AUSTRALIAN ENERGY COUNCIL

# SOLAR REPORT

## QUARTER 3, 2023

Australian Energy Council

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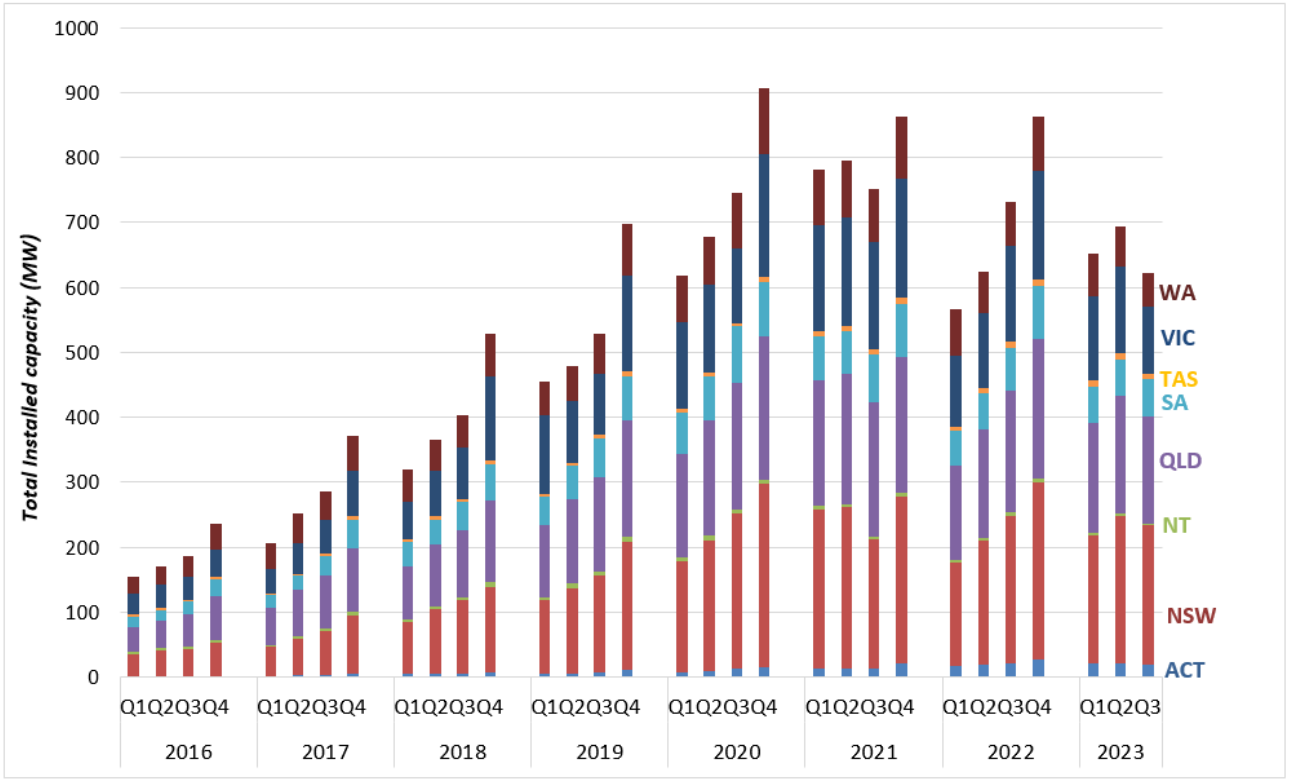
# SECTION I: STATE OF SOLAR IN AUSTRALIA

According to the latest data from the Clean Energy Regulator (CER), household and business rooftop solar has added 1.97 GW of capacity from 219,000 PV systems this year. In the third quarter more than 68,500 new installations were installed with a total installed capacity of 620 MW, taking the total cumulative Australian rooftop solar capacity to 21.2 GW at the end of the third quarter.

During the third quarter, New South Wales maintained its leading position in the country, boasting the highest capacity for newly installed rooftop solar systems accounting for 34.8 per cent of total nationally installed capacity (or 216 MW installed capacity). Following closely behind were Queensland and Victoria, contributing 26.6 per cent and 16.4 per cent, respectively, to the overall new installations. South Australia accounted for 9 per cent of the total installed rooftop solar systems across the country, while Western Australia accounted for 8.3 per cent of new installations. There continues to be a sustained nationwide interest in the adoption of rooftop solar.

