IPART Independent Pricing and Regulatory Tribunal | NSW

Solar feed-in tariff benchmarks

Final Report

June 2021

Energy »

Tribunal Members

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The Independent Pricing and Regulatory Tribunal (IPART)

We make the people of NSW better off through independent decisions and advice. IPART's independence is underpinned by an Act of Parliament. Further information on IPART can be obtained from IPART's website.

Our final all-day feed-in tariff benchmark range is 4.6 to 5.5 c/kWh for 2021-22

Solar panels can provide significant savings to customers. A typical solar customer can save more than $450 per year on their electricity bills by using the electricity they generate, instead of buying this electricity from their retailer. As an added benefit, customers can also earn revenue via a feed-in tariff from any unused electricity they export to the grid - this can be $300 per year for a typical customer.[1]

Retailers are not required to pay customers for the electricity they export, but most of them do. If retailers offer feed-in tariffs, they set this tariff themselves.

Since 2012, IPART has been setting benchmarks to guide customers about the feed-in tariffs they could expect to be paid by their retailers for their solar exports. These benchmarks provide information about how much their solar exports are worth to help customers negotiate with their retailer and compare offers.

Our all-day feed-in tariff benchmark range for 2021-22 is 4.6 to 5.5 c/kWh. This is based on the wholesale value of this electricity. This range is slightly narrower than the range in our Draft Report (4.4 to 5.9 c/kWh) mainly because we have used a more up to date forecast of wholesale costs.

Our benchmark for 2021-22 is lower than the benchmark range of 6.0 to 7.3 c/kWh for 2020-21.[i] This is due to lower forecast wholesale electricity prices. Increasing solar penetration has resulted in these lower prices, because it has reduced demand for electricity from the National Electricity Market (NEM).[ii]

Lower forecast wholesale prices also mean that retail electricity prices are likely to decrease. This will provide further savings to customers through reduced electricity bills. These lower prices are reflected in the price caps set by the Australian Energy Regulator (AER), which will fall by 2.7 to 7% in NSW from July 2021.[2] Most customers are on market offers that are lower than these caps – these customers should negotiate lower prices with their retailer.[iii]

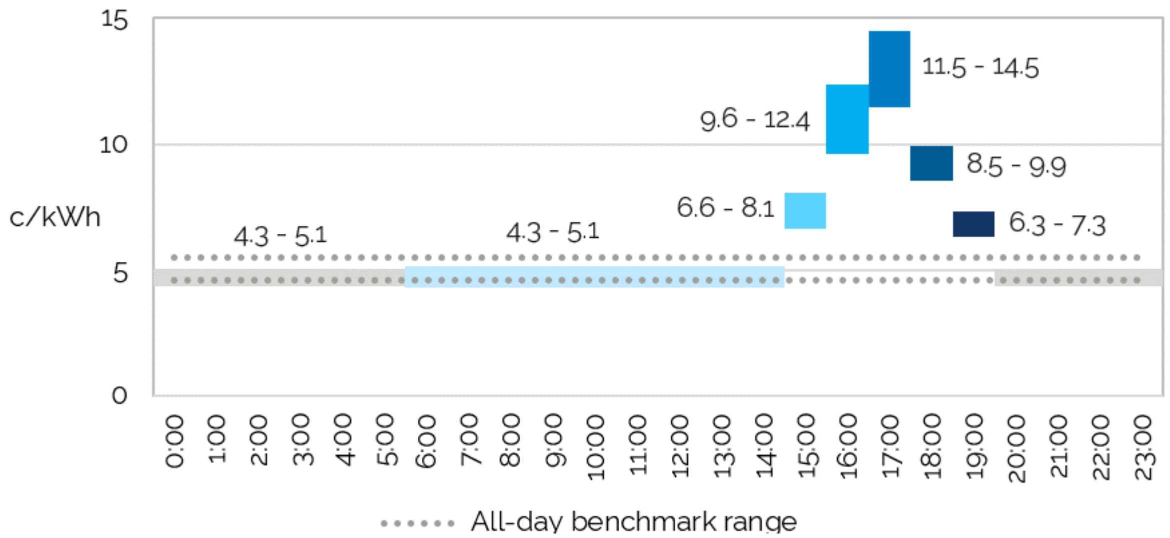
As more customers export their excess electricity and increase the supply of solar generated electricity available, electricity prices are likely to continue to fall during the day. This means that the value of solar exports is likely to remain low in the longer term. However, customers will continue to make savings on their bills by using the electricity they generate – the key benefit of having solar panels.

[1] Inclusive of GST. A typical customer is assumed to have a north-facing 5 kW solar system, These figures are different to those used in our Draft Report, because we have new information that suggests that a typical customer with this system would export around 70% of their solar electricity generated. Our Draft Report assumed that 50% of the solar was exported, and 50% would be used in-house. More detail is provided later in this report.

[2] The AER sets Default market offer (DMO) prices that cap the price retailers can charge consumers on a standing offer contract. AER, Final Determination, Default Market Offer Prices 2021-22, April 2021 p 21.

Customers with batteries may also be offered higher feed-in tariffs if they are able to export their excess solar during the evenings. Prices are likely to remain significantly higher at these times of the day. Although for most customers it does not yet make financial sense to install batteries, we have set time-dependent tariffs to guide customers about the value of their exports at different times of the day, as required by our Terms of Reference. Figure 1 shows that between 5 pm and 6 pm, exports could be worth up to 14 c/kWh in 2021-22, which is significantly higher than IPART's all-day benchmark. However, currently less than 0.5% of exports occur after 5 pm.[3]

Figure 1 Final time-dependent feed-in tariffs (c/kWh)



Note. These tariffs are for Australian Eastern Standard Time (AEST). During daylight savings the tariffs would apply to the hour after the time shown in the chart.

Source: IPART calculations.

To make our decisions on the solar feed-in tariff benchmarks, we made incremental improvements to our previous approach. These have been made based on both our own analysis and in response to stakeholder submissions. We intend to use our updated methodology to update our benchmarks in 2022 and 2023.

This Final Report outlines our final decisions on our feed-in tariff benchmarks, and discusses issues that customers frequently face when dealing with solar energy. We have also released:

- a technical paper that discusses our final decisions in setting the benchmark tariffs in more detail
- a consultant report from HoustonKemp, which concluded that our approach to valuing solar exports is reasonable and fit for purpose
- an information paper on the longer-term value of solar exports, which was released at the time of our Draft Report.

[3] In most cases, the price of buying electricity from a retailer is higher than feed-in tariffs, which means that customers with batteries are still better off using the electricity that they generate rather than exporting it to the grid. The retail price of electricity is higher than the value of exports because retail prices include other costs, including the costs of using the network, environment costs, and retail costs.

Final decisions

1. The all-day solar feed-in tariff benchmark range is 4.6 to 5.5 c/kWh for 2021 22.
2. The time-dependent feed-in tariff benchmark ranges for 2021-22 are set out in Figure 2.
3. We have included a longer historical average of ASX energy futures for our forecast wholesale electricity costs, in addition to the short term (40-day) average.
4. To calculate the solar multiplier, we have calculated the average solar weighted and time weighted prices directly from three years of historical data. In previous years, we used this historical data to generate a Monte Carlo simulation and used the median from the distribution of modelled scenarios.
5. We have used solar export data from all 3 distribution network service providers (Ausgrid, Endeavour Energy and Essential Energy) to calculate a solar multiplier for each network. We have reflected the variations in the solar multipliers within our state-wide benchmark ranges.

Introduction

The NSW Government is committed to taking decisive and responsible action on climate change. In March 2020, the NSW Government released its Net Zero Plan Stage 1: 2020-2030 to set out how it will reduce emissions over the next decade so that net emissions fall to zero by 2050.

The plan will support a range of initiatives targeting electricity and energy efficiency, electric vehicles, hydrogen, primary industries, coal innovation, organic waste and carbon financing. Businesses will be supported to modernise their plant and increase productivity, while farmers will have access to new markets and technologies. The plan will also help to drive down the cost of living and provide consumers with more information to help them make more environmentally and financially sustainable choices.

As a low-emissions technology, solar panels reduce the need for electricity to be generated from sources that contribute to climate change. IPART's solar feed-in tariff benchmark is one tool that informs solar consumers to help them compare retail offers to improve the financial returns on their panels.

Around half a million residential households and small businesses have installed solar panel systems in NSW.[iv] This represents around 15% of residential households and 3% of small businesses in NSW.[v] Energy from small-scale solar panels makes up around 5% of total electricity generated in NSW.[vi] In addition, the number of households with battery systems is slowly increasing, so that solar electricity can be used or exported to the grid even when solar panels are not generating electricity.

