Independent Pricing and Regulatory Tribunal
New South Wales

Solar feed-in tariffs

The value of electricity from small-scale solar panels in 2018-19

Issues Paper
Electricity

March 2018

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The Independent Pricing and Regulatory Tribunal (IPART)

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Tribunal Members

The Tribunal members for this review are:

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Invitation for submissions

IPART invites written comment on this document and encourages all interested parties to provide submissions addressing the matters discussed.

Submissions are due by 16 April 2018.

We would prefer to receive them electronically via our online submission form <www.ipart.nsw.gov.au/Home/Consumer_Information/Lodge_a_submission>.

You can also send comments by mail to:

2018 Solar feed-in tariff review
Independent Pricing and Regulatory Tribunal
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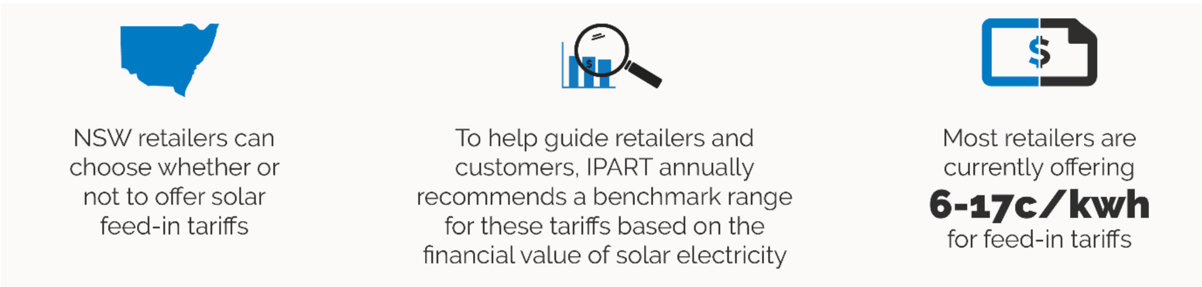
1 Introduction

In NSW more than 10% of households and small business premises have installed a solar photovoltaic (PV) system (commonly called solar panels).[1,2] When these solar customers use the electricity generated by their solar panels rather than buying electricity from their retailer, they save money. When they don't use all this electricity themselves, the excess amount is exported to the grid, and they may be paid a 'solar feed-in tariff' for this electricity.

Retailers aren't obliged to pay solar customers a solar feed-in tariff. Rather, they can choose whether to do so in their market offers to solar customers. And if they do, they set this tariff themselves. Currently, most retailers do offer a solar feed-in tariff of between 6 cents and 17 cents per kilowatt hour.

To help retailers in setting their solar feed-in tariffs, and solar customers in deciding whether these tariffs are reasonable, the Independent Pricing and Regulatory Tribunal of NSW (IPART) has set a 'benchmark range' for solar feed-in tariffs for each year since 2012. This range provides guidance on the value of electricity exported to the grid by solar customers in NSW in the coming financial year.

The NSW Government has asked IPART to continue to review the solar feed-in tariffs. The purpose of this paper is to discuss the main issues we need to consider for this review, and to outline our preliminary views on the approach we will use to set the benchmark range. We invite all interested parties to comment on these issues and preliminary views.



1.1 What have we been asked to do?

We have been asked to review benchmark ranges for solar feed-in tariffs in NSW annually for the next three financial years.[3] We will provide our benchmark ranges to the Minister for Energy and Utilities (the Minister) by 30 June in each year.

1 Department of Planning and Environment, *Solar Panels and Systems*, *https://www.resourcesandelectricity.nsw.gov.au/electricity-consumers/solar/solar-panels*, accessed 14 February 2018.

2 AER, *NSW – Small Customers*, https://www.aer.gov.au/retail-markets/retail-statistics/nsw-small-customers, accessed 14 February 2018.

3 We have been asked to conduct this review under Section 9 of the IPART Act.

Our Terms of Reference indicate that the benchmark range we recommend:

- should not lead to solar feed-in tariffs that contribute to higher retail electricity prices, and
- should operate in a way that supports a competitive electricity market in NSW.

Essentially, these two conditions mean that we cannot set the benchmark range higher than the financial value of the electricity exported by solar customers to a retailer – that is, the price it would pay to purchase that electricity from the National Electricity Market (NEM).

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.

The full Terms of Reference are provided in Appendix A.