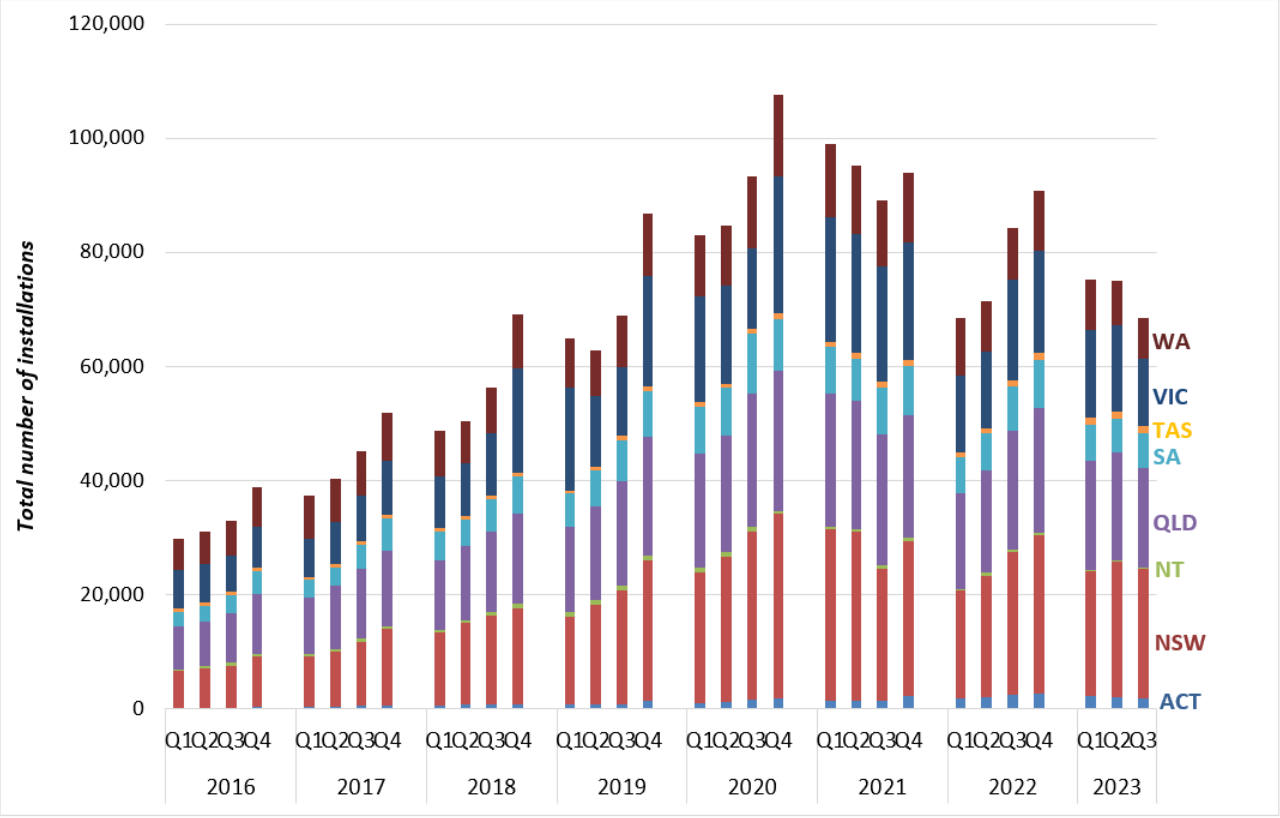
**Figure 1: Quarterly installed capacity of rooftop solar PV in Australia since 2016 (unadjusted data)**




Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 25 October 2023

Figure 2 shows new installations that were added to the grid by state. In assessing the uptake it's important to note that the data reported has a 12-month lag, and as a result, the final figures for the third quarter of 2023 are projected to be approximately 99,500 new rooftop installations. This surge in installations is expected to translate into a total installed capacity of 915 MW, reflecting the continued robust adoption of rooftop solar in the third quarter this year. In line with previous years, with the exception of Q3 2021, the third quarter is expected to outperform the first two quarters of the year. This is attributed to homeowners taking proactive measures in spring to maximize their access to solar energy during the summer months.

**Figure 2: Quarterly installation numbers of rooftop solar PV in Australia since 2017 (unadjusted data)**




Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 25 October 2023

In recent years there has been a notable trend towards larger system sizes as technology advancements and decreasing system costs took hold in the market. However, the most recent data suggests system sizes may be plateauing. As at September 2023, the average system size for rooftop solar installations is estimated to be around 9.3 kilowatts (kW) across Australia. This figure is the same as September last year and only a small increase from an average of 9.0 kW in September two years ago. Several factors may be contributing to this shift.

Firstly, technological advancements have allowed for more efficient solar panels and inverters, which can generate more electricity within the same physical footprint. This has enabled homeowners to achieve higher energy production without necessarily increasing the physical size of their solar installations. As a result, there may be less pressure to continually expand system sizes.

Secondly, there's a growing emphasis on optimizing the size of solar installations to match a household's energy needs. Homeowners and businesses are now better informed about their electricity consumption patterns, allowing them to tailor their solar systems to meet their specific requirements. Another consideration may be the level of feed-in tariffs currently available. These tariffs have reduced over time to reflect the value of the energy to the grid and may have diminished the financial incentive for households to install larger PV systems.

It's worth noting that the average system size figure also exhibits regional disparities, as shown in Table 1 below, with some areas reporting slightly higher or lower averages due to specific energy demands and policies. Nevertheless, the increasing popularity of rooftop solar due to the desire for enhanced energy self-sufficiency, helped fuel the growth in average system sizes over the time.