What we have been asked to do

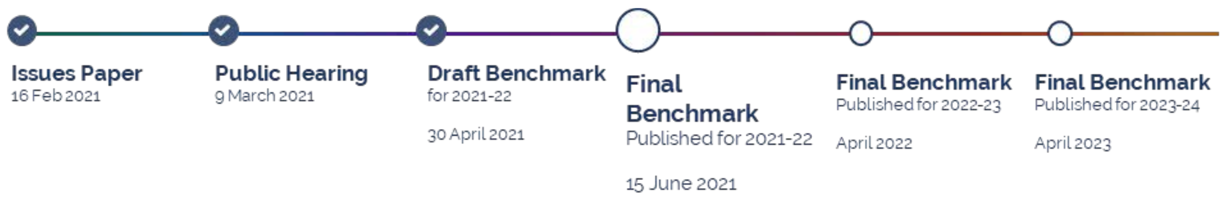
We have been providing advice to the NSW Government on the value of solar electricity since 2012. In November 2020, the NSW Government provided IPART with a Terms of Reference for us to continue this role for the next 3 years.

Our Terms of Reference requires us to set annual benchmark ranges for an all-day feed-in tariff, and feed-in tariffs for different times across the day. In doing so, we are required to consider the following key parameters:

- there should be no resulting increase in retail electricity prices
- the voluntary benchmark range should operate in a way to support a competitive retail electricity market in NSW.

We have also been asked to report on the feed-in tariffs currently being offered by each retailer, and to note whether they are within the benchmark range.

In February 2021, we released an Issues Paper and Information Paper for our review and invited stakeholder submissions. In March 2021, we held a public hearing to discuss with stakeholders issues that consumers experience when dealing with solar energy, and their views on our approach in calculating our feed-in tariff benchmarks. In April 2021, we released a Draft Report outlining our draft decisions for the review and invited stakeholder submissions.[4]



4 Our Terms of Reference requires us to publish solar feed-in tariff benchmarks by April each year. However, we have received a letter from the Coordinator-General of the Department of Planning, Industry and Environment confirming that the benchmark for 2021-22 will be published by IPART in June 2021.

Solar feed-in tariff benchmarks for 2021-22

We set the benchmark tariffs based on the value of solar exports to retailers. When solar exports occur, retailers avoid the wholesale costs of purchasing electricity from the National Energy Market (NEM), transmission and distribution losses, and NEM fees and charges. We estimate that this value of solar exports will be 4.6 to 5.5 c/kWh in 2021-22 (Table 1).

4.6 – 5.5

c/kWh

2021-22 final all-day feed-in tariff benchmark range

For our final decision, we have made incremental improvements to the approach we have used in previous years. This should mean that our benchmark tariffs are a more helpful guide to customers about the feed-in tariffs they could expect to receive from retailers for their solar exports. The changes we have made are:

- including a longer historical average of forecast wholesale prices within our benchmark range, to reflect retailers' actual practices in purchasing wholesale electricity to hedge wholesale spot price risk – previously we only reflected the latest market information on the forecast value of wholesale electricity
- simplifying how we calculate our solar multiplier (the value of solar exports relative to the wholesale price when exports occur) to improve the transparency and replicability of our approach
- calculating solar multipliers for all 3 distribution network areas – previously we only had data from Ausgrid.

These changes are consistent with our draft decisions. We provide further details of our updated methodology in our technical paper accompanying this report.

Table 1 Components for the all-day solar feed-in tariff benchmark range

Benchmark component	2020-21	2021-22 (Draft)	2021-22 (Final)
Forecast wholesale electricity price range	5.7 to 7.0 c/kWh	4.6 to 6.1 c/kWh	4.9 to 5.7 c/kWh[c]
ASX futures baseload contracts for the 12-month period 2021-22 using the 40-day average price (including 5% adjustment to remove contract premium)	6.4 c/kWh	4.6 c/kWh	4.9 c/kWh
ASX futures baseload contracts for the 12-month period 2021-22 using a volume-weighted average of all historical trades	Not applicable[a]	6.1 c/kWh	5.7 c/kWh
Solar multiplier range	0.97	0.88 to 0.91	0.88 to 0.90
Ausgrid	0.97	0.90	0.89
Endeavour Energy	Not available[b]	0.88	0.88
Essential Energy		0.91	0.90
Network loss factor	1.06	1.06	1.06
NEM fees and ancillary charges	0.10 c/kWh	0.09 c/kWh	0.09 c/kWh[d]
Solar feed-in tariff benchmark range	**6.0 to 7.3 c/kWh**	**4.4 to 5.9 c/kWh**	**4.6 to 5.5 c/kWh**

a. In setting our last feed-in tariff benchmark in 2020-21, our estimated average wholesale spot price range was based on a +/-10% range for uncertainty.

b. In our last benchmark, we based the solar multiplier estimate on Ausgrid data only, due to data quality issues.

c. Prices taken at 17 May 2021. For our longer-term historical average, the trades available commenced from May 2019.

d. NEM fees for 2021-22 are estimated as 0.06c/kWh, based on AEMO's advice of proposed 8.3% increase in its NEM fees (of 0.054c/kWh from 2020-21), 31 May 2021.

We have set time-dependent feed-in tariff benchmarks

Retailers could offer different feed-in tariffs across the day as an alternative to an all-day rate. While they are not currently choosing to do so[5], our Terms of Reference requires us to set time-dependent feed-in tariff benchmarks. These are shown in Table 2.

Our final time-dependent ranges are lower than in our draft report, because the top end of the range of forecast wholesale prices is lower.

Table 2 Benchmark ranges for time-dependent feed-in tariffs

Time window	2020-21 ranges (c/kWh)	2021-22 Draft ranges (c/kWh)	2021-22 Final ranges (c/kWh)	% of solar exports 2019-20[a]
6 am to 3 pm	5.7 to 7.0	4.1 to 5.5	4.3 to 5.1	91.77
3 to 4 pm	6.5 to 7.9	6.4 to 8.8	6.6 to 8.1	5.85
4 to 5 pm	7.8 to 9.5	9.2 to 14.2	9.6 to 12.4	1.97
5 to 6 pm	9.0 to 11.0	11.0 to 17.0	11.5 to 14.5	0.30
6 to 7 pm	8.8 to 10.8	8.2 to 10.7	8.5 to 9.9	0.02
7 to 8 pm	8.0 to 10.0	6.0 to 7.9	6.3 to 7.3	0.01
8 pm to 6 am	-	4.2 to 5.4	4.3 to 5.1	0.08

a. Based on Australian Eastern Standard Time (AEST). These are different to the proportions previously reported due to different treatment of daylight savings.

Note: These tariffs are for Australian Eastern Standard Time (AEST). The benchmarks for the 6 pm to 7 pm, 7 pm to 8 pm and 8 pm to 6 am time windows are based on solar multipliers that are not solar-weighted. These times cover less than 0.5% of solar exports. In previous years we did not set a benchmark between 8 pm to 6 am because exports are immaterial and wholesale prices are relatively low at those times (e.g. IPART, Solar feed-in tariffs 2018-19, June 2018, p 8).

Source: IPART analysis based on financial year 2020 export data provided by Endeavour Energy (February 2021), Essential Energy (April 2021) and Ausgrid (April 2021).

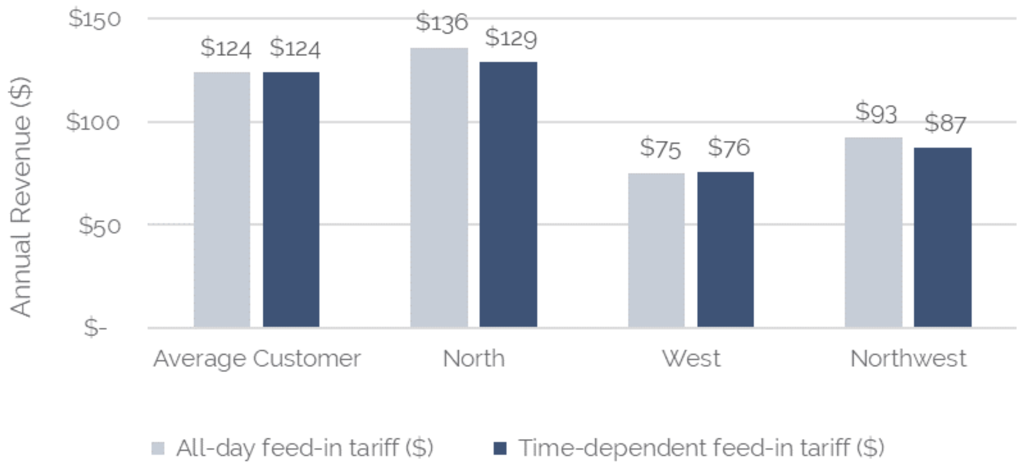
We have set prices for different times based on how much price variation occurs throughout the day. Very little price variation occurs in the earlier part of the day between 6 am and 3 pm. Therefore, we have set one price for this time. On the other hand, prices vary a lot between 3 pm and 8 pm so we have set hourly benchmarks for these times. This is consistent with our previous approach.

