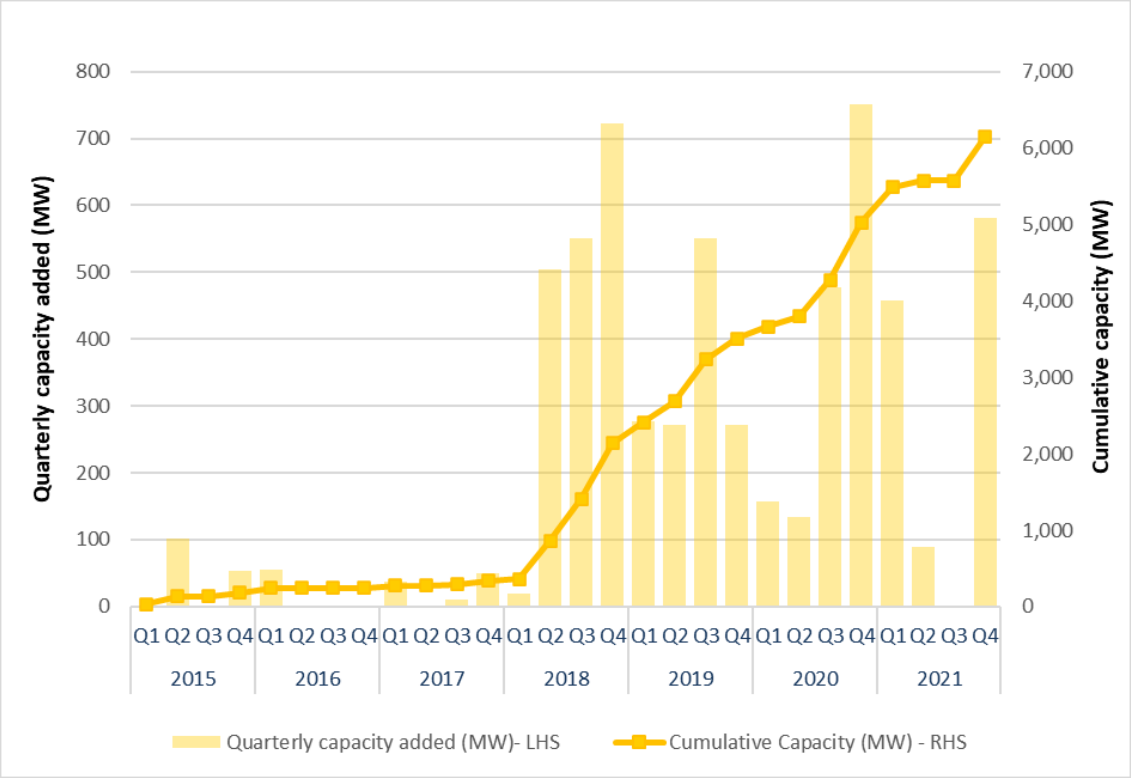
Figure 4: Solar Generation



Source: Australian Energy Council's Analysis

As of February 2022, Australia's large-scale solar energy capacity increased to a total of 5.8GW across 80 projects.