1.2 What issues are we considering?

The approach we have used in previous reviews for setting the benchmark range has been developed over a number of years in consultation with stakeholders. It is based on our forecast of what retailers would pay if they were buying electricity in the wholesale market, instead of using solar exports to supply their customers.

We estimate this value based on the expected average price of wholesale electricity for the next year, and the difference between this average price and the prices when households are exporting their solar electricity to the grid (the solar output-weighted average price). For example, in last year's review of the benchmark range, we found that on average, wholesale prices at the times when solar was exporting to the grid were around 15% higher than the average electricity price across the year.

We consider this approach continues to be broadly appropriate, and do not propose major changes. Therefore, for this review we are considering whether we can improve the data sources that we use to forecast the value of solar exports for the coming year, and how we set the benchmark range using these values. In particular, we are interested in which years of historical data we should use for these forecasts, and how we could incorporate data from all three network areas in future years.

In previous reviews, we have used a historical set of solar export data and wholesale prices back to 2009-10 to estimate the difference between the price of wholesale electricity when solar is being exported to the grid and the average price of wholesale electricity across the whole day for future years. This is because 2009-10 is the first year that we received information about how much solar electricity is being exported to the network across the day.

However, since 2009, there have been changes in demand and supply which mean that it is possible that some of these years are no longer good predictors of the likely value of solar exports in the future. For example, prices in the early afternoon have tended to be lower in recent years than they were in 2009-10 and 2010-2011 because solar is meeting an increasing proportion of demand at this time.

In selecting the historical data, we need to balance the likelihood that future years will continue to be like previous years, against having sufficient and reliable data to establish a representative relationship between average wholesale prices, and wholesale prices when solar electricity is exporting to the grid.

In previous reviews, we only received a large enough data set from the Ausgrid network (which covers Newcastle and most of Sydney). We used this information to understand how much solar electricity is exported to the grid at different times of the day. Most customers in the Endeavour Energy network (which covers South-Western Sydney and the Illawarra) and the Essential Energy network (which covers all areas outside of Sydney, Newcastle and the Illawarra) had accumulation meters or time-of-use meters that did not record data half-hourly, and therefore we did not receive a large enough data set for these networks. However, this year we have received solar export data for a sample of 500 customers for all three networks.

We would like to collect another year of data from the Endeavour Energy and Essential Energy networks to ensure that the data provided is representative before we incorporate it into our benchmark ranges. However, we are interested in how we could use the data in future years.

We are also consulting on how we should set our benchmark ranges. In previous years we set a benchmark range based on the value of electricity at different times of the day that solar electricity is being fed into the grid.

We set the top of the range based on the value of solar electricity when wholesale prices were likely to be highest and solar was exporting to the grid (peak) and the bottom of the range based on the value of electricity at all other times (off-peak). This benchmark range could assist retailers to set solar feed-in tariffs for different times of the day to reflect the value of this electricity. In previous years we found the peak was between 2 and 4 pm, but because higher prices have occurred later in the day in the last two years, the peak now occurs after 4 pm.

In practice, to date retailers have only offered a flat all-time solar feed-in tariff across the whole day, rather than different feed-in tariffs for peak and off-peak times. For customers being offered a flat feed-in tariff, a benchmark rate that reflects the value of solar exports across the day is the most relevant comparator.

Our preliminary modelling is suggesting that in 2018-19, on average across the day the value of solar exports is around 8-9 cents per kilowatt hour for solar electricity. This is lower than our forecast of the value of solar electricity across the day for 2017-18. The main reason for this is that ASX baseload electricity contract prices are indicating that average prices for wholesale electricity next year will be lower in 2018-19, as substantial new generation capacity is expected to enter the market (mainly large-scale renewables). These suggest average wholesale prices will fall to around 8c/kWh, compared to around 11c/kWh when we published our Final Report last year.

In addition, the increasing penetration of solar electricity in NSW over time has meant that less electricity needs to be produced by power stations in the middle of the day and into the afternoon. Over the years this has contributed to a lower number of price spikes for wholesale electricity over the whole afternoon period when solar is exporting to the grid.