**Table 1: Average unit size (kW) of rooftop solar system in Australia by states in Q3- 2023**

| | Average system size (kW) | | |
|---|---|---|---|
| By states | July | August | September |
| ACT | 13.4 | 12.5 | 9.9 |
| NSW | 9.9 | 9.5 | 9.5 |
| NT | 12.4 | 10.2 | 9.3 |
| QLD | 10.4 | 10.6 | 10.4 |
| SA | 9.2 | 9.4 | 9.5 |
| TAS | 8.5 | 7.8 | 7.7 |
| VIC | 9.4 | 9.3 | 8.7 |
| WA | 8.4 | 8.2 | 8.1 |
| **Average size (kW)** | **9.6** | **9.5** | **9.3** |

Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 25 October 2023

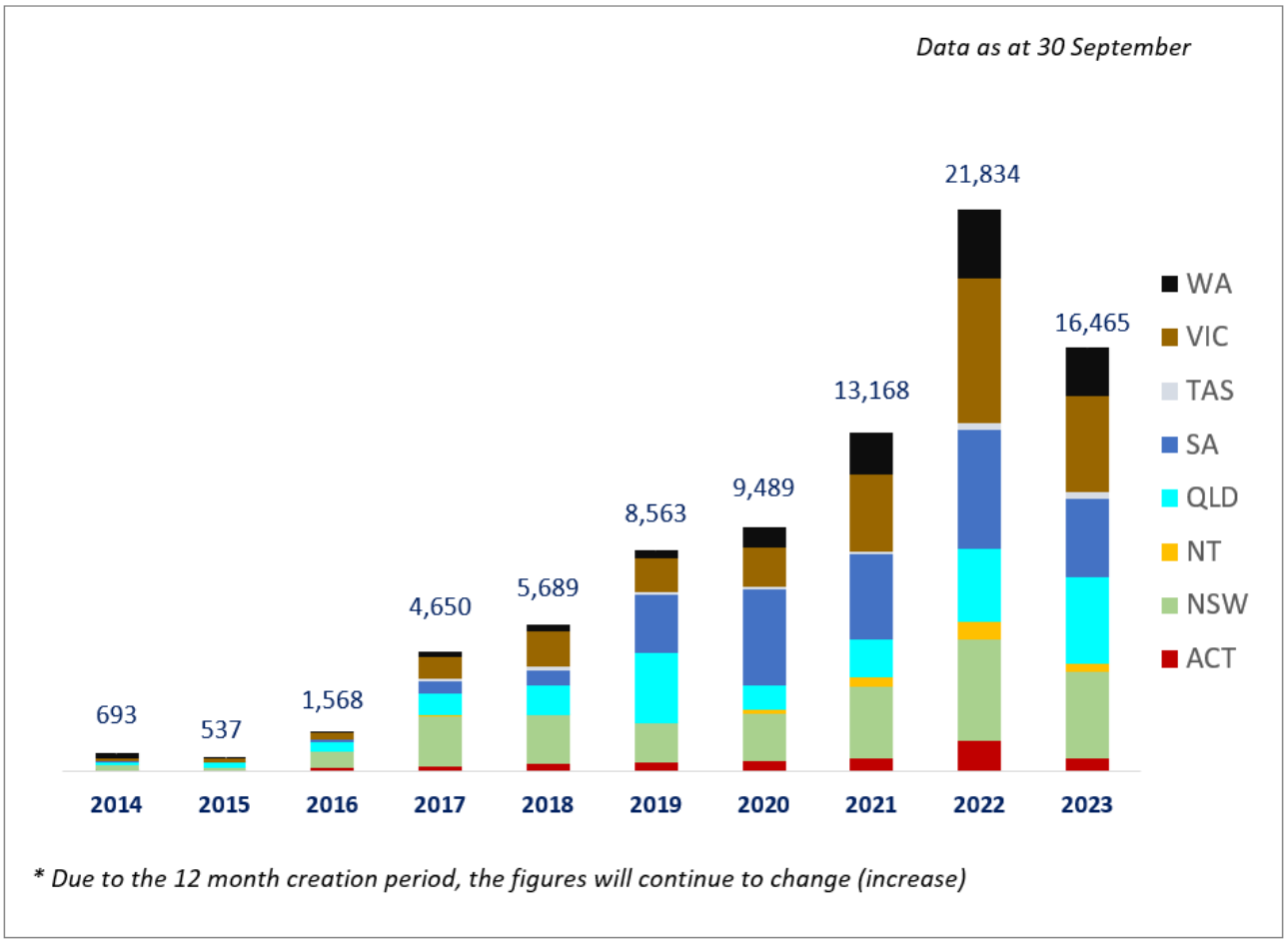
**Battery installations with rooftop solar**

By the end of the third quarter, there were 16,465 new rooftop PV installations equipped with batteries registered to the Clean Energy Regulator (CER) (see figure 3).