We have also set a benchmark tariff for 8 pm to 6 am, even though almost no solar exports occur during this time. However, they provide a price for solar exports from batteries that can occur at any time.[vii]

5 There are exceptions such as Amber Electric that is offering a real-time feed-in tariff that varies every 30 minutes in line with changes in the wholesale spot price of electricity.

Using our benchmarks, we have considered the revenue impact for customers on time dependent feed-in tariffs, versus a single all-day rate. Figure 2 shows the average annual feed-in tariff revenue on all-day and time-dependent tariffs across NSW customers, who have an average panel size of around 3.4 kW.[6] We have compared this to the revenue earned by customers with 3 kW panels that face different directions. Elsewhere in this report our examples refer to a typical customer with a 5 kW system, which reflects the most common size panels that are currently being installed. In those examples, the annual feed-in tariff is higher.

Figure 2 Annual feed-in tariff revenue with different panel orientations



Note: In this example, we used an all-day feed-in tariff of 5.05 c/kWh based on the midpoint of IPART's 2021-22 feed-in tariff range of 4.6-5.5 c/kWh and the midpoint of IPART's time-dependent feed-in tariff range of 4.72 c/kWh between 6 am to 3 pm, 7.36 c/kWh between 3 pm to 4 pm, 11.00 c/kWh between 4 pm and 5pm, 12.99 c/kWh between 5 pm and 6 pm, 9.25 c/kWh between 6 pm and 7 pm, 6.80 c/kWh between 7 pm and 8 pm and 4.70 c/kWh between 8 pm and 6 am.. The average customer reflects an average customer in both Ausgrid and Essential networks. The average customer in Ausgrid and Essential has an average panel size of 3.7 kW and 3 kW, respectively. The scenarios with different panel orientations use a panel size of 3 kW.

Source: IPART analysis based on data provided by the AEMC 21 May 2021.

Figure 2 shows that across all customers (the average customer) the total revenue would be the same, regardless of whether they are on an all-day rate or a time-dependent tariff. However, this varies slightly between customers with different panel orientations:

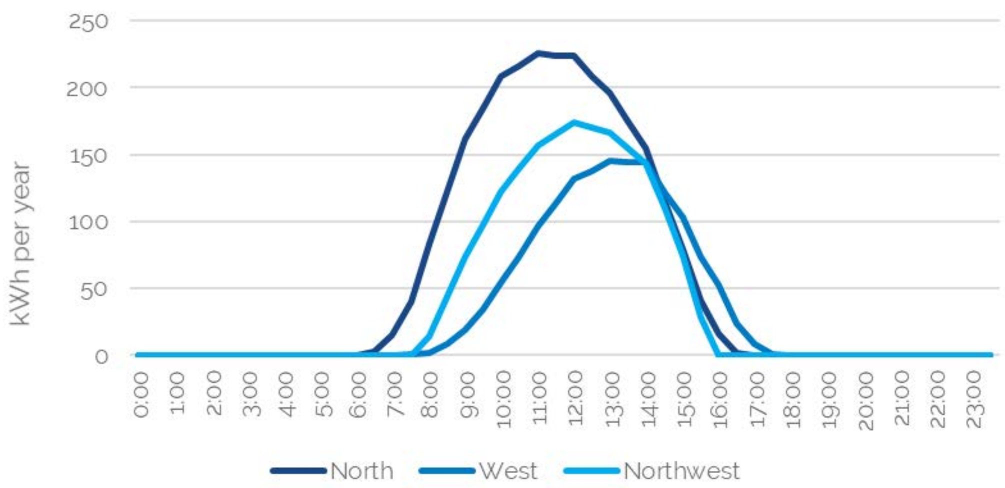
- Customers with north-facing panels make slightly less revenue if they are on a time-dependent tariff. This is because they export a lower proportion of their generation when feed-in tariffs are highest at the end of the day compared to customers with west-facing panels.
- Customers with west-facing panels make slightly more revenue if they are on a time-dependent tariff. They export a higher proportion of their generation when feed-in tariffs are highest at the end of the day compared to customers with north-facing panels (see Figure 3).

6 Based on our sample of customers' export data received from Essential Energy and Ausgrid.

However, time-dependent tariffs within IPART's benchmark ranges would not provide an incentive to adjust panel orientation (for example, to tilt solar panels west instead of north to take advantage of the higher prices in the afternoon). Customers with north-facing panels receive the highest feed-in tariff revenue, regardless of whether they receive an all-day feed-in tariff, or a time-dependent feed-in tariff. This is because they can generate the most solar overall.

Even though customers with west-facing panels could potentially export more when the feed-in tariff is higher, their tariff revenue is lower because they export less overall. This is also true for customers with north-westerly facing panels.

Figure 3 Solar exports by panel orientation and time of day (3 kW panels)



Source: IPART analysis based on data provided by the AEMC 21 May 2021.

Appendix A shows that customers with batteries can also increase their feed-in tariff revenue on time-dependent solar feed-in tariffs compared to an all-day rate. In doing so, they can reduce their overall bill. However, the upfront cost of batteries is still too high to make financial sense for a typical customer (Box 1). However, the technology costs are expected to fall sharply over the coming decade.

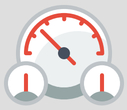
Box 1 Circumstances where batteries may make financial sense (as at 2020)

The NSW Government released the NSW Home Solar Battery Guide in 2020 to help customers decide whether buying a battery is right for them, and whether it can save them money. It shows that in 2020, batteries only make financial sense in limited circumstances. That is, the battery will pay for itself within the warranty period (typically 10 years) and will save money compared to purchasing electricity from a retailer over the same period.

This list might expand within a few years to include most grid-connected households that export solar power to the grid. However, the optimum battery size for most of these households is likely to be relatively small.

High consumption
You have higher than average consumption during peak times, are on a time-of-use tariff, and planning on installing a new solar system with your battery.

Location limitations
A new rural grid connection would be expensive and going offgrid would be a cheaper alternative. This would still have reliability, customer protection, and other implications.



Export limit
You have, or want to install, a large solar system but the local electricity has imposed an export limit on your solar system, so some solar generation will go to waste without a battery.

Special programs
A special program is available in your area, such as a Virtual Power Plant trial, including a battery subsidy. Carefully check installer certification, warranties and customer support and read this guide for other useful information.

Note: Individual circumstances may vary so customers should seek the advice of a qualified professional.

Source: NSW Government, NSW Home Solar Battery Guide, 2020, p 44.

The greatest benefit of solar panels are savings from using the electricity generated

When customers use their solar generated electricity rather than buying electricity from their retailer, they can make significant savings on their energy bill By using the electricity they generate, customers do not have to pay the retail cost of electricity, which includes all the additional costs that retailers incur when supplying retail electricity (for example, network costs, overheads, and the costs of green energy programs). This is a key benefit of solar panels to customers.

For most customers, the feed-in tariff revenue is a secondary benefit. When customers do not use all the electricity generated by their panels, the excess amounts are exported to the grid. Customers may be paid a feed in tariff for these solar exports.

The total savings and feed-in tariff revenue that a customer will realise will depend on a number of factors, including the size (in kWs) and orientation of their solar panels, the total household consumption and when consumption occurs, and their retail offer.

We have calculated a typical bill for solar customers with a 5 kW north-facing solar system, an annual average consumption of 5,100 kWh, and solar feed-in tariffs within our benchmark range.