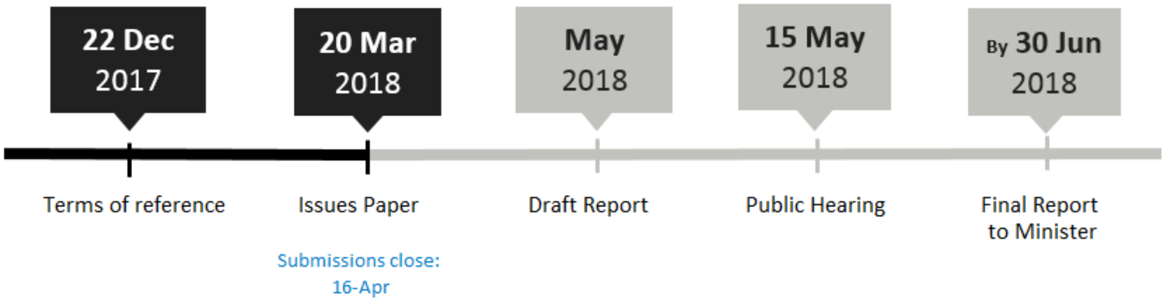
Therefore on average, the difference between the price of wholesale electricity when solar is exporting, compared to the price of wholesale electricity at all other times is reducing.

1.3 How can you contribute to the review?

This Issues Paper is the first step in our public consultation. In preparing this paper, we have considered advice from Frontier Economics (Frontier). We commissioned Frontier to review our existing approach for the benchmark range and recommend ways to improve it. We have included Frontier's recommendations throughout this report for consultation. Frontier's report is available on our website.

We invite all interested parties to make submissions in response to the issues raised in this paper, and other issues they consider are relevant and within the Terms of Reference and scope of the review.

We will consider all submissions made to our Issues Paper and release a Draft Report for public comment in early May. We will also hold a public hearing on 15 May to provide stakeholders with a further opportunity to comment or seek clarification on our Draft Report. We will consider all submissions and comments on our Draft Report before releasing our Final Report at the end of June. We will update this timetable on our website as the review progresses.



We expect that the approach that we use for 2018-19 will be applied in the following two years, updated for the forecast average wholesale price, the solar multiplier, and loss factors. However, we recognise that solar and energy markets are dynamic. For our annual reviews in 2019 and 2020 we would consult with stakeholders on any changes in solar and energy markets that would impact on our approach to calculating solar feed-in tariffs. We would issue a fact sheet at the beginning of each calendar year calling for submissions, followed by a Draft Report with our draft benchmark ranges. We will provide our final benchmark ranges to the Minister in June of each year.

1.4 What does the rest of this paper cover?

The rest of this paper provides more detail on the review and the issues on which we seek comment:

- Chapter 2 outlines the context for this review
- Chapter 3 outlines our proposed approach for setting the benchmark range, and explains why this approach is appropriate for meeting our Terms of Reference
- Chapter 4 discusses how we are proposing to calculate the value of solar electricity in 2018-19, and the issues on which we particularly seek stakeholder comment.

1.5 List of issues on which we seek comment

The issues on which we particularly seek stakeholder comment are highlighted throughout this Issues Paper. For convenience, these issues are also listed below. Stakeholders are also free to raise any other issues that are directly relevant to this review.

We seek feedback on the following:

2 Context for this review

In 2008, there were only a few thousand solar customers in NSW. Since then, the uptake of solar panels has grown rapidly, and there are now 350,000 households and small business solar customers – or around 10% of all small customers.[4] This growth has been supported by the falling cost of solar panels and rising retail electricity prices, as well as subsidies provided through government schemes (Box 2.1).

As context for our review, the sections below outline:

- how the uptake of solar panels has affected NSW's electricity requirements
- how customers can benefit financially from having solar panels
- the feed-in tariffs currently on offer, and how these have changed over time, and
- whether higher solar feed-in tariffs lead to lower electricity bills.

Box 2.1 Government support for solar customers

The Small-scale Renewable Electricity Scheme (SRES) is a Commonwealth Renewable Electricity Target scheme that provides one upfront payment (subsidy) to households and small businesses when they install solar panels. The size of the subsidy varies with the size of the system installed, as it is based on the expected generation from the system until the SRES ends in 2030. Currently, the subsidy ranges from around $800-$1,000 for a 1.5 kW system to around $3,000 for a 5 kW system, which covers around 25-35% of the total system costs. The costs of the SRES subsidy are paid for by retailers, and passed onto customers through electricity retail prices.