Compared to the previous quarter, the latest data reveals that Victoria has surged to the top position in new solar and battery installations. The state has witnessed a significant increase with the addition of 1,517 new combined solar with battery installations, accounting for a total of 22.7 per cent of the

national combined installations. Meanwhile, residents of New South Wales are also making substantial strides in adopting both solar and battery systems, with 1,432 new installations registered in the state. The state year-to-date total accounts for 20.2 per cent of the national total, closely trailing behind Queensland, which stands at 20.3 per cent. South Australia and Western Australia added 1,451 and 664 new registered combined systems during the quarter respectively and sit 4 and 5 in terms of total installations. Tasmania had a total of 240 registered installations. The state has the lowest number of registered solar with battery systems in the first three quarters of 2023.

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




Source: Clean Energy Regulator data, Australian Energy Council analysis, data as of 25 October 2023

Since the last Solar Report, there has been an update to the government support available for solar and battery storage installations in ACT (see table 2).

**Table 2: Government policies**

| State/ Territory | Policy Incentive (Solar & Battery) | Energy target |
|---|---|---|
| Australian Capital Territory | • Sustainable Household Scheme [1]provides zero-interest loans to help with the costs of energy-efficient upgrades, including solar panels and batteries. | • to deliver a 70 per cent cut in emissions by 2035 compared to 2005 levels<br>• net zero by 2050 |
| New South Wales | • Rebate Swap for Solar: The program gives low-income homeowners to swap to a free 3kW solar system.<br>• No specific policy for new solar or battery installations. | • net zero by 2050 |
| Northern Territory | • Home and Business Battery Scheme allows residents to buy and install batteries and inverters with a maximum grant of $5,000 (reducing from $6,000) from 1 July 2023[i] | • 50 per cent by 2030 |
| Queensland | • No specific policy | • 50 per cent by 2030 |
| South Australia | • No specific policy | • 100 per cent by 2030 |
| Tasmania | • No specific policy | |
| Victoria | • 4,500 interest-free loans of up to $8,800 are available in 2023-24. | • 65 per cent by 2030<br>• 95 per cent by 2035[2] |
| Western Australia | • No specific policy | |

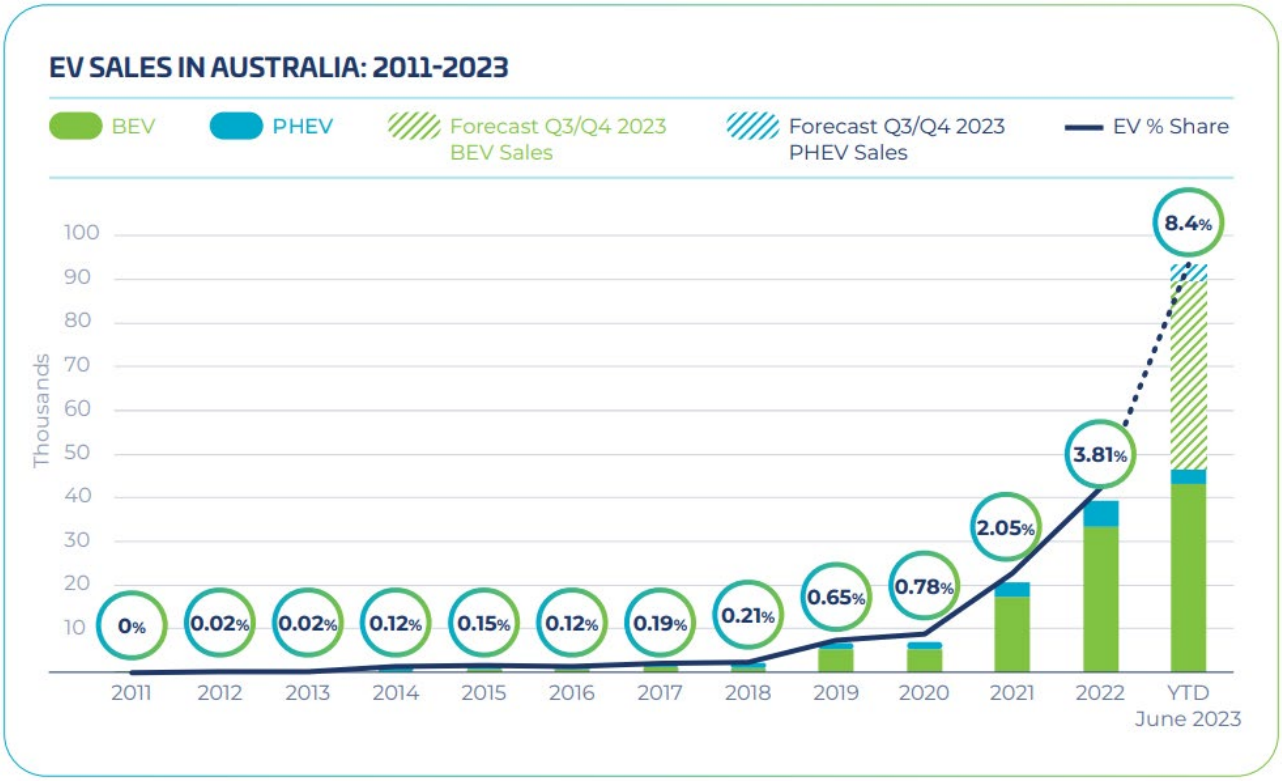
[1] Sustainable Household Scheme

[2] Victorian renewable energy and storage targets, page last updated 15 February, 2023

