SOLAR REPORT

QUARTER 1, 2024

Australian Energy Council

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SECTION I: STATE OF SOLAR IN AUSTRALIA

Rooftop Solar

The latest data from the Clean Energy Regulator (CER) – updated as of the 29 February 2024 – shows the cumulative total of registered rooftop solar installations in Australia has reached 3,742,601 with a capacity of 22.58 GW. The CER registered a total of 50,975 new installations in the first quarter 2024, which combined, added 508 MW to Australia's solar Photo Voltaic (PV) fleet[i].

New South Wales and Queensland continue to lead the way in rooftop solar capacity and installations. New South Wales, with a capacity of 6.232 GW, holds the top spot, closely followed by Queensland with 6.082 GW. In terms of installations, Queensland leads the nation with a total of 1,015,589, while New South Wales follows closely with 963,524 units.

Despite its smaller number of installations, the Northern Territory is making significant strides in solar energy. By the end of the first quarter this year, 22,946 NT households and commercial establishments had installed rooftop solar, contributing 0.61 per cent to Australia's rooftop solar capacity. What is noteworthy is the Northern Territory is installing solar at a faster rate than other states and territories, indicating its potential for further growth in the solar energy sector.

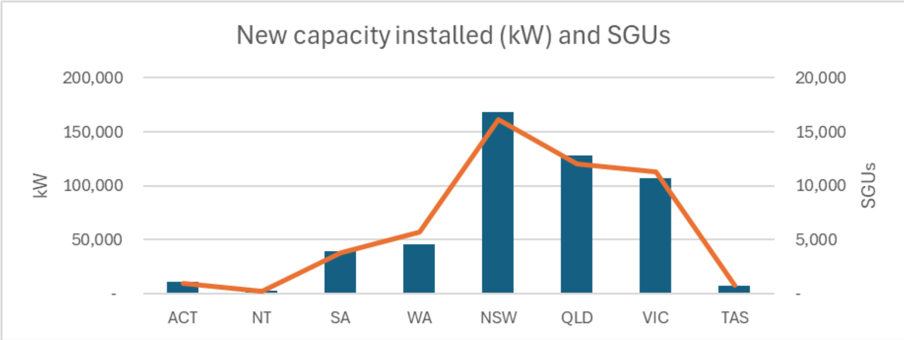
Table 1. Total SGUs installed by territory and period.

	Small Generation Units (SGU) installed								
Year	**Australia**	**ACT**	**NT**	**SA**	**WA**	**NSW**	**QLD**	**VIC**	**TAS**
2011	644,176	10,350	1,484	94,791	87,671	168,812	167,041	107,977	6,050
2012	343,205	1,524	513	41,822	42,639	53,884	130,227	66,232	6,364
2013	200,405	2,413	1,024	29,186	21,600	33,933	71,207	33,384	7,658
2014	180,025	1,227	1,026	15,153	23,490	37,121	57,730	40,071	4,207
2015	141,459	1,067	1,196	12,073	20,793	33,438	39,504	31,368	2,020
2016	132,601	1,001	1,745	12,597	24,190	29,443	34,409	26,730	2,486
2017	174,761	1,954	1,949	16,188	31,397	43,083	46,430	31,371	2,389
2018	224,741	3,198	2,370	21,884	33,094	59,261	55,069	47,225	2,640
2019	283,512	3,788	3,493	27,056	36,628	77,372	70,629	61,655	2,891
2020	368,652	5,544	3,200	36,176	48,145	110,277	88,089	73,881	3,340
2021	377,408	6,489	1,942	32,593	48,760	110,141	90,195	83,175	4,113
2022	315,585	9,073	1,760	29,139	38,668	92,979	77,361	62,492	4,113
2023	323,486	8,242	1,171	27,130	34,586	102,480	79,135	65,208	5,534
Q1 -2024	32,585	512	73	2,393	4,087	11,300	8,563	5,113	544
Total	3,742,601	56,382	22,946	398,181	495,748	963,524	1,015,589	735,882	54,349

Source: Analysis from the AEC with data from CER.

The chart in **Figure 1** illustrates the newly added capacity and units across different jurisdictions based on the latest CER update. New South Wales leads the way with 168.03 MW, followed by Queensland at 127.76 MW, Victoria at 107.28 MW, Western Australia at 45.23 MW, South Australia at 38.85 MW, the Australian Capital Territory at 10.48 MW, Tasmania at 7.48 MW, and the Northern Territory at 2.75 MW.

Figure 1. New rooftop solar capacity (bar) and SGUs (line) installed since last report (Jan-24).



Source: Analysis from the AEC with data from CER.

In 2024, the average size of solar systems across Australia dropped slightly compared to previous periods. However, this number is most likely to improve once more installations are recorded by the CER. Most of the states and territories installed average systems greater than 9.00 kW, except for Victoria, Tasmania, and Western Australia. These statistics encompass both residential and commercial installations.

Table 2. Average size of solar systems per state and period.

Year	Australia	NT	SA	ACT	QLD	NSW	VIC	TAS	WA
2012	3.02	4.47	3.30	3.26	3.21	2.68	3.13	3.18	2.33
2013	3.95	4.93	4.85	4.49	3.78	3.93	3.94	4.11	3.22
2014	4.44	5.97	5.44	3.98	4.31	4.63	4.28	4.51	4.05
2015	4.99	7.22	5.52	5.37	4.88	5.28	4.78	4.72	4.63
2016	5.64	7.28	6.16	6.89	5.79	5.66	5.40	4.76	5.29
2017	6.40	7.88	7.13	6.33	6.60	6.07	6.55	6.08	5.94
2018	7.19	8.51	7.98	6.91	7.40	7.16	7.17	7.15	6.35
2019	7.62	8.18	8.24	7.92	7.99	7.60	7.45	7.09	6.73
2020	8.00	8.57	8.35	8.34	8.51	8.08	7.71	7.97	6.95
2021	8.46	9.64	8.89	8.99	8.99	8.63	8.13	8.09	7.24
2022	8.84	10.84	8.84	9.43	9.24	9.15	8.66	8.38	7.41
2023	9.29	11.93	9.32	10.07	9.69	9.69	8.93	8.70	7.64
Q1- 2024	8.87	9.80	9.11	9.88	9.49	9.31	8.05	8.17	7.21