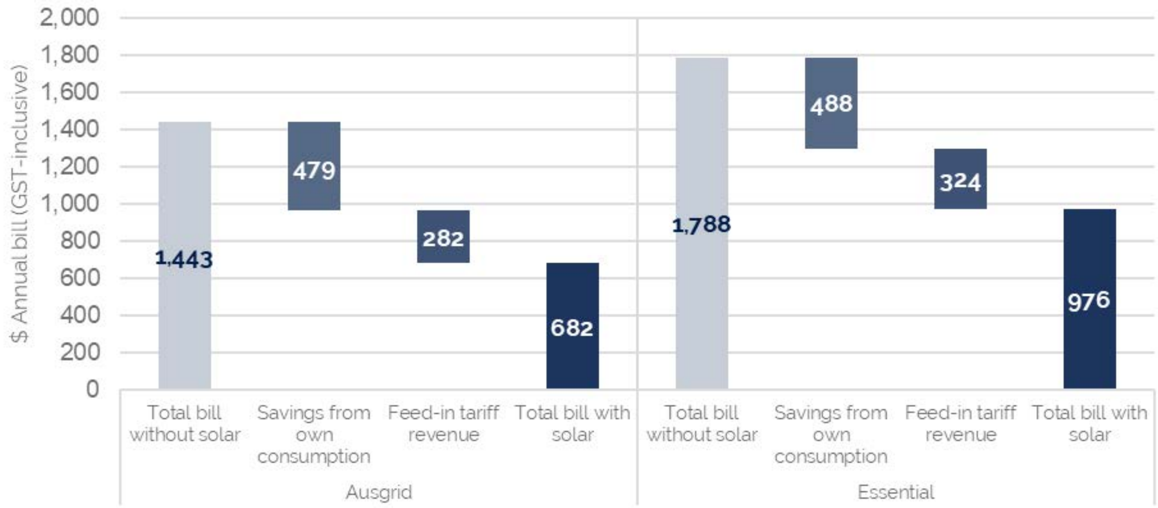
Figure 4 shows a typical customer would reduce their overall bill by more than $750 as a result of their solar panels, made up of:

- Savings of more than $450 per year- roughly a third of their bill. By using solar electricity, they can meet approximately 40% of their household electricity needs.
- Around $300 a year in feed-in tariff revenue if they earned a solar feed-in tariff of 5 c/kWh (the midpoint of our benchmark range). They would export around 70% of the solar electricity that they generate.[7]

For a typical Ausgrid customer, this would more than halve their bill. A typical solar customer in the Essential network with 5 kW panels would typically earn around $40 more in solar feed-in tariff revenue compared to customers in the Ausgrid and Endeavour networks, because they export around 15% more electricity through the day. However, they have higher bills overall, because their daily supply charge is much higher (around 150 c/day compared with a daily supply charge of 90c/day (including GST) in the Ausgrid and Endeavour networks).

[7] These figures are different to those used in our Draft Report, because we have new information that suggests that a typical customer with this system would export around 70% of their solar electricity generated. Our Draft Report assumed that 50% of the solar was exported, and 50% would be used in house.

Figure 4 Bill for a typical solar customer - Ausgrid and Essential networks.



Note: In this example, we used a feed-in tariff of 5.05 c/kWh based on the midpoint of IPART's 2021-22 feed-in tariff range of 4.6-5.5 c/kWh and a solar system size of 5 kW and north-facing panels. For a customer in Ausgrid's network we used a daily supply charge of 88 c/day and variable charge of 22 c/kWh and for a customer in Essential's network we used a daily supply charge of 152 c/kWh and variable charge of 24 c/kWh (including GST). These are based on the median retail offers available in 2020-2021, adjusted for expected reductions in wholesale costs in 2021-22. Bills and bill savings for Ausgrid and Endeavour customers are similar.

Source: IPART analysis based on data provided by the AEMC 21 May 2021.

The upfront cost of a 5 kW solar system in Sydney is around $4,500[viii] (including the SRES subsidy and GST). The total annual bill reduction of around $750 to $800 would pay off these upfront costs in about six years.

Another way of looking at this is by spreading the upfront costs over the life of the solar panels, and comparing the annual costs to the annual bill reductions. To pay off their upfront costs of their solar panels, a customer would pay:

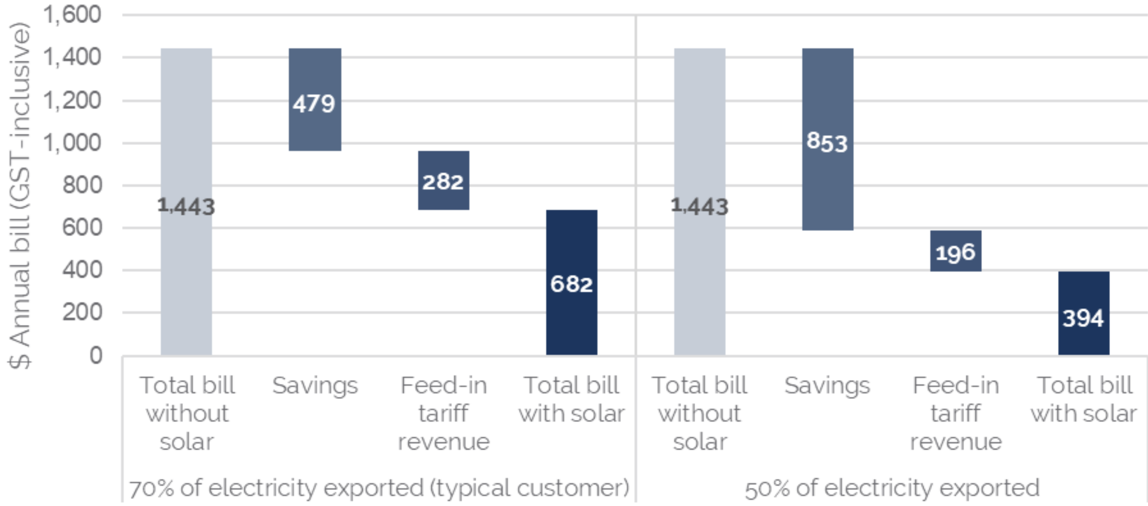
- $450 per year over 10 years, or
- $180 per year over 25 years.

For a typical customer, their overall bill reductions would more than cover these annualised costs.

To maximise the benefit of solar panels, customers could consider shifting some of their electricity usage to when their solar panels are generating the most electricity. This is typically during the middle of the day. For example, customers may be able to turn on or use a timer, to use their appliances (e.g. dishwasher or washing machine) at midday rather than at other times.

Figure 5 shows the impact of using a higher proportion of solar electricity in the home. If the same customer consumes 50% of their solar generated electricity, they would reduce their bills by a further $300. This is because the reduction in feed-in tariff revenue of around $100 would be more than offset by around a further $400 in bill savings compared to a customer that exports 70% of their solar and only uses around 30% in the home. Overall, this customer would reduce their annual bill by around $1,000 per year compared to if they did not have solar panels. This reduces the payback period for their solar panels to just over 4 years.

Figure 5 Solar panels provide greater benefits as more solar electricity is consumed at home



Note: In this example, we used a feed-in tariff of 5.05 c/kWh based on the midpoint of IPART's 2021-22 feed-in tariff range of 4.6-5.5 c/kWh, a solar system size of 5 kW, daily supply charge of 88 c/day and variable charge of 22 c/kWh (including GST).

Source: IPART analysis based on data provided by the AEMC 21 May 2021.

One way to use more electricity in the home is to install a battery. Customers that can store more than they need may also export their stored electricity. However, as noted in the previous section, the upfront costs of batteries mean that batteries only currently make financial sense in some circumstances. For a typical customer only using 5,100 kWh, the additional bill savings from installing a battery **would not** offset the upfront costs. Appendix A provides more detail.

Empowering consumers to make informed choices about solar energy

Stakeholders submitted that there is a lot of information available to consumers about solar energy and the different feed-in tariffs that retailers offer.[ix] For example:

- The Australian Government price comparator service, Energy made easy, provides information on retailers' offers, including feed-in tariffs (Figure 6).
- Clean Energy Council provides information about upfront costs of solar systems and batteries.
- The Australian PV institute, SunSpot, shows the savings that could be achieved from solar systems and batteries.

However, stakeholders also submitted that it is difficult for customers to combine the information that is available to decide which offer of feed-in tariff, retail charge and daily supply charge represented the best value for money given their circumstances.[x] PIAC noted that households may actually be worse off, despite receiving a reasonable feed-in tariff, as they may receive higher than normal fixed or usage rates for consumption.[xi]

Customers need their gross generation data and gross consumption data by time of day to work out which offer is best for them. However, net meters do not capture this information.

Almost all customers have net meters, which only capture how much electricity is consumed from the grid (net consumption), and how much solar electricity customers export to the grid (net exports). They do not tell customers about how much solar electricity they have generated (gross generation) nor how much of this generated electricity the customer uses.