# SECTION II: ELECTRIC VEHICLES

The most recent *State of Electric Vehicles* report showed that by June 2023, Australia had seen the sale of 46,624 electric vehicles (EVs), representing a 269 per cent surge compared to the same period in 2022. The total sales figure now indicate that EVs account for 8.4 per cent of all new car sales in Australia, representing a substantial 120.5 per cent increase when compared to the full 2022 year. Figure 4 shows a strong preference from consumers purchasing battery electric vehicles (BEV), over plug-in hybrid electric vehicles (PHEVs). BEV accounted for more than 83 per cent (109,000 vehicles) of total Australia's electric car fleet, while PHEV accounts for less than one-fifth of Australia's electric car fleet total (roughly 21,000 vehicles) in the first half of 2023.

**Figure 4: Electric vehicles sales in Australia since 2011**




Source: State of EV, July 2023

**Figure 5: Share of EV sales in Australia**


Source: State of EV, July 2023

Similar to solar and battery storage, state and territory governments in Australia have also introduced various incentives aimed at promoting the adoption of electric vehicles. These incentives encompass rebates that lower the initial purchase cost, zero-interest loans, and reductions in stamp duty and registration fees. ACT leads the country on EV sales at 21.8 per cent, followed by Tasmania (9 per cent), New South Wales (9 per cent), Victoria (8.5 per cent ), Queensland (7.7 per cent ), Western Australia (7.5 per cent ), South Australia (6.5 per cent ), and the Northern Territory (2.4 per cent ).

**Effect of having solar panels and owning battery electric vehicles**

While EV car statistics may not directly provide information about battery and solar panel installations, they are part of a broader ecosystem of clean energy technologies. The adoption of solar panels is often motivated by the desire to reduce greenhouse gas emissions for heating, cooling, and other private electricity consumption requirements. Similarly, the idea of owning an electric vehicle is also to contribute to lower carbon emissions. Combining EVs with solar panels for charging can further reduce the environmental footprint of households and businesses. A research study on "*Effect of Having Solar Panels on the Probability of Owning Battery Electric Vehicle*" finds that there is a significant association between owning PV and BEVs. In particular, the study shows that having solar panel increases the probability of having a BEV by 34 per cent, on average.

The benefits of energy cost savings associated with solar panels and fuel savings from BEVs are also factors in encouraging the combined uptake. Solar panels can significantly reduce electricity bills. When solar panel owners combine their energy generation with BEV ownership, they can

charge their vehicles with self-generated, low-cost electricity, further reducing their transport costs along with the overall household costs.

**Government policies**

Greater electrification in sectors like transport is achievable and will be an important ingredient in successfully getting that sector's carbon emissions down. Encouraging the expansion of charging infrastructure, including smart chargers in homes, EVs in commercial and government fleets and the consideration of tariff reforms to better integrate EVs into the grid are all positive measures that have previously been announced by the Federal Government. If households increase their electricity production by installing additional or more efficient PV to be able to charge their battery electric vehicles (BEV), this could be part of future electricity provision. The annual *State of Electric Vehicle* report argues that current Government policies and incentives that encourage EV adoption fall short on measures to accelerate the adoption of electric cars, trucks as well as heavy commercial vehicles. Freight transport networks and supply chains present particular challenges for reducing emissions.

In the near future, the growing supply of second-hand EVs, as well as a broader range of new EVs, can be expected to make affordable electric vehicles more accessible to a wider audience. Supportive policies are likely to play a part in realising this.

# 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 2 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, while Darwin prices are obtained from Jacana Energy's regulated residential usage charges. Tables 3, 4 and 5 show the LCOE across major cities at different discount rates.

**Table 2: Central estimate: 4.97 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 | $0.09 | $0.08 | $0.08 | $0.08 | $0.08 | $0.42 | $0.09 |
| **Brisbane** | $0.10 | $0.10 | $0.09 | $0.09 | $0.09 | $0.09 | $0.31 | $0.13 |
| **Canberra** | $0.11 | $0.09 | $0.08 | $0.08 | $0.08 | $0.08 | $0.26 | $0.08 |
| **Darwin** | $0.11 | $0.12 | $0.11 | $0.11 | $0.11 | $0.10 | $0.28 | $0.08 |
| **Hobart** | $0.14 | $0.13 | $0.12 | $0.12 | $0.11 | $0.12 | $0.30 | $0.11 |
| **Melbourne** | $0.12 | $0.11 | $0.10 | $0.10 | $0.10 | $0.09 | $0.31 | $0.06 |
| **Sydney** | $0.11 | $0.10 | $0.09 | $0.08 | $0.08 | $0.08 | $0.35 | $0.08 |
| **Perth** | $0.09 | $0.08 | $0.08 | $0.08 | $0.08 | $0.08 | $0.31 | $0.07 |