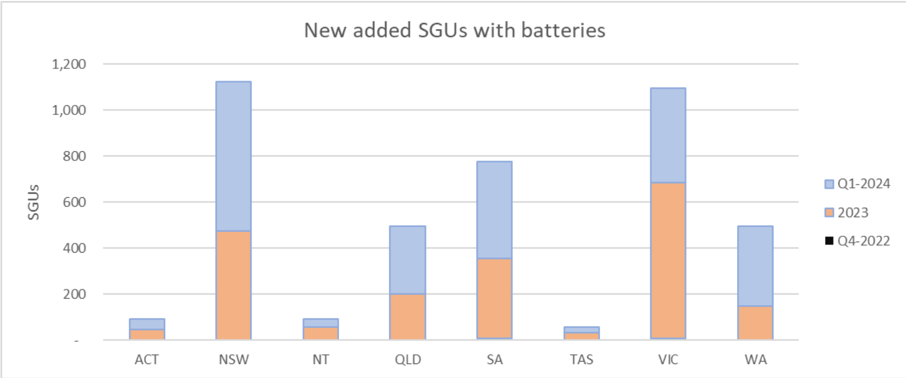
Source: Analysis from the AEC with data from CER.

Battery installations with rooftop solar

Since our last publication, the CER has registered a total of 4,221 new batteries with rooftop solar installations in Australia. Of these, 1,979 units were installed during 2023, but reported in the latest data, while 2,226 were installed in the first quarter of 2024. The remaining 16 units were actually added in the last quarter of 2022 but are only now reported. These were added in Victoria (8 units), SA (7 units), and WA (1 unit).

New South Wales and Victoria continue to top the number of solar installations with batteries. NSW has a new fleet of 1,123 batteries, while Victoria added 1,096 units. Fifty per cent of the total new batteries added in Australia since the last report has come from both Victoria and NSW. They are followed by South Australia, which installed 776 new batteries (18.38 per cent).

Figure 2. New battery systems installed per state since last report.



Source: Analysis from the AEC with data from CER.

Tasmania contributed only 1.33 per cent of the new battery with solar additions and sat at the bottom of the rank, adding only 56 units. This means that the Northern Territory took over another region for the first time, and their outlook is promising, with a significant percentage increase in the uptake, although from a low base, which was also noticeable in 2022 and 2023. **Table 3** shows the percentage of solar systems installed in conjunction with a battery per jurisdiction and year. The NT has been the leader in the growth of battery with solar installations in percentage terms since 2021.

Table 3. Battery installations as a percentage of SGUs installed per state and period.

Installation year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA
2014	0.65%	0.56%	0.29%	0.22%	0.22%	0.12%	0.34%	0.72%
2015	0.28%	0.40%	0.08%	0.47%	0.17%	0.30%	0.52%	0.12%
2016	10.49%	2.27%	0.34%	0.96%	1.03%	0.72%	0.90%	0.29%
2017	10.49%	4.51%	0.92%	1.84%	2.96%	3.89%	2.69%	0.68%
2018	9.63%	3.17%	0.34%	2.03%	2.81%	6.21%	2.88%	0.71%
2019	8.90%	1.94%	0.63%	3.84%	8.47%	3.25%	2.09%	0.86%
2020	6.84%	1.68%	4.63%	1.09%	10.33%	3.08%	2.07%	1.62%
2021	8.00%	2.50%	20.08%	1.58%	10.15%	3.06%	3.63%	3.33%
2022	13.15%	4.21%	38.69%	3.68%	16.28%	6.05%	9.05%	7.01%
2023	9.18%	5.67%	42.36%	5.83%	17.98%	6.70%	9.18%	8.39%
Q1-2024	8.98%	5.75%	46.58%	3.42%	17.55%	4.60%	8.06%	8.47%

Source: Analysis from the AEC with data from CER.

There have been no changes in incentives since the last report.

Current 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 • Net zero by 2050
New South Wales	• Rebate Swap for Solar: The program gives low-income homeowners the option to get a free 3kW solar system. • 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 (reduced from $6,000) from 1 July 2023.	• 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. • The solar homes program provides rebates of up to $1,400 towards the installation of solar panel systems.	• 65 per cent by 2030 • 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 24 November, 2023

SECTION II: SOLAR INFLUENCE IN THE NEM

Utility-scale solar often sets the prices in the electricity spot market, as the marginal bidder sets the market clearing price for all bids dispatched. Solar acts as the marginal bidder regularly enough that the behaviour of non-solar bidders in the market has changed in response.

In 2023, solar was the price setter in Queensland almost 14.70 per cent of the time. In New South Wales, solar set the spot price 7.65 per cent of the time. South Australia and Victoria saw these events around 6 per cent of the time, and Tasmania only 0.20 per cent of the time.

Table 4. Time of price setting for different technologies across the NEM.

Fuel type Price Setter In 2023	NSW	QLD	SA	TAS	VIC
Black Coal	**45.56%**	**44.16%**	19.94%	11.98%	20.47%
Natural Gas	9.74%	11.46%	13.24%	3.63%	8.49%
Hydro	29.37%	24.39%	**26.07%**	**74.89%**	**29.84%**
Brown Coal	3.33%	1.84%	11.42%	5.26%	18.26%
Solar	**7.65%**	**14.69%**	**6.41%**	**0.20%**	**5.99%**
Wind	1.26%	0.81%	15.29%	1.23%	11.08%
Battery	1.62%	1.54%	2.19%	0.67%	2.11%
Others[3]	1.47%	1.10%	5.44%	2.13%	3.76%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