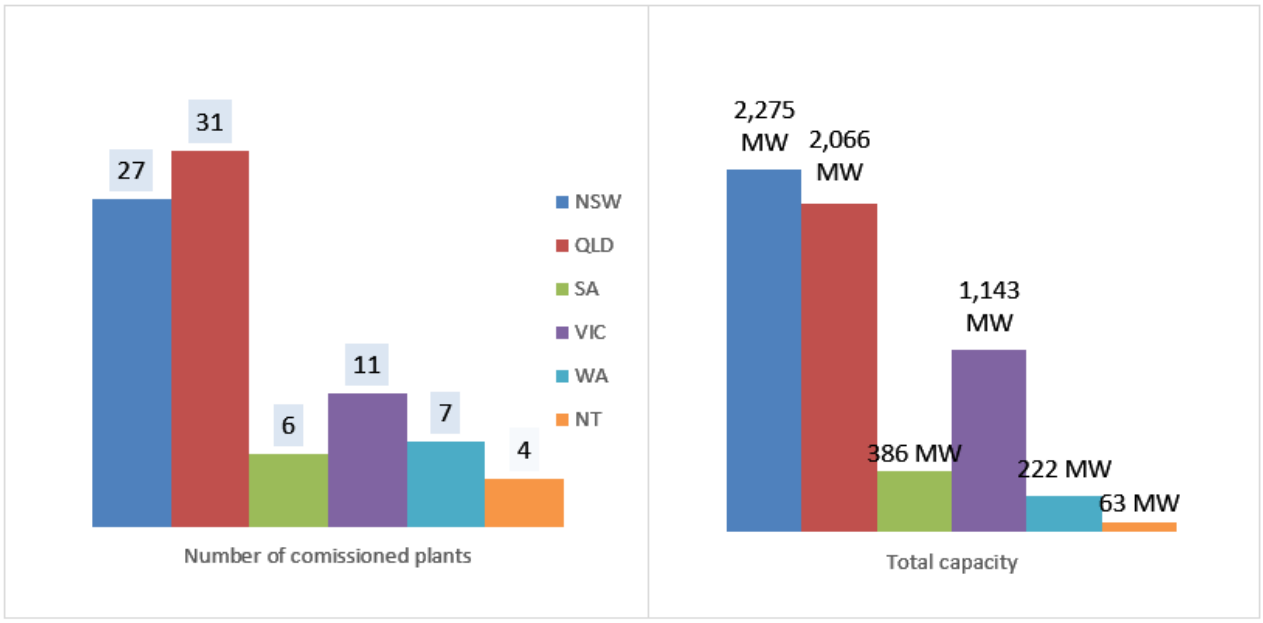
Figure 5: Australia utility-scale solar capacity commissioned by quarter



Source: AEMO Generation Information, Australian Energy Council's Analysis

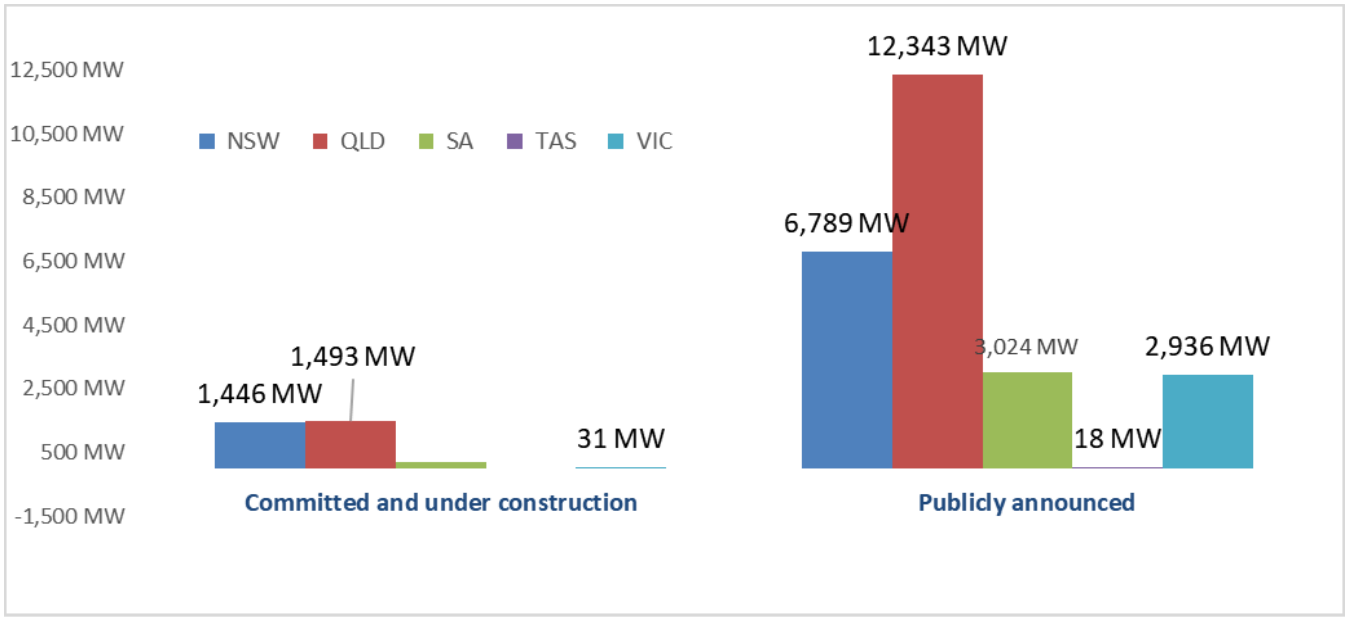
Although Western Australia pioneered the installation of Australia's first solar plant (the 10MW Greenough River Solar Farm which has upgraded to 40 MW in 2020), it is not surprising to see Victoria is now leading with the highest number of committed large-scale solar plants (Figure 6).