Source: Australian Energy Council analysis, October 2023

**Table 3: Low cost of capital sensitivity: 6.59 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** | $0.10 | $0.09 | $0.09 | $0.08 | $0.09 | $0.09 | $0.42 | $0.09 |
| **Brisbane** | $0.11 | $0.10 | $0.10 | $0.09 | $0.09 | $0.09 | $0.31 | $0.13 |
| **Canberra** | $0.12 | $0.10 | $0.09 | $0.09 | $0.09 | $0.08 | $0.26 | $0.08 |
| **Darwin** | $0.12 | $0.13 | $0.12 | $0.12 | $0.12 | $0.11 | $0.28 | $0.08 |
| **Hobart** | $0.15 | $0.14 | $0.13 | $0.12 | $0.12 | $0.12 | $0.30 | $0.11 |
| **Melbourne** | $0.13 | $0.12 | $0.11 | $0.10 | $0.10 | $0.10 | $0.31 | $0.06 |
| **Sydney** | $0.11 | $0.10 | $0.09 | $0.09 | $0.09 | $0.09 | $0.35 | $0.08 |
| **Perth** | $0.09 | $0.08 | $0.08 | $0.08 | $0.08 | $0.09 | $0.31 | $0.07 |

Source: Australian Energy Council analysis, October 2023

**Table 4: High cost of capital sensitivity: 16.83 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** | $0.15 | $0.13 | $0.13 | $0.12 | $0.12 | $0.13 | $0.42 | $0.09 |
| **Brisbane** | $0.17 | $0.15 | $0.14 | $0.14 | $0.13 | $0.13 | $0.31 | $0.13 |
| **Canberra** | $0.18 | $0.15 | $0.13 | $0.12 | $0.13 | $0.12 | $0.26 | $0.08 |
| **Darwin** | $0.20 | $0.20 | $0.19 | $0.19 | $0.18 | $0.16 | $0.28 | $0.08 |
| **Hobart** | $0.24 | $0.21 | $0.20 | $0.19 | $0.18 | $0.19 | $0.30 | $0.11 |
| **Melbourne** | $0.21 | $0.17 | $0.16 | $0.15 | $0.15 | $0.14 | $0.31 | $0.06 |
| **Sydney** | $0.17 | $0.15 | $0.14 | $0.12 | $0.13 | $0.13 | $0.35 | $0.08 |
| **Perth** | $0.14 | $0.12 | $0.12 | $0.12 | $0.12 | $0.13 | $0.31 | $0.07 |

Source: Australian Energy Council analysis, October 2023

### 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 can negotiate lower prices. If a business was to consume all electricity onsite, the electricity prices in Tables 5 and 6 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[ii].

**Table 5: Central estimate: 5.55 per cent discount rate, ten-year average small business interest rate**

| All figures in $/KWh | System Size | | | | |
|---|---|---|---|---|---|
| | 10kW | 30kW | 50kW | 70kW | 100kW |
| **Adelaide** | $0.09 | $0.09 | $0.09 | $0.09 | $0.09 |
| **Brisbane** | $0.09 | $0.09 | $0.09 | $0.09 | $0.09 |
| **Canberra** | $0.09 | $0.09 | $0.09 | $0.09 | $0.08 |
| **Hobart** | $0.12 | $0.10 | $0.10 | $0.10 | $0.09 |
| **Melbourne** | $0.10 | $0.10 | $0.10 | $0.10 | $0.09 |
| **Sydney** | $0.10 | $0.09 | $0.09 | $0.09 | $0.09 |
| **Perth** | $0.09 | $0.08 | $0.09 | $0.08 | $0.08 |

Source: Australian Energy Council analysis, October 2023

**Table 6: Central estimate: 4.62 per cent discount rate, ten-year average large business interest rate**

| All figures in $/KWh | System Size | | | | |
|---|---|---|---|---|---|
| | 10kW | 30kW | 50kW | 70kW | 100kW |
| **Adelaide** | $0.09 | $0.09 | $0.09 | $0.09 | $0.08 |
| **Brisbane** | $0.09 | $0.08 | $0.09 | $0.09 | $0.08 |
| **Canberra** | $0.08 | $0.09 | $0.08 | $0.08 | $0.08 |
| **Hobart** | $0.11 | $0.10 | $0.10 | $0.10 | $0.09 |
| **Melbourne** | $0.10 | $0.09 | $0.10 | $0.09 | $0.09 |
| **Sydney** | $0.09 | $0.09 | $0.09 | $0.09 | $0.08 |
| **Perth** | $0.09 | $0.08 | $0.09 | $0.08 | $0.08 |