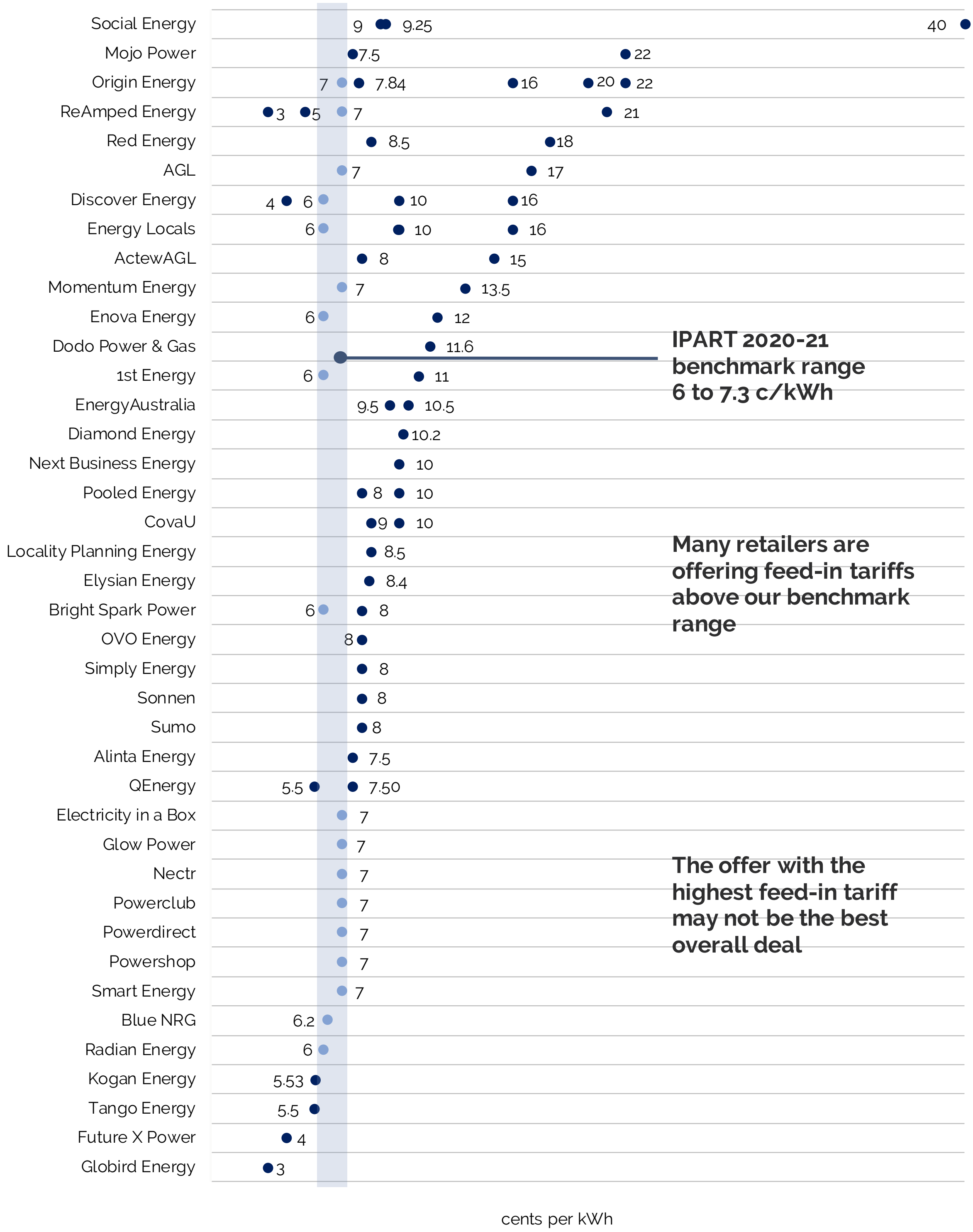
For our analysis, we have used the AEMC's analysis of solar generation based on weather data from the Bureau of Meteorology for different solar system sizes (1 kW to 10 kW) and panel orientation (e.g. north, south, east and west), and weekday net system load profile data from AEMO to allocate usage to each half hour across the day.

Customers could use smart energy monitoring devices to get access to information about their own consumption patterns. However, aggregate information from companies that distribute these devices is not freely available to help other customers estimate their own consumption. More information on potential data sources is provided in Appendix B.

As explained in the previous section, a typical customer with a north-facing 5 kW panel using 5,100 kWh per day exports more solar electricity than they use in their house. For these customers there is some correlation between a higher-feed in tariff, and a lower bill overall (Figure 7). However, Figure 7 also shows that:

- The highest feed-in tariff is not the best deal overall for this type of customer. This is because this offer also has higher retail tariffs than the other offers.
- Many offers with lower feed-in tariffs result in lower bills overall because they also have lower retail prices.

Figure 6 Solar feed-in tariffs available in NSW – May 2021



Note: Actew AGL does not supply in the Ausgrid network and Pooled Energy does not supply in the Essential Energy network. Some tariff offers include declining block tariffs where premium feed-in tariffs are only paid to a limited quantity of exports each period. Other offers may only pay premium feed-in tariffs during a time-limited (or quantity-limited) benefit period after which retailers will pay lower feed-in tariffs.

Data source: Energy Made Easy and IPART analysis.

Figure 7 Annual bills and feed-in tariffs

Note: Inclusive of GST. In this example, we used a solar system size of 5 kW, consumption of 5,100 kWh per year, assumed that around 70% of solar generated electricity is exported, and that the customer is in Ausgrid's network area.

Source: IPART analysis based on data from Energy Made Easy using tariffs available as at April 2021.

Stakeholders such as Red Energy and Lumo Energy noted that the energy industry is actively engaged to include energy data in the Consumer Data Right.[xii] Red Energy and Lumo Energy submitted that this would allow customers to provide energy retailers consent to share their data with an accredited service provider such as a comparison site to get more tailored, competitive services.

We support the development of the Consumer Data Right for the energy sector. The ability to securely share energy data with accredited parties (such as a comparison site) and then quickly use this information, can help consumers make better financial decisions. It could also promote competition between energy service providers, leading to better prices and innovation in product and service offerings.[8]

New types of retail packages supported by new technologies could also be developed to help optimise the times that households use, store, or export electricity, to benefit these households and also other consumers around them.

8 The ACCC released a consultation paper on its preliminary positions on the energy rules framework and stakeholder submissions closed in August 2020. We will continue to monitor developments in this area.

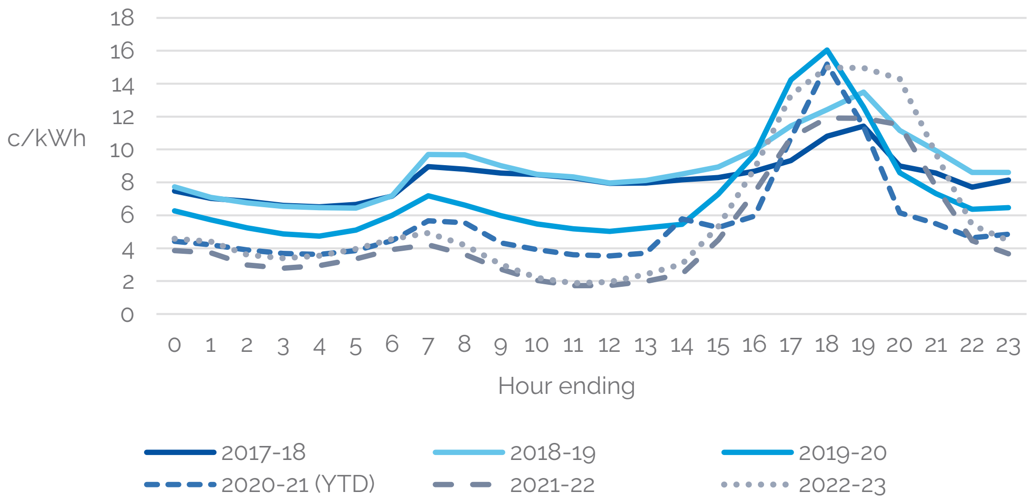
Longer-term value of feed-in tariffs

IPART sets solar feed-in tariff benchmarks each year. Several of the stakeholders who responded to our Issues Paper consider that IPART's benchmark should be for a longer period, as solar panels are a long-term investment.[xiii] This would allow people to better assess the financial value of their solar panels.

We set a benchmark range each year because the price of electricity can fluctuate significantly from year to year, and it can be difficult to predict several years in advance. As a result, most retailers change their retail prices (including their solar feed-in tariffs) at least once a year, rather than locking them in over the longer term. This means that IPART needs to provide an up-to-date guide of what solar exports are worth.

However, there are some clear trends emerging that mean that solar feed-in tariffs are likely to stay relatively low over the medium term. Solar exports are likely to be worth half of what they were over the last few years. This is because wholesale prices in the middle of the day – when solar is exporting to the grid – are likely to be much lower, as solar penetration continues to increase. Figure 8 shows forecasts from the Australian Energy Market Commission (AEMC) that prices in the middle of the day are expected to fall to around 2 c/kWh in the next few years, down from around 8 c/kWh in 2018-19.