The NSW Solar Bonus Scheme provided a subsidised feed-in tariff to solar customers between 2010 and 2016. Initially, the feed-in tariff was set at 60c/kWh, and was reduced to 20c/kWh for new participants after 27 October 2010. The scheme was closed to new participants on 1 July 2011, and ended on 31 December 2016. Over the life of the scheme the total amount paid in feed-in tariffs was around $1.5 billion. This cost was funded through a levy on electricity distribution networks, which was passed on to all electricity customers in NSW.

Note: The values for financial incentives under the SRES assume the solar unit is installed in Sydney on 1 March 2018. The dollar range is based on certificate prices of $30 and $38.

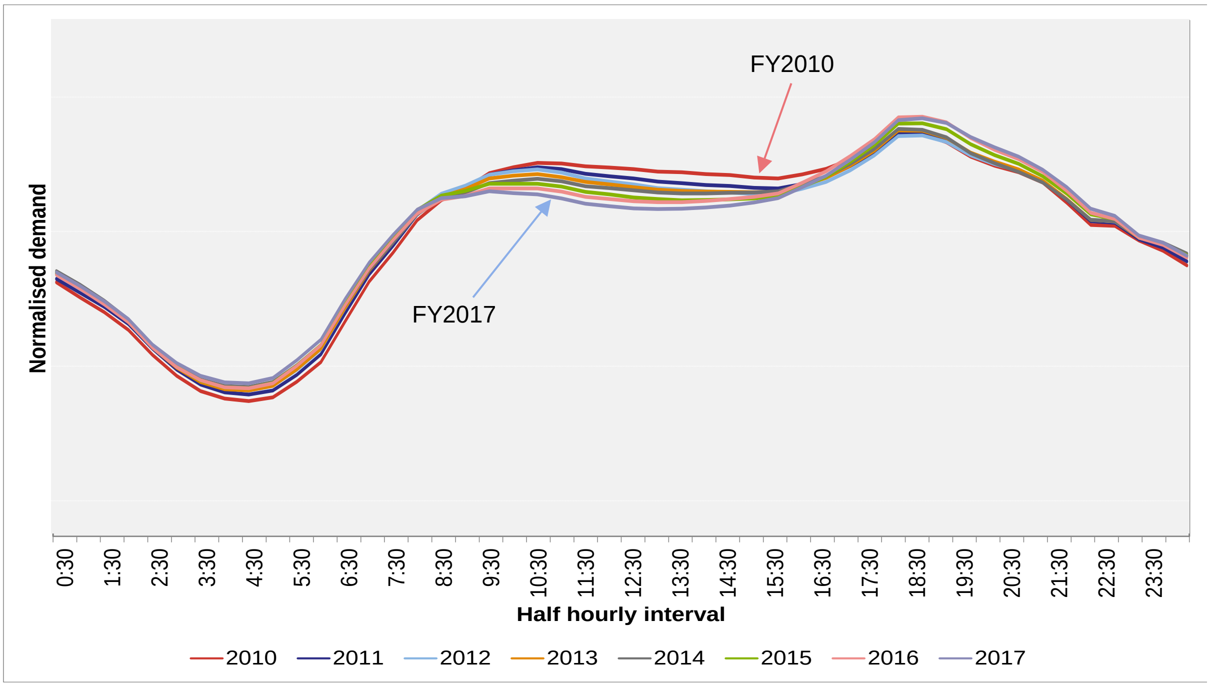
Source: IPART, *Solar feed-in tariffs,* Final Report, March 2012, pp 145-148; Clean Energy Regulator, *Small generation unit STC calculator*, https://www.rec-registry.gov.au/rec-registry/app/calculators/sgu-stc-calculator, accessed 22 February 2018; Green Electricity Markets, *STC Market Prices,* http://greenmarkets.com.au/resources/stc-market-prices, accessed 22 February 2018. Solar Choice, *Current Solar System Prices: Residential and Commercial*, *https://www.solarchoice.net.au/blog/solar-power-system-prices*, accessed 23 February 2018.

4 https://www.resourcesandelectricity.nsw.gov.au/electricity-consumers/solar/solar-panels, accessed 10 Janury 2018.

2.1 How has the uptake of solar panels affected NSW's electricity requirements?

The uptake of solar panels in NSW has contributed to a reduction in the system-wide demand for electricity from the National Electricity Market (NEM), particularly during the middle of the day when solar generation tends to be highest. Figure 2.1 shows that in the middle of the day, demand has progressively reduced during daylight hours between financial years 2010 and 2017.