Source: Australian Energy Council analysis, October 2023

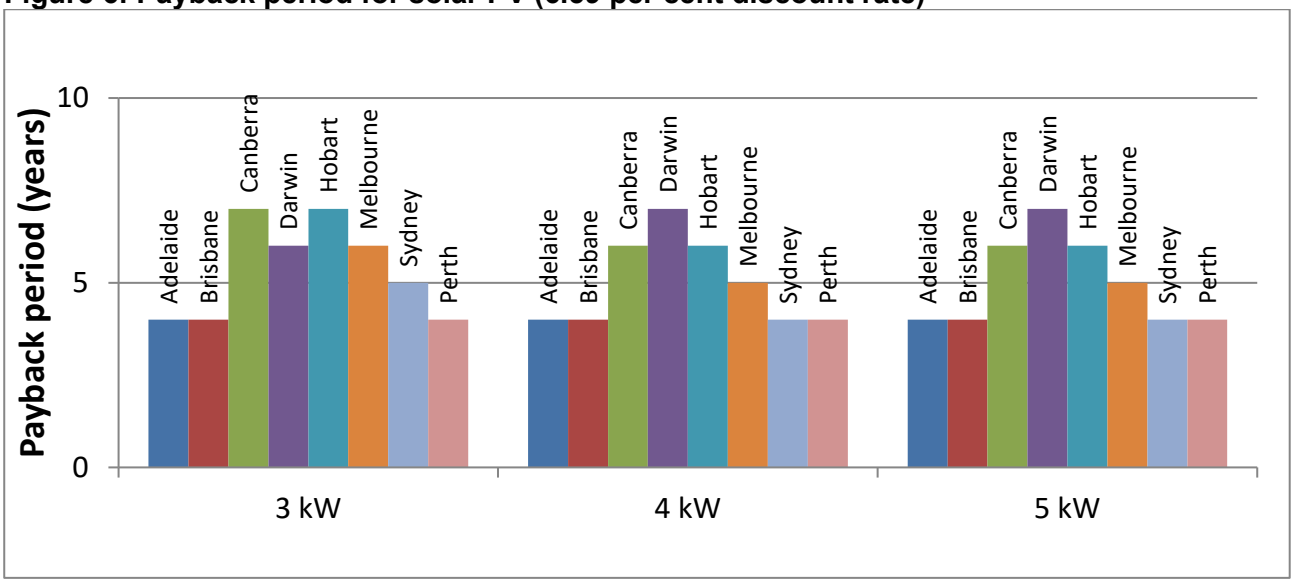
# SECTION IV: PAYBACK PERIOD, DETAILED MODEL

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.

Although the installation of solar panels typically involves an initial investment, customers who have them benefit from reduced electricity bills. This is achieved by lowering their reliance on grid electricity and selling surplus electricity back to the grid in exchange for solar feed-in tariff credits. Nevertheless, it's essential to note that solar feed-in tariff rates have declined in all regions nationwide. When selecting an energy plan, customers with solar panels should assess their choices based on their historical electricity consumption and the amount of solar energy they export. It's important to remember that an energy plan offering the highest solar feed-in tariff may not always be the most cost-effective choice overall, as it could involve higher supply and usage charges compared to other plans.

Figure 6 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. However, the persistent high interest rates in Australia, along with minimal price differences in the cost of the systems, do not have a significant impact on the payback period when compared to the previous quarter.

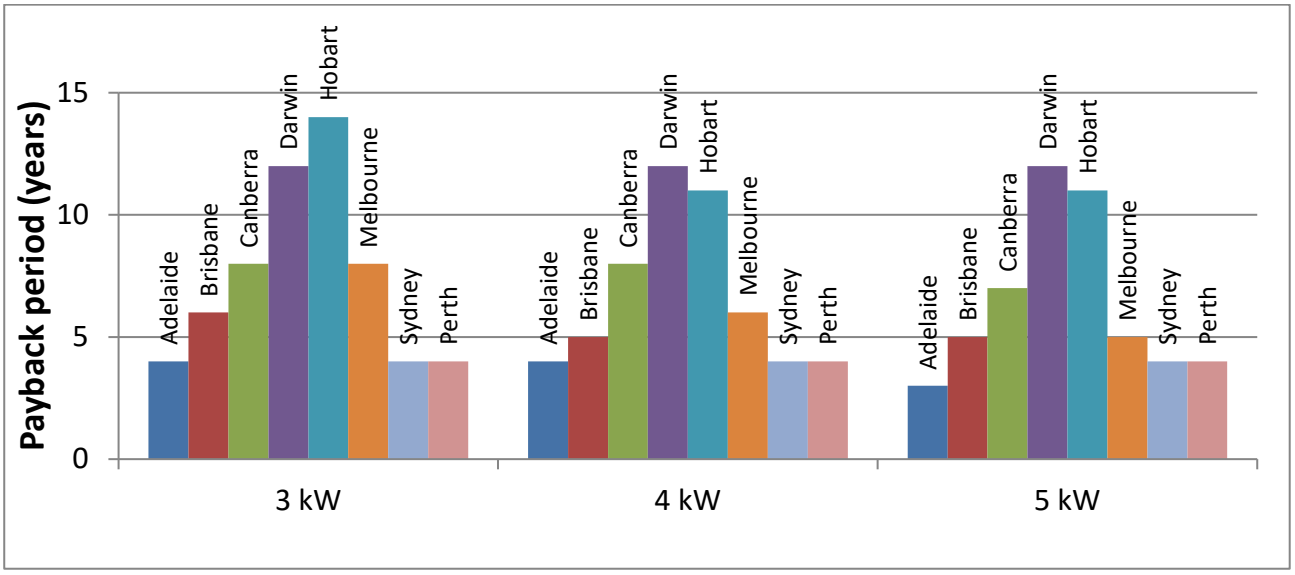
**Figure 6: Payback period for solar PV (6.59 per cent discount rate)**