Figure 8 Wholesale price by time of day (actual and forecast)



Data source: IPART calculations, based to data from AEMO, AEMC, Residential Electricity Price Trends 2020 Final Report, 21 December 2020, p 11.

As shown in the previous section, solar panels are still likely to remain a good investment for many electricity customers. Customers can significantly reduce the amount of electricity they need to buy from their retailer by generating it themselves. However, they should put less weight on the revenue from exporting excess electricity to the grid when they are not using it.

Our benchmarks reflect the value of solar exports to retailers

Stakeholders submitted that our benchmarks should be higher to reflect:

- the value of solar energy in displacing high-cost generation[xiv]
- avoided network costs as less of the power system is used if solar exports are used by customers nearby[xv]
- the environmental benefits that solar generated electricity provides compared to other forms of generation.[xvi]

A number of stakeholders also considered that feed-in tariffs offered by retailers should at least be equal to retail electricity prices.[xvii]

Retailers are not required to offer feed-in tariffs, and if they do, they are free to set their own tariffs. They are also not required to follow our feed-in tariff benchmarks. This means that if IPART sets a higher benchmark, it would not mean that retailers would have to pay customers more for their solar energy, because offering a feed-in tariff is voluntary.

For our benchmarks to be useful to customers, it should reflect what retailers are actually likely to pay their customers, based on how much the solar electricity is worth to them. This means that we have not included 'external benefits' – benefits to the wider community, such as avoided health and environmental costs in our benchmark.

But if IPART did set a higher benchmark, and all retailers paid a higher feed-in tariff, this would result in higher costs to retailers, which would mean that they would have to increase their prices. For example, if all retailers paid a feed-in tariff of 15 c/kWh (around three times the 2021-22 benchmark), the average annual household bill would need to increase by around $35 (to recover additional costs of around $120 million each year).

Households without solar panels should not have to pay more to reduce the bills of customers with solar panels. This would disadvantage the households who are unable to install a solar system themselves (for example, because they rent or they cannot afford the upfront costs).

We discuss below each of the issues raised by stakeholders.

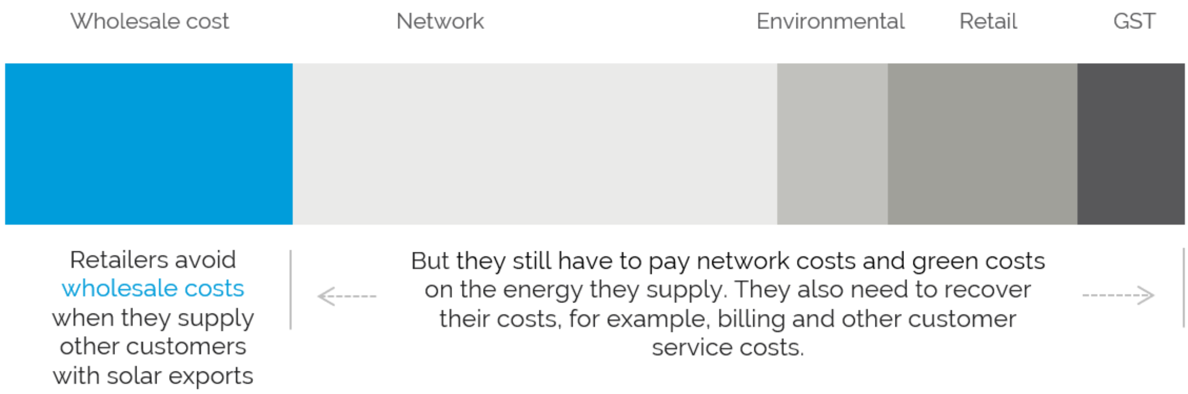
Our feed-in tariff benchmarks are lower than retail electricity prices

A number of stakeholders submitted that they considered the feed-in tariff offered by their retailer to be too low compared to the retail price of electricity. They considered that the feed-in tariff should be higher, and some submitted that it should be at least equal to the retail price. This has also been the main issue raised by stakeholders in past reviews.

Our feed-in tariff benchmarks (4.6 to 5.5 c/kWh) are substantially lower than retail electricity prices (variable costs of around 20 to 30 c/kWh). Our benchmark represents the savings to retailers as a result of not buying the equivalent electricity from the wholesale market. This represents a fair price that retailers should be willing to pay for solar exports.

Once retailers purchase solar electricity from solar customers, there are additional costs that retailers incur when delivering this electricity to other customers. These include network costs, retailers operating overheads, funding for green energy programs and GST[9] – see Figure 9 below.

Figure 9 Wholesale costs are a small proportion of retail costs (2021-22)



Note: Fixed cost have been excluded from this chart.
Data source: IPART calculations, based on data from the AER, Final Determination Default Market Offer Prices 2021-22, p 9; AEMC, Residential Electricity Price Trends 2020 Final Report, 21 December 2020, p 12; Energy Made Easy data, Ausgrid, Network price list 2021-22; Endeavour, Network price list: Network tariffs 2021-2022, p 31; Essential Energy, Network price list and explanatory notes, p 1.

The feed-in tariff reflects the market price of wholesale electricity

Stakeholders submitted that solar energy displaces high-cost generation (including the need to build alternative generating capacity) and reduces the chances of high wholesale electricity prices occurring in the first place.

However, we consider that solar customers should be treated consistently with other electricity generators and so should not get a higher or lower tariff to reflect their impact on wholesale prices. For example, a new wind turbine that contributes to reduced wholesale spot prices does not receive any additional payment to reflect the lower wholesale price. It takes the same market price as all other generators. This also means that all consumers benefit from lower prices.

9 Most residential customers are not registered for GST and so they do not need to pay GST on their solar feed-in tariff revenue. Our feed-in tariff benchmarks are exclusive of GST. However, when retailers supply solar exports to other customers, the supply of those exports are subject to GST. Solar customers that are registered for GST must pay GST on their feed-in tariffs. Australian Tax Office, Are there any GST implications for owners of grid-connected solar power generation equipment in respect of electricity supplied via the network?, accessed 12 April 2021.

Retailers have to pay network costs on solar exports

Stakeholders submitted that avoided network costs should be included in our benchmarks as less of the network is used if exported solar energy is used by other consumers nearby.

We don't make an allowance for this, because retailers still incur the full network costs when they sell solar exports to other consumers and so do not avoid these network costs.

In addition, large volumes of solar exports may have the potential to impose higher network costs due to additional investment required to support the bidirectional flows of electricity to handle the volume of solar exports. As a result of these costs, the AEMC has recently made a draft determination to allow distribution network service providers to levy export charges. Under their draft determination, networks could also pay customers more for exporting solar electricity where it reduces their costs.

If the rule changes are approved, customers will not see any impacts until 2024. Distribution network service providers would need to consult extensively with their customers and have their pricing structures approved by the AER before levying any export charges.[xviii] We will consider the impact of any network charges on our benchmarks in our next review of our methodology in 2024, once specific information becomes available. More information on the AEMC's draft determination is provided in the next section.

Solar customers receive upfront subsidies to reflect avoided carbon emissions

Stakeholders submitted that our benchmark should include the environmental benefits that solar generated electricity provides compared to other forms of generation. As explained previously, for our benchmarks to be useful to customers, it should reflect what retailers are actually likely to pay their customers, based on how much the solar electricity is worth to them. Retailers do not capture avoided externalities from supplying solar generated electricity. This means that if we included a value for environmental benefits in the feed-in tariffs that was paid by retailers, retailers would need to recoup this amount from their customers (including those without solar panels) through higher retail prices.

We note that solar customers currently receive an upfront subsidy for installing their panels under the Small Scale Renewable Energy Scheme (SRES) to reflect the avoided costs of carbon emissions. For a 5 kW solar system installed in Sydney, the subsidy is currently worth around $2,600.[xix]

All electricity customers pay an average of around $41 per year to subsidise customers with solar panels. Customers also pay another $55 per year (for an average bill) for other 'green costs' (including subsidies for the Renewable Energy Target, the Climate Change Fund, and the Energy Saving Scheme).[xx]

Potential changes in the market design of solar exports

The traditional model of electricity supply is changing. Smaller generators, such as solar panels, have increased rapidly over the network (known as distributed energy resources or 'DER'). Many consumers have installed solar panels and so now both import and export their electricity. However, the design and rules for the electricity market were established when electricity flowed in one direction, from a small number of large thermal generators to consumers.

Regulators and various market bodies are working to ensure that the NEM can continue to meet the needs of consumers as technology evolves.

Recently, the AEMC released a draft reform package to integrate distributed energy resources, such as small-scale solar and batteries, more efficiently into the electricity grid.