Figure 2.1 Average daily demand shape in NSW for 2009-10 to 2016-17



Note: Data has been normalised to keep the **total** output in each year constant to show the shift in *when* electricity is being consumed.

Data source: Frontier Economics, *2018 Solar Feed-in Tariff Review,* Draft Report, March 2018, p 19.

In the future, the uptake of solar panels could also affect the level of peak demand, as more solar customers install battery systems so they can store the electricity they generate and then use or export it when they choose. As at 31 December 2017, there were around 1,600 solar customers with battery systems in NSW.[5] However, this is expected to increase as the cost of batteries falls over time.[6]

5 Australian Energy Council, *Solar Report – January 2018*, p 6.

6 Some other states are providing upfront subsidies to support the uptake of battery systems. For example, the ACT Government is providing $25 million worth of grants to companies installing batteries, ACT Government, *actsmart battery storage factsheet, https://www.actsmart.act.gov.au/__data/assets/pdf_file/0004/854779/Actsmart-Battery-Storage-Factsheet_11May2017.pdf*, accessed 14 March 2018. South Australia's virtual power plant, http://ourenergyplan.sa.gov.au/virtual-power-plant, accessed 21 February 2018.

2.2 How can consumers financially benefit from solar panels?

Having solar panels benefits customers in different ways, depending on their metering arrangements. Currently, most customers in NSW have **net meters**. This means that:

- the electricity they generate with their solar panels is used to power the appliances running in their home at the time the electricity is generated,
- when they generate more electricity than they need to power their home, the excess amount is exported to the grid and the customer may receive a solar feed-in tariff for this amount (if such a tariff is included in their market offer), and
- when they generate less electricity than required to power their home (such as at night when their solar panels are not generating power), the shortfall is imported from the grid and the customer pays the retail price for this amount.

When customers with net meters use the electricity they generate to power their home, they save money because they don't need to buy this electricity from their retailer. This saving is typically the largest financial benefit of having solar panels. The savings are usually significantly more than the revenue customers make from solar feed-in tariffs when they are generating more electricity than they need.

Some customers still have **gross meters**. These customers export (and earn the feed-in tariff offered by their retailer for) every kWh of electricity generated by their solar panels, and import (and pay the retail price for) every kWh they use to power their home.

Customers with gross meters only tend to be better off than if they had a net meter if their feed-in tariff is higher than the retail price of electricity. This was the case for those who received subsidised feed-in tariffs under the Solar Bonus Scheme, until it closed in December 2016.

For example, consider an offer with an all-time retail tariff of 30 c/kWh, and a feed-in tariff of 10 c/kWh. For customers with a gross meter, for each kilowatt hour they use at the same time their panels are exporting electricity, they pay the full 30 cents to their retailer, and receive 10 cents for the electricity they generate. They save 10 cents in total and pay a net amount of 20 cents for this electricity. By contrast, with a net meter, for each kilowatt hour a customer generates and uses, they receive no feed-in tariff, but they save the full 30 cents on the retail price of electricity because they can avoid purchasing this electricity from their retailer.

Customers who still have gross meters can ask their retailer to install a net meter. Retailers may charge customers for the costs of the meter and installation. However, we note that throughout 2017, it sometimes took several months for net meters to be installed. The Energy and Water Ombudsman (EWON) received a large number of complaints about installation delays. These delays were due to installations taking more time than expected, a lack of qualified installers, aged/damaged house/meter wiring, the presence of asbestos or other meter board/box quality issues; and problems with access to meters. EWON is working with providers regarding these issues.[7]

[7] EWON, *Consumer Issues*, 16 March 2018, https://www.ewon.com.au/page/publications-and-submissions/annual-reports/2016-17/consumer-issues

2.3 What solar feed-in tariffs are retailers offering customers?

Retailers aren't obliged to pay solar customers a solar feed-in tariff. Rather, they can choose whether to do so in their market offers to solar customers. And if they do, they set this tariff themselves. As part of our review, IPART is required to report on the feed-in tariffs currently being offered by each retailer, and to note whether they were within the benchmark range.

In January this year, we found that 20 of the 26 retailers operating in NSW included a solar feed-in tariff in their market offers, and that the tariffs varied from 6 to 17 cents (Figure 2.2). They all offered the same feed-in tariff across each network area where they were selling electricity.