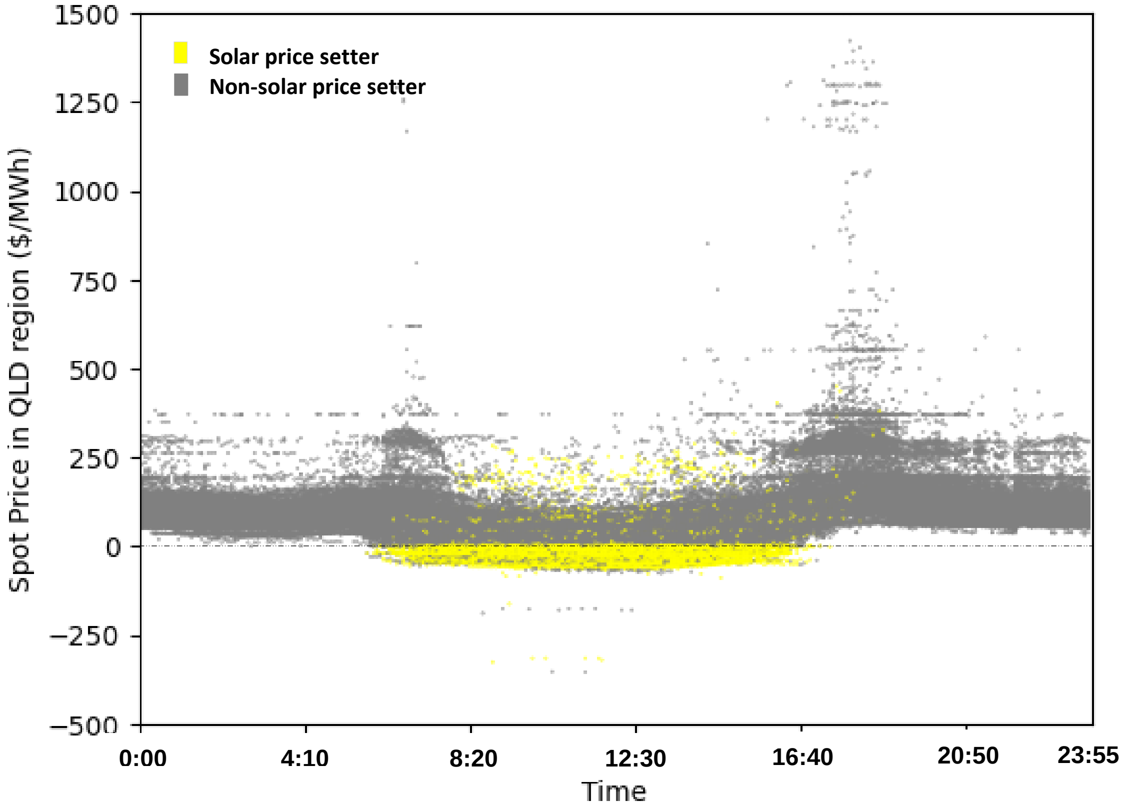
Source: Analysis from the AEC with data from NEOExpress.

Other traditional technologies continue to be the main market price setters, especially when solar generation is unavailable. For example, black coal set the price in the Queensland and New South Wales markets around 45 per cent of the time last year. Hydro was responsible for moderating prices in South Australia, Tasmania, and Victoria. Hydropower was the marginal supplier 26.07 per cent, 74.89 per cent, and 29.84 per cent of the time in those states, respectively, and was the primary generation to set the price in those markets.

Note: It is worth clarifying the marginal supplier represented in the data for this report corresponds to the energy-only market. Other marginal suppliers exist for ancillary services, like those for frequency balance. Thus, increasing production in Tasmania's hydro plants in the energy-only market could be the least-cost solution to balance energy in South Australia or Victoria, for example. Similarly, increasing brown coal production in Victoria could be the best solution to balance South Australia, Tasmania, or Queensland's power requirements.

[3] Others include Kerosene, Diesel, Bagasse, etc.

Figure 3. Queensland spot price outcomes in the electricity market in 2023.



Source: Analysis from the AEC with data from NEOExpress.

Figure 3 shows all the spot price outcomes in Queensland for the year 2023 in the range of -$500/MWh to $1,500/MWh graphed in a 24-hour period (or 288, 5-minute intervals). Every point in the graph represents a time and spot price outcome at the time registered in the NEM, and in yellow, we identified those intervals where solar was a price setter in Queensland. To compare the different market outcomes, **Figure 4** shows four of the states in the NEM. Tasmania is excluded from the graphs due to its low count of solar price-setters and the fact that all price-setters are outside of Tasmania.

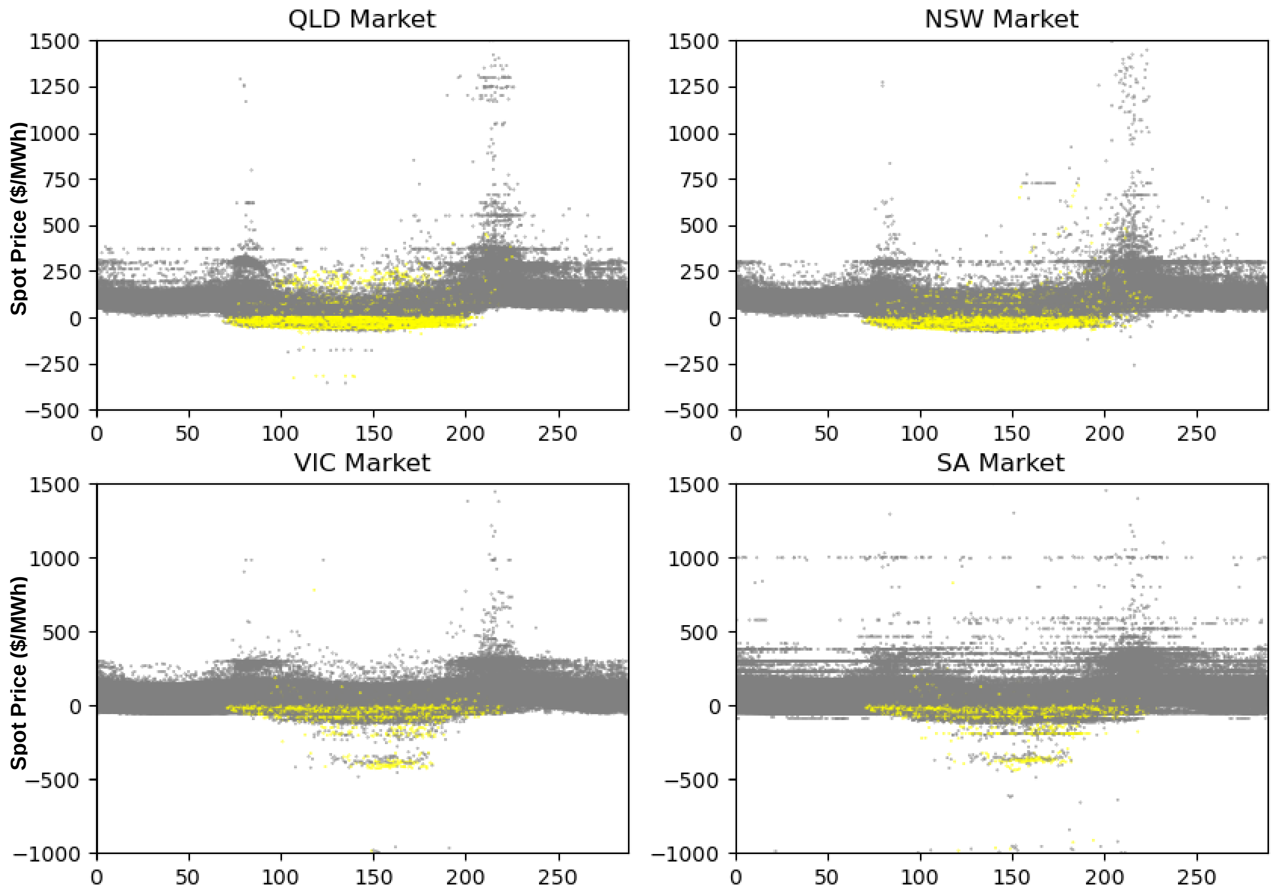
Solar energy can participate as a price setter just during the daytime. However, most of the time that solar sets the price, it is at a negative price[4].