Figure 6: Number of commissioned plants and its total capacity as of Feb 2022 across the states in Australia



According to the Australian Energy Market Operator's (AEMO) July Generation Information data , there are currently 128 proposed projects with 39 committed and under construction (Figure 7). With an ambitious planned pipeline and current installed capacity, looking further ahead to optimise operation and management of these assets is becoming increasingly important. A range of measures is being considered by the market operator and at times it has had to constrain the output of some projects to maintain system security.

Figure 7: Total semi-scheduled, committed & under construction and publicly announced solar projects in NEM states.



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 Oct 2021. Perth prices are regulated and obtained from Synergy. Hobart prices were obtained from Aurora Energy's Tariff 31, while Darwin prices are obtained from Jacana Energy's regulated residential usage charges. Tables 1, 2 and 3 show the LCOE across major cities at different discount rates.

Table 1: Central estimate: 5.2 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	$0.10	$0.09	$0.08	$0.08	$0.08	$0.08	$0.31	$0.15
Brisbane	$0.10	$0.09	$0.09	$0.09	$0.09	$0.08	$0.22	$0.15
Canberra	$0.10	$0.09	$0.08	$0.08	$0.08	$0.08	$0.23	$0.11
Darwin	$0.13	$0.12	$0.11	$0.11	$0.10	$0.10	$0.26	$0.24
Hobart	$0.13	$0.12	$0.12	$0.12	$0.11	$0.11	$0.27	$0.09
Melbourne	$0.12	$0.10	$0.10	$0.09	$0.09	$0.09	$0.22	$0.10
Sydney	$0.11	$0.10	$0.09	$0.09	$0.09	$0.09	$0.21	$0.15
Perth	$0.08	$0.08	$0.07	$0.07	$0.08	$0.08	$0.29	$0.07

Source: Australian Energy Council analysis, April 2022

Table 2: Low cost of capital sensitivity: 3.2 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	$0.08	$0.08	$0.08	$0.08	$0.08	$0.31	$0.15
Brisbane	$0.09	$0.09	$0.08	$0.08	$0.08	$0.08	$0.22	$0.15
Canberra	$0.09	$0.08	$0.08	$0.08	$0.07	$0.07	$0.23	$0.11
Darwin	$0.11	$0.11	$0.10	$0.10	$0.09	$0.09	$0.26	$0.24
Hobart	$0.12	$0.11	$0.11	$0.11	$0.10	$0.10	$0.27	$0.09
Melbourne	$0.11	$0.10	$0.09	$0.09	$0.09	$0.09	$0.22	$0.10
Sydney	$0.10	$0.09	$0.09	$0.08	$0.08	$0.08	$0.21	$0.15
Perth	$0.08	$0.07	$0.07	$0.07	$0.07	$0.07	$0.29	$0.07

Source: Australian Energy Council analysis, April 2022

Table 3: High cost of capital sensitivity: 8.99 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	$0.11	$0.10	$0.10	$0.09	$0.09	$0.10	$0.31	$0.15
Brisbane	$0.12	$0.11	$0.10	$0.10	$0.10	$0.10	$0.22	$0.15
Canberra	$0.12	$0.11	$0.10	$0.09	$0.09	$0.09	$0.23	$0.11
Darwin	$0.15	$0.14	$0.13	$0.13	$0.12	$0.12	$0.26	$0.24
Hobart	$0.16	$0.15	$0.14	$0.14	$0.13	$0.13	$0.27	$0.09
Melbourne	$0.14	$0.12	$0.11	$0.11	$0.11	$0.11	$0.22	$0.10
Sydney	$0.13	$0.12	$0.11	$0.10	$0.10	$0.10	$0.21	$0.15
Perth	$0.09	$0.09	$0.08	$0.08	$0.09	$0.09	$0.29	$0.07

Source: Australian Energy Council analysis, April 2022

Small and large business - Levelised cost of electricity

Tables 4 and 5 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 can negotiate lower prices. If a business was to consume all electricity 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. The average electricity bill for industrial businesses in 2014-15 was 10.72 c/kWh[ix].