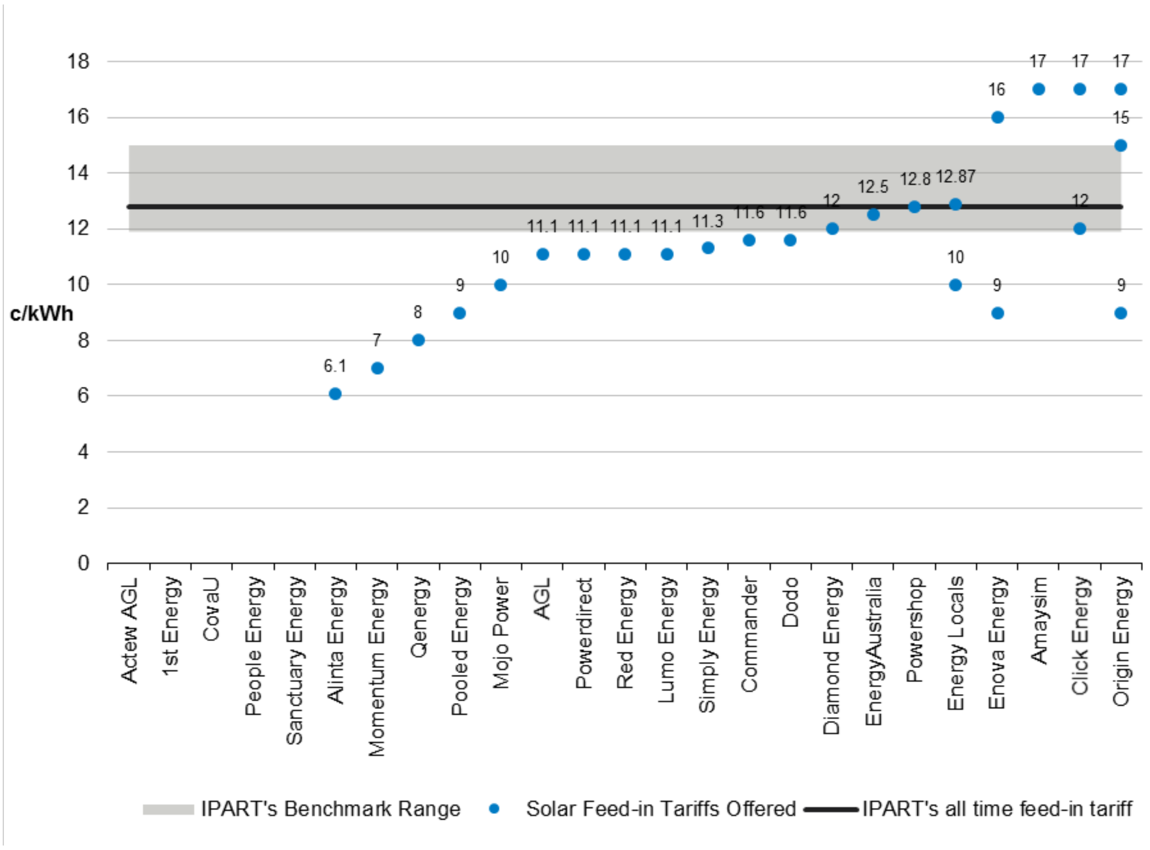
Our recommended benchmark range for the current financial year (2017-18), was from 11.9 (for off-peak times) to 15.0 cents per kilowatt hour (at peak times) (c/kWh) (not including GST).[8] We note that all retailers offered a flat all-time rate across the whole day, rather than different feed-in tariffs for peak and off-peak times. IPART's equivalent all-time benchmark was 12.8 cents.

When comparing retailers' all-time feed-in tariffs to our benchmark feed-in tariff range we found that of the retailers offering tariffs:

- Fourteen offered a solar feed-in tariff that was below IPART's all-time benchmark feed-in tariff of 12.8 cents, and 12 of these were below the lower end of the benchmark range. The lowest of these was 6.1 c/kWh.
- Six offered a feed-in tariff equal or greater than IPART's all-day benchmark, with four retailers offering more than 15.0 c/kWh (the upper end of the benchmark range). The highest of these was 17 c/ kWh, which was offered by three retailers.
- Three retailers had more than one solar feed-in tariff option.