The dashed line in **Figure 3** separates negative and positive spot prices and shows a clear trend for solar to remain under the dashed line in Queensland for the period analysed. Further, note that other non-solar technologies are below-zero price setters in the Queensland market; brown coal and wind

[4] Tasmania is the only state with a different effect, but with little data and no solar marginal supplier to conclude this.

suppliers are the most notable examples. Some of the grey dots in the negative-price area correspond to these technologies.

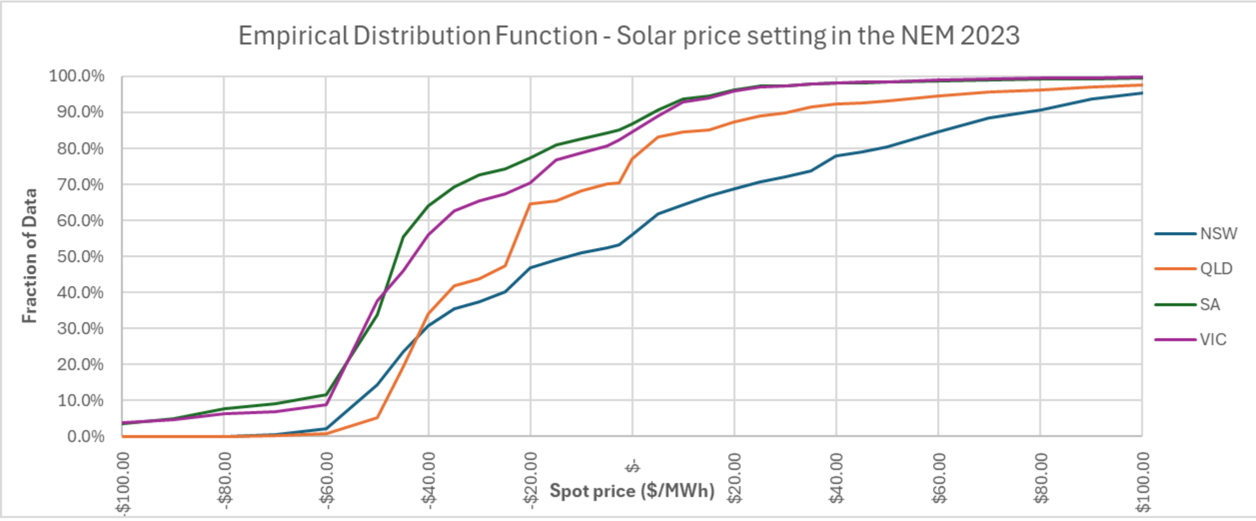
Figure 4. Spot price outcomes of QLD, NSW, VIC, and SA electricity markets in 2023.



Source: Analysis from the AEC with data from NEOExpress.

In the case of Queensland in 2023, 77.05 per cent of the time when solar was a price setter, spot prices were negative, and 90 per cent of the time, the system recorded a price lower than $30.50/MWh. Negative prices were registered 86.84 per cent of the time of solar price-setting in SA, 84.53 per cent in Victoria, and 56.1 per cent in NSW. In other words, NSW and Queensland have a higher number of solar events with higher-than-zero prices, which we can see illustrated in **Figure 4** as the set of dispersed dots above the dashed line. This is partially due to more frequent solar price-setting events in these states. In contrast, solar suppliers in Victoria and SA tend to set prices below zero, which we can identify as the three clustered yellow lines in the graphs of these states. The Empirical Distribution Functions of this data for the four states in the NEM are presented in **Figure 5** to show a difference in the distributions.

Figure 5. Empirical Distribution Function of solar price setting in the NEM.



Source: Analysis from the AEC with data from NEOExpress.

It is unclear what is driving the different bidding strategies behind the distributions in NSW and Queensland compared to SA and Victoria. One possible driver could be the availability or otherwise of Power Purchase Agreement revenues or Large-Scale Generation Certificate (LGC) revenues driving more negative bidding than would otherwise be the case. Interestingly, we detected nearly two-thirds (67.72 per cent) of the events with these different price settings in the Queensland market correspond to two specific solar farms in NSW and 11.63 per cent more to one solar farm in Queensland. That is, almost 80 per cent of the cases come from three suppliers.