Table 4: Central estimate: 4.85 per cent discount rate, ten-year average small business interest rate

All figures in $/KWh	System Size				
	10kW	30kW	50kW	70kW	100kW
Adelaide	$0.11	$0.10	$0.10	$0.10	$0.10
Brisbane	$0.11	$0.10	$0.10	$0.10	$0.09
Canberra	$0.10	$0.10	$0.10	$0.10	$0.10
Hobart	$0.14	$0.13	$0.13	$0.12	$0.11
Melbourne	$0.13	$0.12	$0.12	$0.12	$0.11
Sydney	$0.12	$0.10	$0.11	$0.11	$0.10
Perth	$0.11	$0.10	$0.11	$0.10	$0.09

Source: Australian Energy Council analysis, April 2022

Table 5: Central estimate: 4.75 per cent discount rate, ten-year average large business interest rate

All figures in $/KWh	System Size				
	10kW	30kW	50kW	70kW	100kW
Adelaide	$0.10	$0.10	$0.10	$0.10	$0.10
Brisbane	$0.11	$0.10	$0.10	$0.10	$0.09
Canberra	$0.10	$0.10	$0.10	$0.10	$0.10
Hobart	$0.14	$0.12	$0.13	$0.12	$0.11
Melbourne	$0.13	$0.12	$0.12	$0.11	$0.11
Sydney	$0.12	$0.10	$0.11	$0.11	$0.10
Perth	$0.11	$0.10	$0.11	$0.10	$0.09

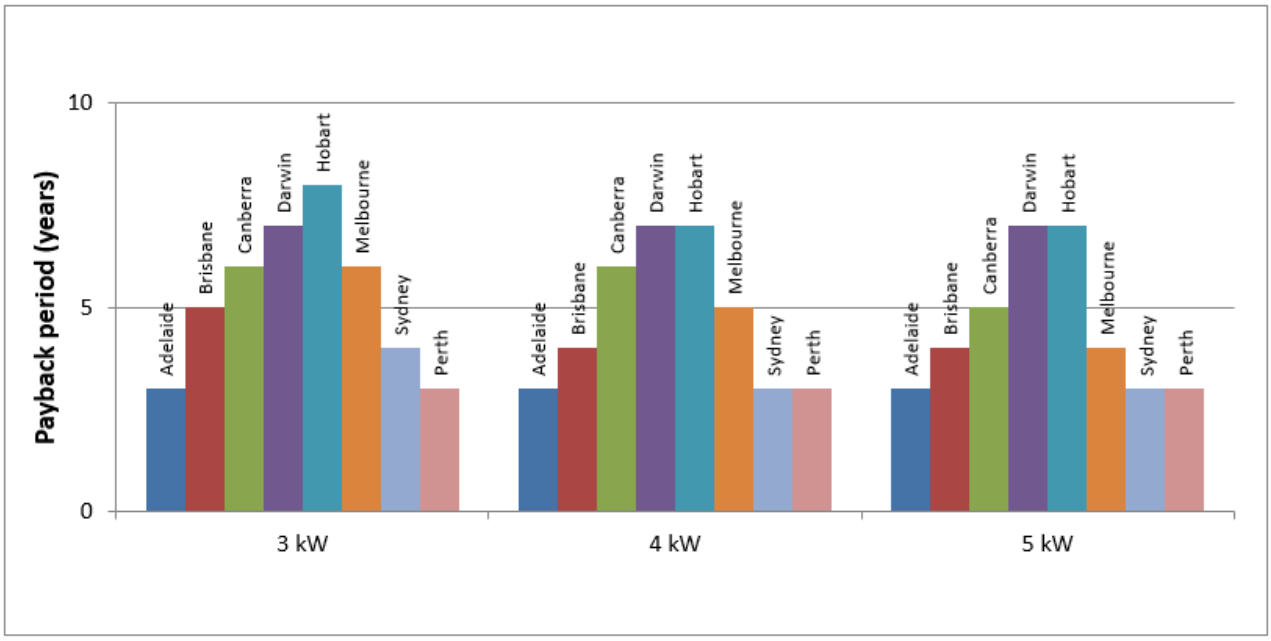
Source: Australian Energy Council analysis, April 2022

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 8 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. Many 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 8: Payback period for solar PV (3.2 per cent discount rate)