AEMC's draft ruling to allow distributed network service providers to charge for export services

On 25 March 2021, the AEMC released its draft reform package comprising the following key changes:

- **Updating the regulatory framework to clarify that distribution services are two-way and include export services.** The current rules relating to distribution services will apply to export services and officially recognise energy exports as a service to customers.
- **Promoting incentives to efficiently invest in, operate and use export services.** This is to give networks stronger incentives to deliver quality export services. Currently there are no financial penalties (or rewards) for poor (or good) network export service.
- **Enabling distribution networks to develop new tariff options, including two-way pricing for export services.** Networks may reward (or charge) customers for exports when demand is high (or low). Options could include allowing free exports up to a limit, paying extra for guaranteeing export at peak times, providing export rebates (negative pricing option), grandfathering of existing arrangements, or no export charges.
- **Allowing flexible pricing solutions at the network level.** Each network will be able to devise its own pricing structure as different networks have different capabilities and customer preferences. Each plan must be approved by the AER.[xxi]

The AEMC modelled the potential impact on customer bills if networks introduced export charges. Most retail customers could receive a small bill reduction. This reflects that customers who have not had the opportunity to invest in solar panels, would no longer be asked to pay an equal share of the costs for distribution networks to maintain or improve export services. Customers with battery storage could see more benefits. They could gain especially through export rebates (negative prices).

The AEMC is aware that some stakeholders, particularly rooftop solar owners, are opposed to the potential changes. However, its view is that rooftop solar owners are already paying a financial penalty from being constrained off the network at times and that this problem will become worse. It considers that all users can benefit by sharing the cost of upgrading distribution networks to enable more efficient two-way flows of energy (regardless of whether they have solar or not).

The rule changes, if approved, do not mandate export charges. Implementation by the networks are optional. It is expected that the networks would develop their pricing plans and options, and transition plan if introducing any charges. Networks would be required to consult with its customers and their plans must be approved by the AER. We will consider the impact of any network charges on our benchmarks in our next review of our methodology in 2024, once specific information becomes available.

Appendix

A Solar customers with batteries

In response to our Issues Paper, EnergyAustralia submitted that IPART should provide information for options in the market for consumers to manage their own energy use and costs, including for combinations of solar PV and batteries.[xxii]

This Appendix provides examples of bills for a typical customer with solar panels and a battery under both our all-day and time-dependent feed-in tariffs and retail tariffs. Currently retailers do not offer time-dependent feed-in tariffs[10], and so our indicative bill impacts analysis presents the bill outcomes that might be possible if retailers were to offer such tariffs.

Our analysis is based on a typical customer:

- with a 14 kWh battery
- with a north-facing 5 kW solar system
- consuming 5,100 kWh per year in the Ausgrid network
- receiving feed-in tariffs equal to the midpoint of our benchmark ranges (e.g. 5.05 c/kWh for an all-day feed-in tariff).

We found that a battery can reduce the overall annual bill of a typical solar customer on an all-day solar feed-in tariff from around $700 to $300 – an additional saving of around $400 per year. However, over 10 years (the typical warranty period of a battery), these additional savings ($4,000) would not offset the upfront costs of a battery (around $10,000 to $14,000 including installation of software[xxiii]).

A customer would be able to make slightly more feed-in tariff revenue on time-dependent feed-in tariffs. However this would only be the case if they also paid time-of-use retail tariffs and there are times of the day where the feed-in tariff is higher than the retail tariff – even if these times do not coincide. They could increase their additional savings (relative to a solar customer without a battery) over 10 years to around $500 per year but these additional savings would still be less than half of the upfront cost of a battery.

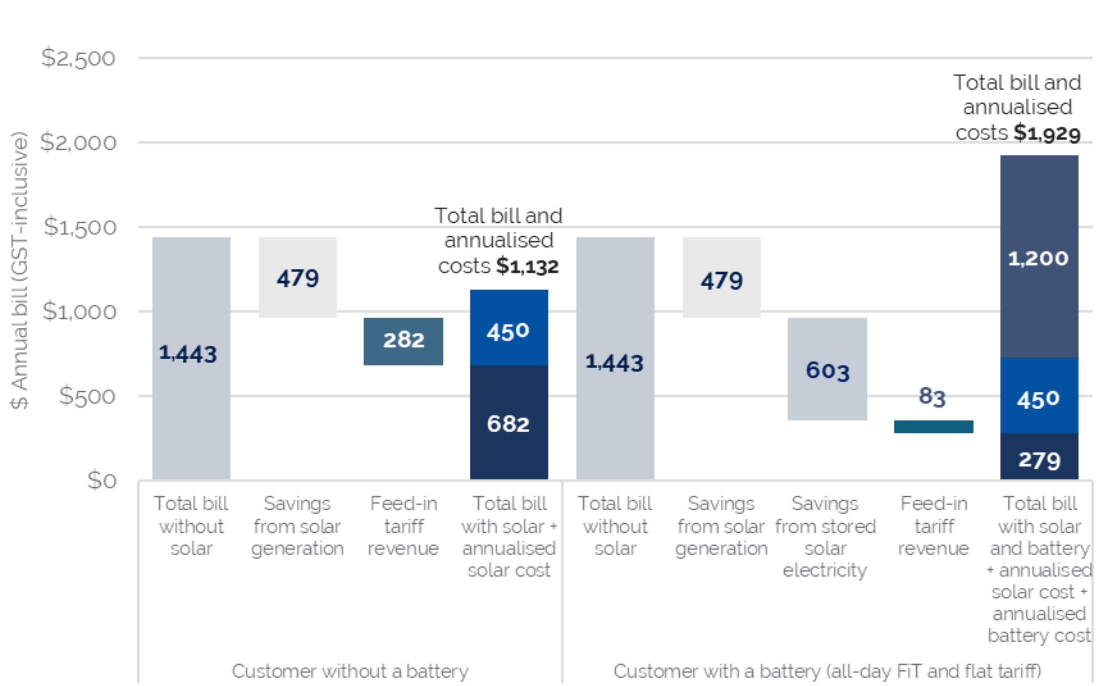
10 The exception is Amber Electric that offers a real-timer feed-in tariff that varies every 30 minutes in line with changes in the wholesale spot prices.

All-day solar feed-in tariffs

Figure A,1 compares the annual bills for a solar customer with and without batteries on an all-day solar feed-in tariff, and a flat retail tariff across the day.[11] It shows that the customer with a battery:

- would make higher savings ($1,100) by consuming the electricity they generate ($480) and using the stored solar electricity in their batteries in the evenings ($600) to avoid paying the retail prices
- would earn less feed-in tariff revenue (around $80 compared to $280)
- would have higher costs overall (around $500) because the costs of the batteries do not outweigh the additional bill savings.

Figure A.1 Bill for a typical solar customer with and without batteries



Note: In these examples, we used a feed-in tariff of 5.05 c/kWh based on the midpoint of IPART's 2021-22 feed-in tariff range of 4.6-5.5 c/kWh, a solar system size of 5 kW, daily supply charge of 88 c/day and variable charge of 22 c/kWh (including GST).

Source: IPART analysis based on data provided by the AEMC 21 May 2021.

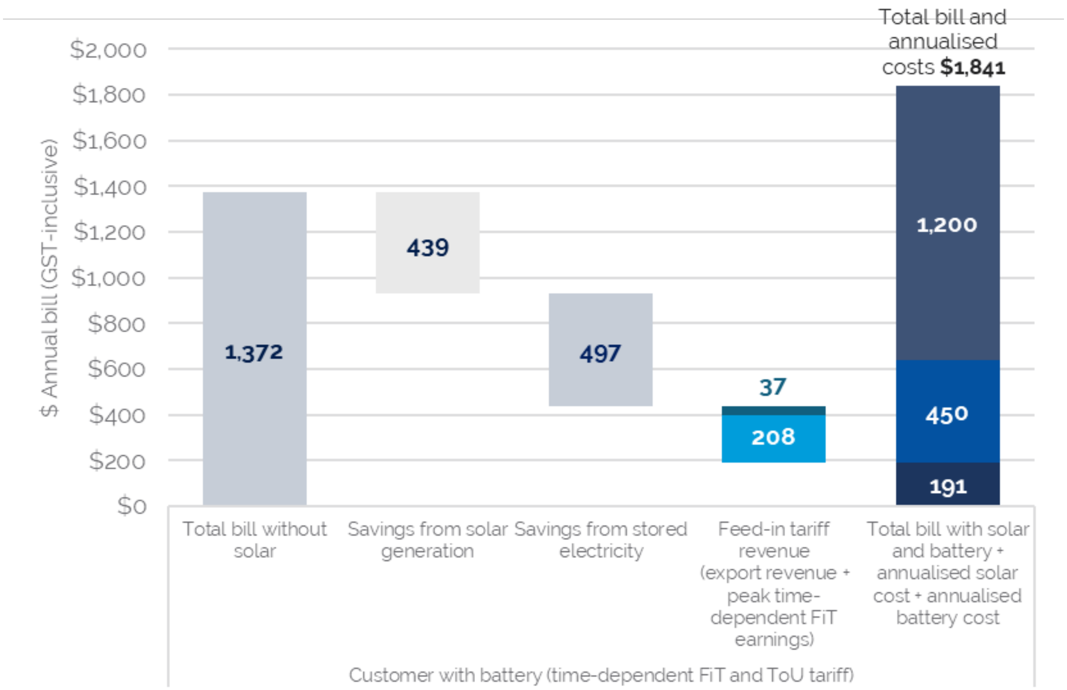
[11] Inclusive of GST. Based on typical retail charges for the Ausgrid network of 22 c/kWh and 88 cents per day in supply charges (inclusive of GST).