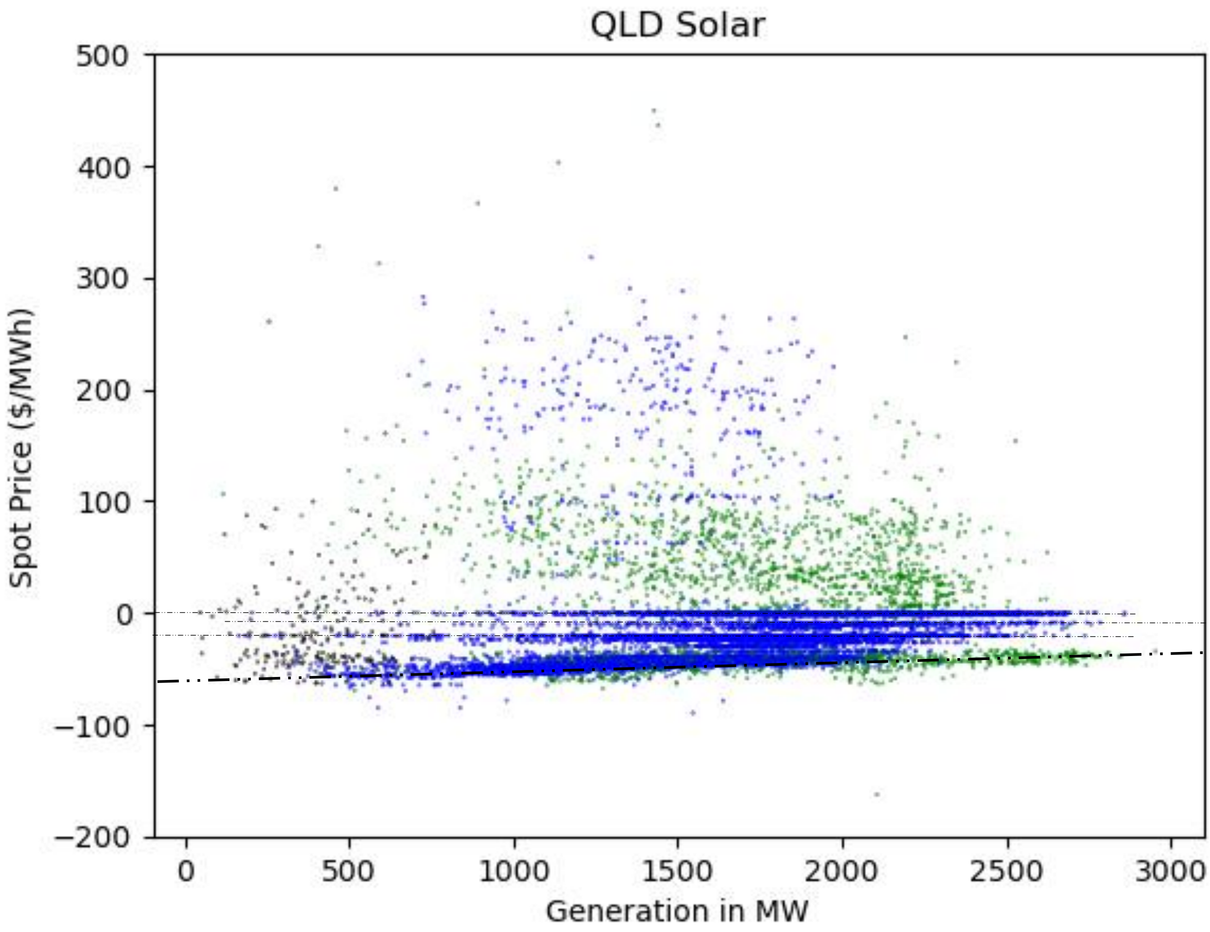
Looking deeper into the Queensland data, we constructed a supply curve by using the total generation of solar suppliers at the time of solar price-setting events, and have graphed the result in **Figure 6**[5]. We categorised those prices set by different states in the Queensland region by colour. Prices set by a Queensland producer in the Queensland spot market are blue, New South Wales producers are green, and the rare cases from Victorian and South Australian producers are in black.

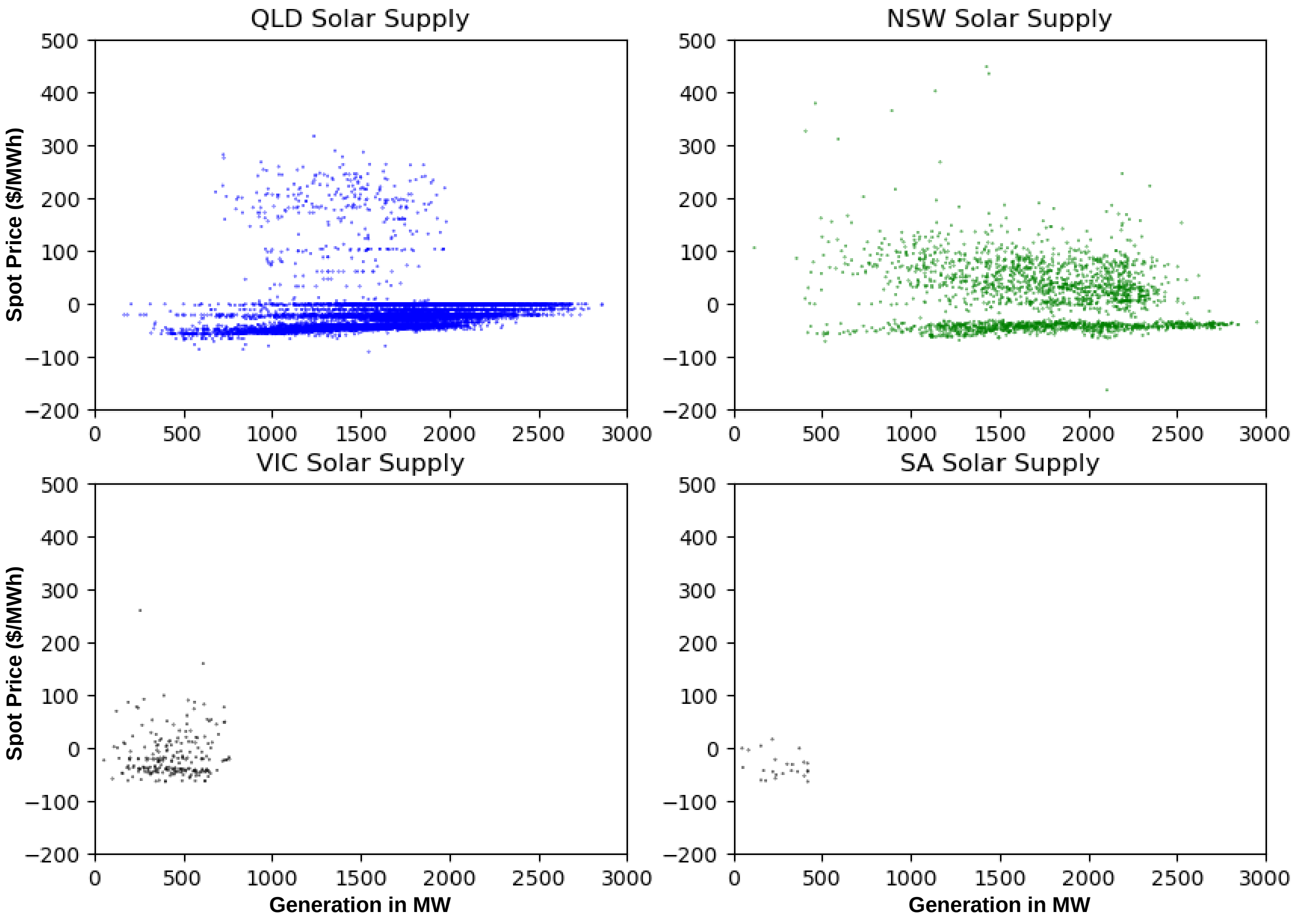
When graphing generation versus spot prices, we can see lines of fixed prices in the chart for Queensland and New South Wales producers. A set of clustered dots that form a line, most likely, indicates a producer or a set of producers with similar revenues and/or agreement characteristics. That is, a bidder or set of bidders who use the same strategy to be dispatched in the electricity market. For example, a group of solar farms willing to pay to produce at the level of revenues generated by large-scale generation certificates. As long as this group has a second income stream

[5] The total megawatts of generation are those of production at a certain time in the correspondent state that set the price for the Queensland market.

for production, like Power Purchase Agreements, there will be net revenues for production for the plant.