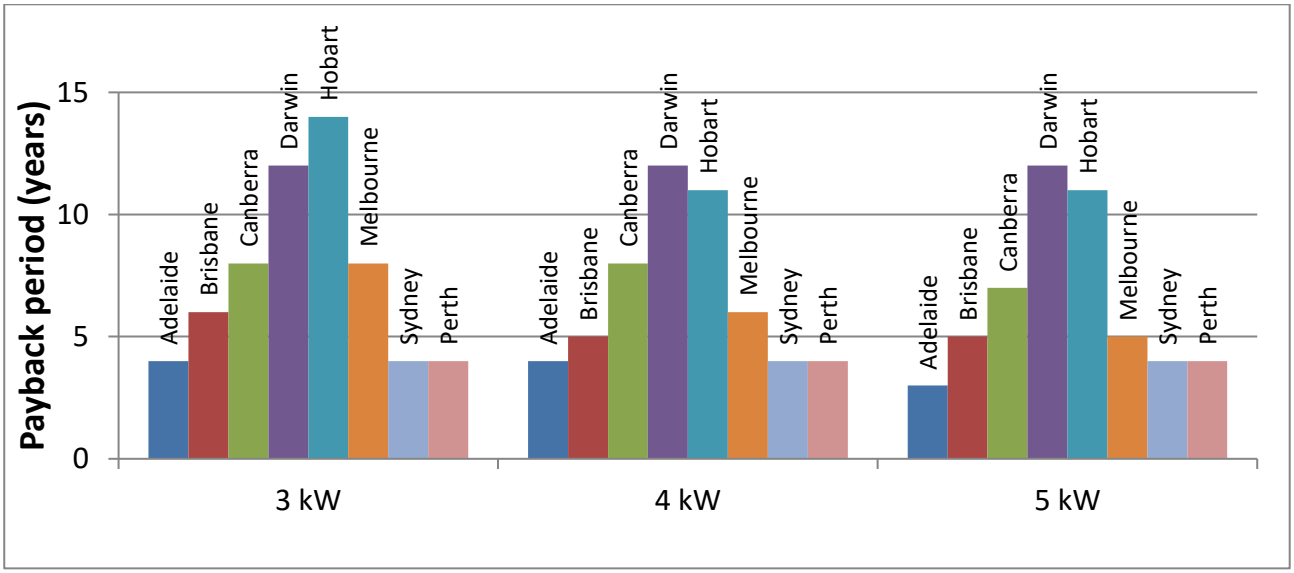


Source: Australian Energy Council analysis, April 2022

Compared to the previous quarter, the price of solar system sizes has not change in Darwin and Hobart. The two states have the highest cost of installations, resulting in the highest payback period of more than 7 years with a 3kW, 4kW and 5kW system. In NSW, the system price has increased $400 for a 3kW PV system, $280 for a 5kW system compares to a quarter ago. Other states see relatively stable system prices. Melbourne sees a strong encouragement to install a 5kW system rather than a 3kW or 4kW unit size. This can reduce the payback time by two years for a 5kW system compares to a 3kW system.

Figure 9 shows the expected payback period for systems with a 5.2 per cent discount rate (10-year average home loan rate). Melbourne sees strong incentive to install a 5kW system rather than a 3kW or 4kW unit size. This can reduce the payback time by three years for a 5kW system compares to a 3kW system. Adelaide, Brisbane, Sydney and Perth show no change in payback periods with a higher interest rate.

Figure 9: Payback period for solar PV (5.2 per cent discount rate)



Source: Australian Energy Council analysis, April 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[x].

[i] [1] The raw data shows installed capacity is the lowest in four years. With the 12 month period in which to create certificates there will be a lag in finalising the actual number of installations and capacity for this period.

[ii] Clean Energy Regulator, Small-Scale Renewable Energy Scheme data
[iii] The most recent three months underestimates the data because of a time lag in data collation. The data represents all systems that have had certificates created against them. There is a 12-month period to create the certificates, so numbers of installations are expected to continue to rise.
[iv] Solar PV system owners have up to 12 months to report their data to the Clean Energy Regulator.
[v] Growth in rooftop solar slows due to lockdowns and supply chain issues | Energy | The Guardian
[vi] Solar Choice Solar Price Index and Solar Quotes Price Index
[vii] Australian Solar Prices: April 2022 Update - Solar Quotes Blog
[viii] Solar panel glut causing messy 'false economy' in Australia – pv magazine International (pv-magazine.com)
[ix] BCA, "Impact of Green Energy Policies on Electricity Prices", June 2014
[x] Sunwiz, Solar Pays Its Way on Networks. Last accessed 17 June 2015.