8 IPART, *Solar feed-in tariffs – benchmark range 2017-18*, Final Report, June 2017, p 1.

Figure 2.2 Solar feed-in tariffs available in NSW, based on retailers' market offers in January 2018



Note: Enova Electricity's was only retailing in the Essential Energy network area and Pooled Electricity was only supplying electricity in the Ausgrid and Endeavour Energy network areas.

Data source: www.energymadeeasy.com.au

2.4 Do higher feed-in tariffs lead to lower electricity bills?

When solar customers are comparing retailers' market offers, the level of the feed-in tariff included in the offer is not the only factor they should consider.

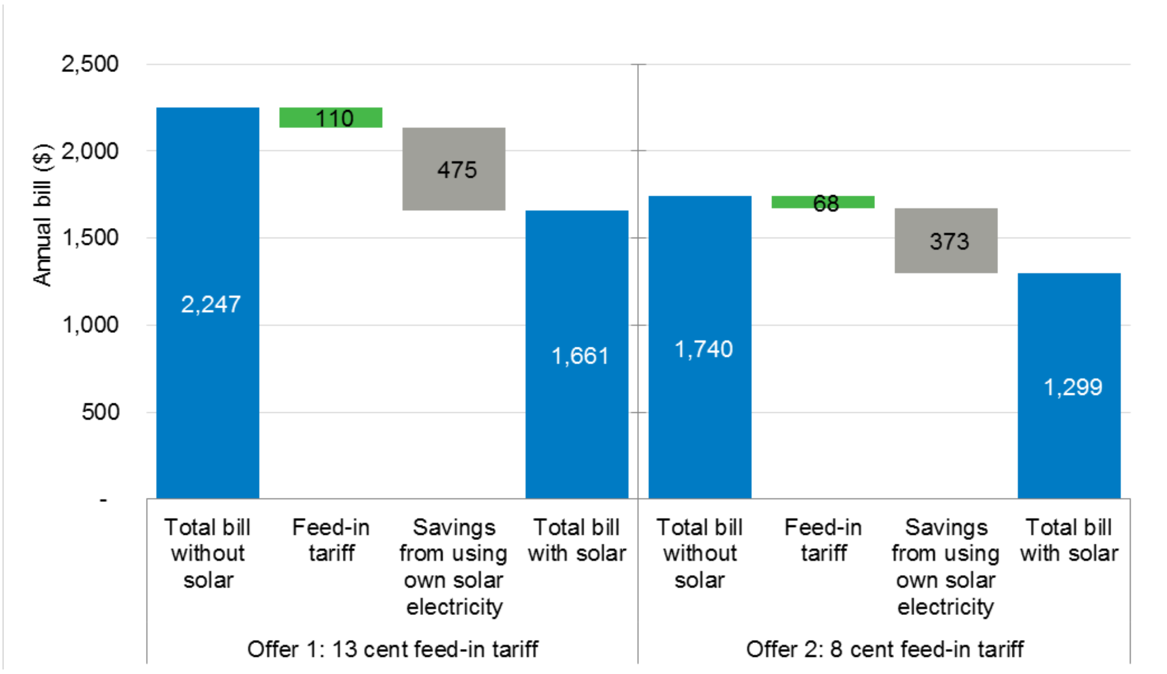
Most solar customers import much more electricity than they export, and so the most important driver of their bills would still be the price they pay to buy electricity when the solar panels are not generating, such as at night or on cloudy days when the sun is not shining. Customers also pay a fixed retail charge of around 80 cents to $1.50 per day. Other important factors are the terms and conditions associated with the offer, such as any contract period, early termination fees etc. This means that offers with higher feed-in tariffs will not necessarily result in lower bills.

For example, consider two typical offers:

- The first offers a **13 cent** feed-in tariff, and charges **28 c/kWh** for electricity, plus a daily supply charge of **95 cents per day**.
- The second offers a lower feed-in tariff of **8 cents** feed-in tariff, and charges **22 c/kWh** plus a daily supply charge of **85 cents**.

Figure 2.3 shows that for a solar customer with a 2 kW system (around 8 panels) consuming 6,500 kWh per year and exporting around **one-third** of the electricity to the grid (and using the rest to supply their home), their annual bill would be higher for Offer 1 with the higher feed-in tariff ($1,661, compared to $1,299 on Offer 2 which has the lower feed-in tariff).