Figure 6. Queensland solar supply curve constructed from spot price outcomes and state price setters.





Source: Analysis from the AEC with data from NEOExpress.

The changes in the system

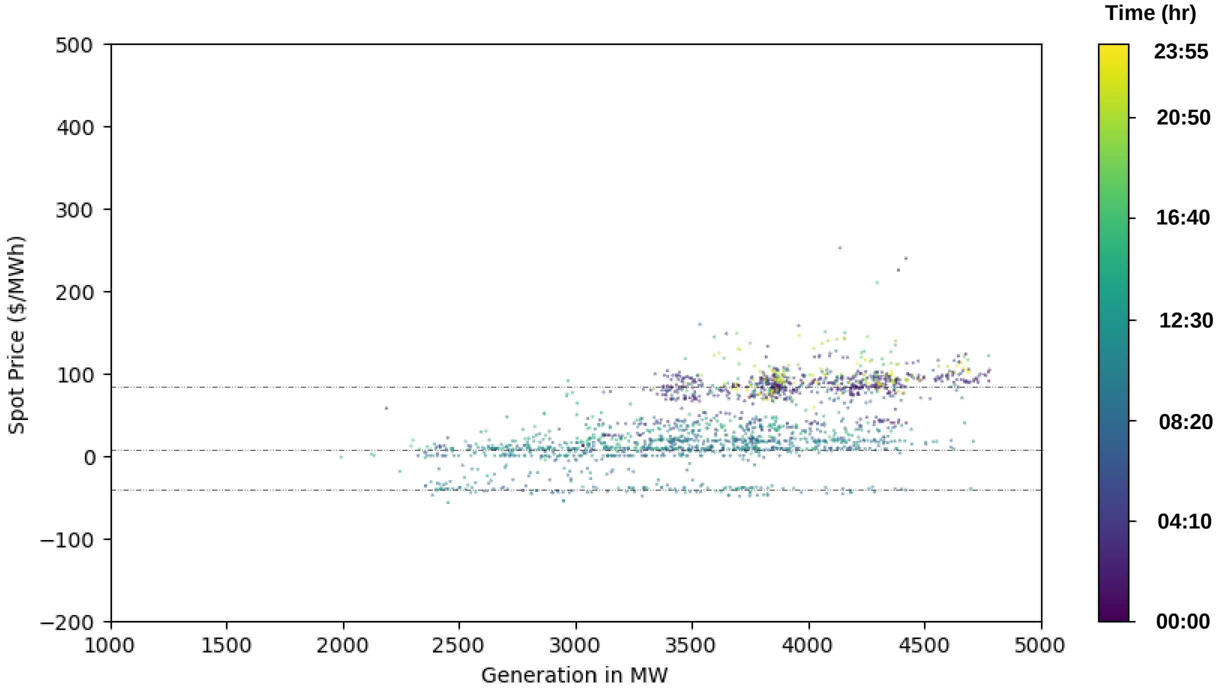
The electricity supply during the middle of the day has changed over the last few years in the NEM. Solar electricity has become a common source of energy for houses, businesses, and suppliers in the wholesale electricity market, affecting the daytime demand for electricity.

With the connection of more solar PV systems in Australia, operational demand has shifted from a plateau to a curved line with low demand at times of high solar radiation – the so-called "duck curve". When there is lower demand, prices in the market drop, if supply remains constant, as in the case of electricity.

Looking at suppliers other than solar, we show brown coal plants setting prices in the Queensland market in **Figure 7**. This shows the supply curve of brown coal plants with different colours indicating the price-setting events according to the time of day.

We identified two clear cases where brown coal generators are marginal producers. Firstly, higher spot prices are recorded when solar is not available in the system (i.e. outside of daytime). We see this in the graphs as the top cluster line is coloured in darker and brighter tones. Additionally, brown coal suppliers generated more power during these times, ranging between 3,300 MW and 4,750 MW, and the price was set at about 90 $/MWh for the Queensland market.

Figure 7. Queensland's brown coal supply curve constructed from spot price outcomes.



Source: Analysis from the AEC with data from NEOExpress.

Secondly, when solar energy was available in the system, brown coal supplier prices fell nearly to zero, or even below zero, in a few cases consistent with more supply and lower demand. Brown coal suppliers are forced to bid at low prices when the operational demand is low to keep their plants running, and are also, at times, willing to pay to produce when the demand drops to very low levels. In these instances, the supply of these generators ranged from 2,300 MW to 4,500 MW.

In conclusion, we believe that bilateral agreements coupled with revenues from other markets impact the electricity market by decreasing the average spot price overall. However, the prices agreed on these contracts also depend on the changing signal price of the electricity spot market, and the revenues from other markets depend on the supply and demand in those other markets. Eventually, prices in all markets will find equilibrium.

SECTION III: LEVELISED COST OF ELECTRICITY

The Levelised Cost of Electricity (LCOE) is the cost of energy per kilowatt hour (kWh) produced for a type of electricity generator. The LCOE helps to compare costs between different electricity sources like coal, wind, solar, etc. When the cost is equal to or below the price consumers pay directly to suppliers for electricity, this is called grid parity.

Table 5 shows the LCOE for rooftop solar in Australia's major cities, indicative retail prices and current Feed-in tariff (FiT) rates. A detailed methodology on how the LCOE was computed can be found in the Appendix.

The retail comparison rates are representative variable rates and do not include supply charges. That is, the rate is an energy-only price. 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 2023. Perth prices are regulated and obtained from Synergy. Hobart prices were obtained from Aurora Energy's Tariff 31, while Darwin prices were obtained from Jacana Energy's regulated residential usage charges. **Tables 5, 6** and **7** show the LCOE across major cities at different discount rates.