Source: Australian Energy Council analysis, October 2023

Figure 7 shows the expected payback period for systems with a 4.97 per cent discount rate (10-year average home loan rate). Melbourne sees a 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 compared to a 3kW system. Adelaide, Brisbane, Sydney and Perth show no change in payback periods with a higher interest rate.

**Figure 7: Payback period for solar PV (4.97 per cent discount rate)**




Source: Australian Energy Council analysis, October 2023

# 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 $(1 + real\ discount\ rate)^t$

t = years

**Avoided cost and FiT**

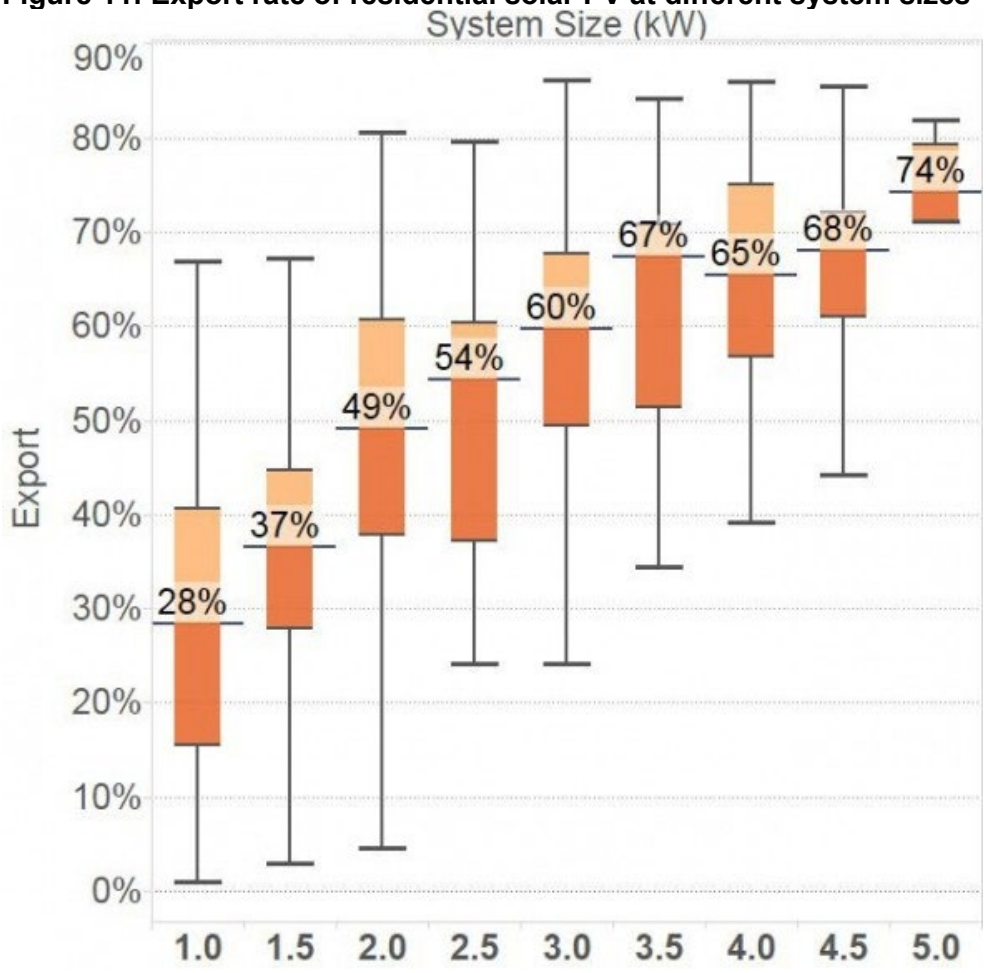
The onsite consumption is multiplied by the retailer's usage charges. CPI has been applied to the usage charge to allow for growth in retail prices. The excess energy is exported to the grid and the

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' analysis[iii]. See Figure 11 below.

**Figure 11: Export rate of residential solar PV at different system sizes**




Source: Sunwiz' analysis, 2015

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

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

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