Time-dependent solar feed-in tariffs

Compared to a customer on an all-day feed-in tariff, a customer on a time-dependent solar feed-in tariff that pays time-of-use retail tariffs, could reduce their bill by a further $100 – to around $200 in total (Figure A.2). Time-of-use retail tariffs are retail offers where the price of electricity changes throughout the day. The variable usage charge is highest during peak periods (typically between 2 – 8 pm) and lowest during off-peak periods (typically 10 pm to 7 am and weekends).

Instead of using the solar generated electricity stored in their batteries in the late evenings when off-peak retail prices are low, a customer could choose to import electricity (e.g. pay the 11.7 c/kWh off-peak retail prices) and export earlier in the day when the time-dependent feed-in tariff is higher (e.g. receive a 13 c/kWh feed-in tariff between 5 pm to 6 pm). Over a year, a customer could earn around $200 from exporting the stored electricity in their battery when the feed-in tariff is high, while using their battery, in addition to around $40 of revenue from exports during the day.

Figure A.2 Typical bill for a customer with a battery under flat retail and time-of-use retail tariffs



Note: For our time-of-use retail tariffs we used, inclusive of GST, 98.9 c/day for the daily supply charge, a peak price of 36.4 c/kWh (2 to 8 pm), a shoulder price of 18.6 c/kWh (7 am to 2 pm and 8 pm to 10 pm) and an off-peak price of 11.7 c/kWh (10 pm to 7 am and weekends).

Source: IPART analysis based on data provided by the AEMC 21 May 2021.

B Data sources – solar generation and household consumption

As mentioned earlier in this report, it is difficult for customers to calculate their bills for different offers, because they need their gross generation data and gross consumption data by time of day to work out which offer is best for them. However, the net meters used at customer premises, do not capture this information. Table B.1 provides additional information on potential sources of generation and consumption data that could instead be used to capture some of this information.

Table B.1 Potential sources of electricity consumption and/or solar generation data in NSW

Organisation	Organisation type	Data collected	Use	Variables not captured	Latest available data
Australian Energy Market Commission (AEMC)	Federal Government agency	Half-hourly interval data: • Analysis of electricity consumption based on net system load profiles by network from AEMO • Analysis of solar generation for different panel orientations (north, east, south and west or azimuth, 0, 90, 180 and 27) and panel size for 365 days each for locations within each network, based on weather data from the BOM	Analysis for public reports	• Household size • Dwelling type	2018
Australian Energy Regulator (AER)	Commonwealth Government agency	Average annual and seasonal electricity consumption by: • Network areas • With and without solar panels • Climate zone • Household size	Reporting on residential energy consumption benchmarks, for various regulatory applications (e.g. calculating default market offers, comparing annual bills for different offers on Energy Made Easy)	• Half-hourly interval data • Panel size/orientation. Not all variables are reported by network and/or state.	2020
Victoria Energy Policy Centre	Research Centre	For households with solar panels by state: • Total consumption: • Grid purchases • Self-consumption • Solar production • Solar exports • Bills	Analysis for the report: Using electricity bills to shine a light on rooftop solar photovoltaics in Australia, A comparison of prices, volumes and socio-economic rank of households with and without rooftop solar photovoltaics (PV) based on information in electricity bills - A report for Solar Citizens, November 2018	• Half-hourly interval data • Panel size/orientation • Household size • Dwelling type	2018
Ausgrid	Electricity Network	Half-hourly interval data for electricity consumption for solar and non-solar customers (residential and small businesses) for 2 years	n/a	• Panel size/orientation • Household size • Dwelling type	2018

Organisation	Organisation type	Data collected	Use	Variables not captured	Latest available data
Solar Analytics	Company – produces solar energy monitoring devices	Data for 500-5000 sites: • Half-hourly interval Solar generation • Half-hourly interval Solar exports • Half-hourly interval Grid imports • Panel size/capacity • Panel tilt/orientation • Solar system panel and inverter brand • Battery, electric hot water, pool, electric vehicle • Offer - Flat or Time of use tariffs • Postcode	For customers with solar monitoring devices and third parties	• Household size • Dwelling type	2021
Wattwatchers	Company – produces energy monitoring devices	Half-hourly interval, daily and monthly data available for 3 years • Solar generation • Solar exports • Grid imports • Consumption	For customers with energy monitoring devices and third parties	• Panel orientation • Household size • Dwelling type	2021
SMA Australia	Company – solar inverter manufacturer	Solar generation and household energy data	For customers with solar inverters only (not shared due to strict privacy agreements)	n/a	2021
PhiSaver	Company – produces electricity monitoring devices	Minute, half-hourly, daily site data: • Household consumption (grid imports, power points, lights, hot water) • Solar generation	For customers with energy monitoring devices, third parties (including universities)	• Panel orientation • Household size • Majority of sites are in Queensland	2021

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i IPART, Solar feed-in tariff benchmark, April 2020, p 2.
ii AEMC, Final Report Residential Electricity Price Trends 2020, December 2020, p 9.
iii AER, Final Determination, Default Market Offer Prices 2021-22, April 2021, p 15.
iv Based on data provided by Endeavour Energy, Essential Energy and Ausgrid on small customer numbers as at 30 June 2020.
v Estimated from data provided by Endeavour Energy, Essential Energy and Ausgrid; NSW Department of Planning, NSW 2019 Population Projections; Small Business Commissioner, The NSW small business landscape at a glance, last accessed 8 February 2021.
vi Data from Australian Energy Council, 5 February 2021; Clean Energy Council, Clean Energy Generation in 2019.
vii Both AGL and Climate Change Balmain-Rozelle submitted that we should have a time-dependent feed-in tariff benchmark available at all times of the day to support solar exports from batteries. AGL submission to IPART Issues Paper, March 2021, p 2; Climate Change Balmain-Rozelle submission to IPART Issues Paper, March 2021, p 4.
viii Solarchoice, Solar panels cost data: Solar Choice Price Index | June 2021, accessed 8 June 2021.
ix Australian Energy Council submission to IPART Issues Paper, March 2021, p 1; Climate Change Balmain-Rozelle submission to IPART Issues Paper, March 2021, p 1.
x Climate Change Balmain-Rozelle submission to IPART Issues Paper, March 2021, p 1.
xi PIAC submission to IPART Issues Paper, March 2021, p 2.
xii Red Energy and Lumo Energy submission to IPART Issues Paper, March 2021, p 2.
xiii PIAC submission to IPART Issues Paper, March 2021, pp 1-2; Energy Australia submission to IPART Issues Paper, March 2021, p 3.
xiv G.Harris submission to IPART Issues Paper, March 2021.
xv Anonymous submission to IPART Issues Paper, March 2021.
xvi D.Curtis submission to IPART Issues Paper, March 2021.
xvii Anonymous submission to IPART Issues Paper, March 2021; E.Ellis submission to IPART Issues Paper, March 2021; D.Curtis submission to IPART Issues Paper, March 2021.
xviii AEMC, Consumer FAQs: How the AEMC proposes making room on the grid for more solar and new-tech energy, March 2021, p 2, accessed 28 April 2021.
xix IPART calculation based on: Australian Government Clean Energy Regulator Rec Registry, Small generation unit STC calculator, accessed 9 February 2020; and Ecosave, Spot Trade Market Update, accessed 9 February 2020.
xx AEMC, Residential electricity price trends report - End-year 2020, 21 December 2020, p 16.
xxi AEMC, Integration of distributed energy resources, March 2021, accessed 8 April 2021; AEMC, Have your say: Making room for more solar and new tech energy – infographic, March 2021, accessed 8 April 2021.
xxii Energy Australia submission to IPART Issues Paper, March 2021, p 2.
xxiii Canstar Blue, Tesla Powerwall Review & Guide, accessed 8 June 2021.