Table 5. Central estimate: 5.01 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	$0.09	$0.09	$0.09	$0.08	$0.42	$0.09
Brisbane	$0.10	$0.10	$0.09	$0.09	$0.09	$0.09	$0.31	$0.08
Canberra	$0.11	$0.10	$0.09	$0.09	$0.09	$0.08	$0.26	$0.10
Darwin	$0.11	$0.12	$0.11	$0.11	$0.11	$0.10	$0.28	$0.11
Hobart	$0.15	$0.13	$0.12	$0.12	$0.11	$0.12	$0.30	$0.11
Melbourne	$0.13	$0.11	$0.11	$0.10	$0.10	$0.10	$0.31	$0.07
Sydney	$0.11	$0.10	$0.10	$0.09	$0.09	$0.09	$0.35	$0.08
Perth	$0.09	$0.09	$0.08	$0.08	$0.08	$0.09	$0.31	$0.06

Source: AEC, April 2024

Table 6. Low cost of capital sensitivity: 6.54 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	$0.11	$0.10	$0.09	$0.09	$0.09	$0.09	$0.42	$0.09
Brisbane	$0.11	$0.10	$0.10	$0.09	$0.09	$0.09	$0.31	$0.08
Canberra	$0.12	$0.11	$0.10	$0.09	$0.09	$0.09	$0.26	$0.10
Darwin	$0.12	$0.13	$0.12	$0.12	$0.11	$0.11	$0.28	$0.11
Hobart	$0.16	$0.14	$0.13	$0.12	$0.12	$0.12	$0.30	$0.11
Melbourne	$0.14	$0.12	$0.11	$0.11	$0.11	$0.10	$0.31	$0.07
Sydney	$0.12	$0.11	$0.10	$0.09	$0.09	$0.09	$0.35	$0.08
Perth	$0.10	$0.09	$0.08	$0.09	$0.08	$0.09	$0.31	$0.06

Source: AEC, April 2024

Table 7. High cost of capital sensitivity: 19.99 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	$0.19	$0.16	$0.15	$0.14	$0.15	$0.14	$0.42	$0.09
Brisbane	$0.19	$0.17	$0.16	$0.15	$0.15	$0.15	$0.31	$0.08
Canberra	$0.21	$0.18	$0.16	$0.15	$0.15	$0.14	$0.26	$0.10
Darwin	$0.21	$0.23	$0.21	$0.21	$0.20	$0.18	$0.28	$0.11
Hobart	$0.28	$0.24	$0.22	$0.21	$0.20	$0.21	$0.30	$0.11
Melbourne	$0.24	$0.20	$0.18	$0.17	$0.17	$0.16	$0.31	$0.07
Sydney	$0.21	$0.18	$0.16	$0.15	$0.15	$0.14	$0.35	$0.08
Perth	$0.16	$0.15	$0.13	$0.14	$0.13	$0.15	$0.31	$0.06

Source: AEC, April 2024

Small and large businesses - Levelised cost of electricity

Tables 8 and **9** 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 from residential retail tariffs. Depending on the size of the customer and the amount of energy used, businesses can negotiate lower prices. If a business were to consume all electricity onsite, the electricity prices in **Tables 8** and **9** would represent the cost per kWh of energy consumption generated from the different system sizes listed. For businesses, installation occurs if the benefits outweigh the cost. The average electricity bill for industrial businesses in 2014-15 was 10.72 c/kWh[ii.]

Table 8. Central estimate: 5.49 per cent discount rate, ten-year average small business interest rate

All figures in c/KWh	System Size				
	10kW	30kW	50kW	70kW	100kW
Adelaide	9.40 c/kWh	9.28 c/kWh	9.54 c/kWh	9.60 c/kWh	8.88 c/kWh
Brisbane	9.31 c/kWh	9.00 c/kWh	9.31 c/kWh	9.12 c/kWh	8.71 c/kWh
Canberra	9.00 c/kWh	9.41 c/kWh	9.22 c/kWh	9.06 c/kWh	8.86 c/kWh
Hobart	12.44 c/kWh	10.54 c/kWh	10.69 c/kWh	10.64 c/kWh	9.73 c/kWh
Melbourne	10.85 c/kWh	10.16 c/kWh	10.54 c/kWh	10.19 c/kWh	9.81 c/kWh
Sydney	10.29 c/kWh	9.25 c/kWh	9.76 c/kWh	9.43 c/kWh	9.00 c/kWh
Perth	9.48 c/kWh	8.92 c/kWh	9.62 c/kWh	8.96 c/kWh	8.59 c/kWh

Source: AEC, April 2024

Table 9. Central estimate: 2.95 per cent discount rate, ten-year average large business interest rate

All figures in c/KWh	System Size				
	10kW	30kW	50kW	70kW	100kW
Adelaide	8.55 c/kWh	8.45 c/kWh	8.66 c/kWh	8.72 c/kWh	8.11 c/kWh
Brisbane	8.47 c/kWh	8.22 c/kWh	8.47 c/kWh	8.32 c/kWh	7.98 c/kWh
Canberra	8.20 c/kWh	8.54 c/kWh	8.38 c/kWh	8.25 c/kWh	8.08 c/kWh
Hobart	11.23 c/kWh	9.64 c/kWh	9.77 c/kWh	9.72 c/kWh	8.97 c/kWh
Melbourne	9.87 c/kWh	9.30 c/kWh	9.62 c/kWh	9.33 c/kWh	9.01 c/kWh
Sydney	9.35 c/kWh	8.48 c/kWh	8.91 c/kWh	8.63 c/kWh	8.27 c/kWh
Perth	8.58 c/kWh	8.12 c/kWh	8.70 c/kWh	8.15 c/kWh	7.84 c/kWh

Source: AEC, April 2024

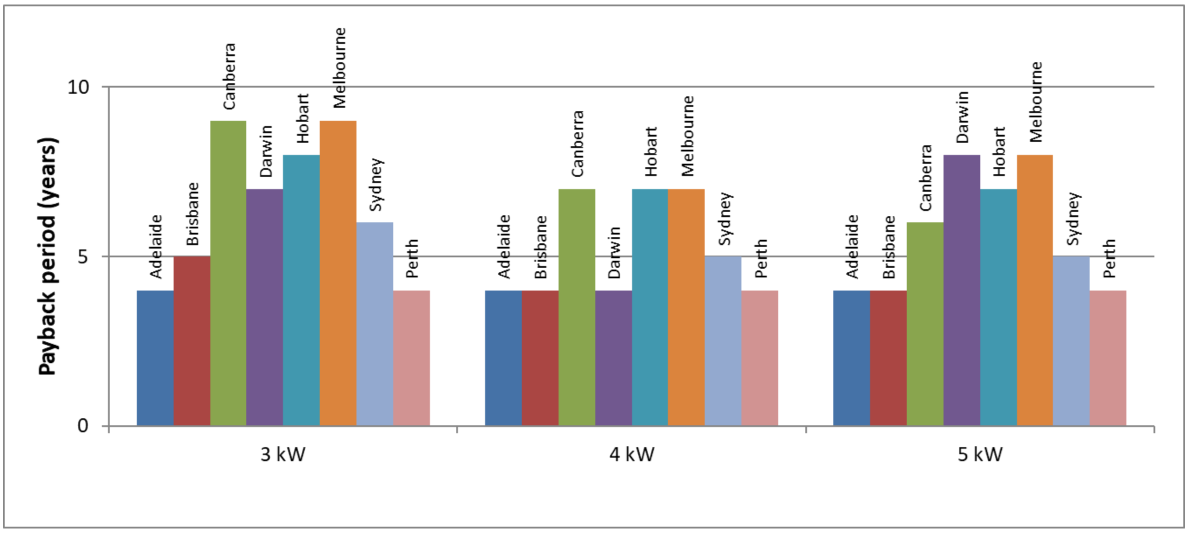
SECTION IV: PAYBACK PERIOD, DETAILED MODEL

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 installing solar panels typically involves an initial investment, customers who use them, benefit from future 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 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 9 highlights the payback period for different system sizes across Australia. Note: Electricity prices are subject to change with consumer price index (CPI) levels and, therefore, will affect the payback period. The low payback periods across many cities highlight the reason behind the continuous support of 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 significantly impact the payback period compared to the previous quarter.

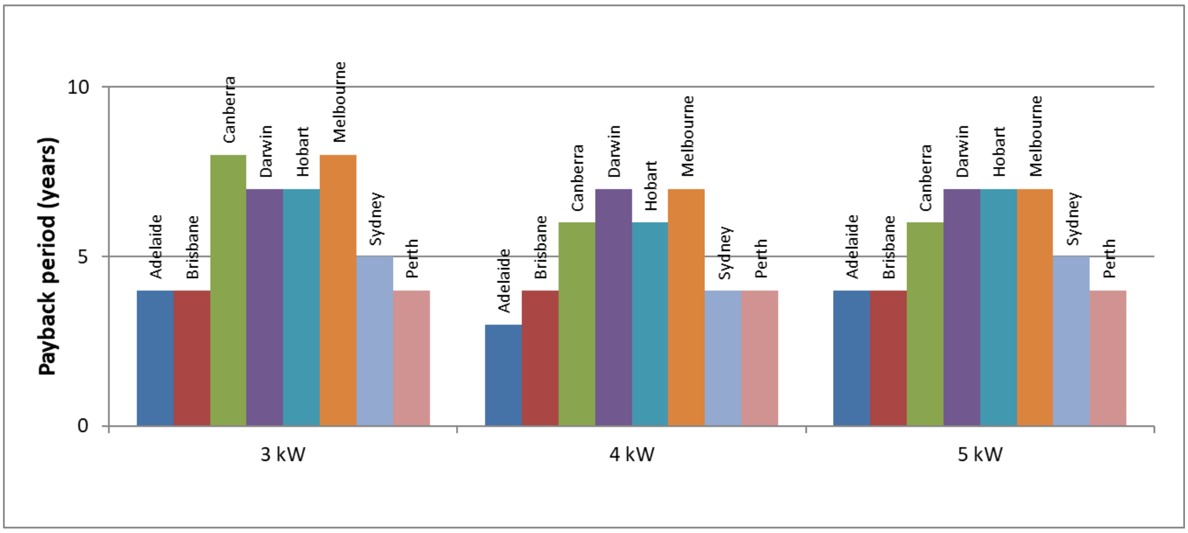
Figure 8. The payback period for solar PV (6.54 per cent discount rate)



Source: AEC, January 2024

Figure 9 shows the expected payback period for systems with a 5.01 per cent discount rate (10-year average home loan rate). Most capital cities' payback period falls between 5 - 7 years inclusive. The 3 kW systems in Canberra and Melbourne have a payback of 8 years. However, Adelaide is the best place to produce returns on installing solar panels, with a 3-4-year payback period. Since the costs of electricity are high, solar panels are cheap, and solar irradiation is excellent in this place, the benefits of installing solar are evident. Brisbane and Perth are in a similar situation, with payback periods of up to 4 years.

Figure 9. The payback period for solar PV (5.01 per cent discount rate)



Source: AEC, January 2024

SECTION V: METHODOLOGY APPENDIX

1. Solar installation 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 of 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 to 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. The key difference to LCOE calculation is that the payback period assumes no annual maintenance cost.

Calculation

The payback period occurs when $\sum$ savings > $\sum$ cost

Where:

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

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

t = years

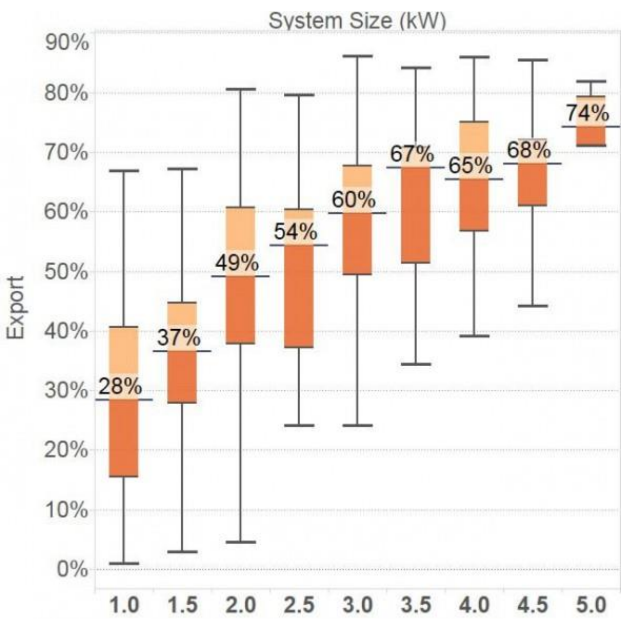
Avoided cost and FiT

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[iii]. See **Figure 10** below.

Figure 10. Export rate of residential solar PV at different system sizes



Source: Sunwiz's analysis, 2015

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[i] These units are registered in the period of the last twelve months, not year to date

[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.