Figure 2.3 Comparison of two offers with different solar feed-in tariffs (exporting one-third of generation)



Note: in this example, the 2 kW solar system generates 2,546 kWh per year.

Data source: IPART

Even if the same customer exported **two-thirds** of their solar energy to the grid (and only use one-third), they would still be better off on Offer 2, which has the lower feed-in tariff (in this scenario, the annual bill for Offer 2 would be $1,418, compared to $1,788 on Offer 1).

For both Offers 1 and 2, the customer is better off using more of the electricity that they generate (so they buy less from their retailer) rather than exporting more of their solar electricity to the grid.

Similarly, our 2016 review of retail offers for solar customers found that the offer with the highest feed-in tariff was unlikely to provide the best overall electricity deal. We found that an average customer with a 1.5 kW system could save around $200 by moving from the highest feed-in tariff offer to the best offer overall.[9]

9 IPART *Fact Sheet, Solar customers should shop around for the best retail electricity offer*, November 2016, pp 8-9.

3 Our proposed approach

As Chapter 1 noted, the our Terms of Reference for this review indicate that the benchmark range we recommend:

- should not lead to solar feed-in tariffs that contribute to higher retail electricity prices, and
- should operate in a way that supports a competitive electricity market in NSW.

Essentially, these two conditions mean that we cannot set the benchmark range higher than the financial value of the electricity exported by solar customers to a retailer – that is, the price it would pay to purchase that electricity from the National Electricity Market (NEM).

These parameters are the same as those for our previous reviews of solar feed-in tariffs. Therefore, we propose to use the same approach we used to recommend the benchmark range for our 2017 review. This approach has been developed and refined over several years in consultation with stakeholders. It continues to be broadly appropriate, although we are interested in stakeholders' views on how it can be incrementally improved.

The sections below provide an overview of our proposed approach. The chapters that follow discuss each of the main steps in the approach in detail and identify the issues on which we particularly seek stakeholder comment.

3.1 Overview of proposed approach

Our proposed approach for determining a benchmark range for solar feed-in tariffs involves three main steps:

1. **Estimating the value of electricity exported by solar customers to retailers.** This value represents the savings retailers make when they receive electricity generated by solar customers instead of purchasing the equivalent electricity amount of electricity from the NEM.
2. **Converting this value into a range.** In previous years, we have set the range based on the different value of solar exports at different times of the day.
3. **Updating the benchmark range.** We will use the latest inputs to update our value of solar exports to update our benchmark range each year.

The next sections explain each of these steps in more detail.

3.2 How do we propose to estimate the value of solar electricity?

When solar customers export their solar electricity to the grid, it is used to supply other households. This reduces the amount of wholesale electricity that retailers have to buy from the NEM. Because of this, solar exports are reported in the NEM through a lower demand profile, and so retailers do not have to pay NEM fees and charges on this electricity. However, they do have to pay network fees and the costs of environmental policies on all electricity that they supply.

As for our 2017 review, our estimated value of solar electricity is based on these savings to retailers. They include:

- wholesale electricity costs, which we calculate using:
  - the **forecast average wholesale spot price** for electricity in NSW for the forthcoming year, and
  - a **solar multiplier** or factor that reflects that solar exports may occur at times when wholesale spot prices are either higher or lower than this average
- a **loss factor** that accounts for the losses that occur when electricity is transported long distances on the network from where it is generated to where it is consumed, and
- the **NEM fees and charges** that retailers incur when they purchase electricity on the NEM.

These savings are summarised in the following formula:

Forecast average wholesale price × *solar multiplier* × *loss factor* + *NEM fees and charges*

The forecast average wholesale spot price is by far the largest component of the estimated value of solar exports, accounting for around 80% in previous years. Losses and NEM fees and charges are relatively small components.

We discuss each of these components in detail in the next chapter.

3.2.1 Why do we focus on the value of solar electricity to retailers?

To ensure the benchmark range for solar feed-in tariffs does not result in higher retail electricity prices and supports a competitive electricity market, this range must not exceed the savings retailers are likely to make when they supply electricity from solar customers rather than buy it on the NEM.

Retailers would incur a loss if they paid more for solar exports than they would if they purchased the electricity from the NEM.

If retailers increased their retail tariffs to cover this loss, this would make customers without solar panels worse off. These customers are often renters or customers who cannot afford to bear the upfront cost of solar panels. Alternatively, retailers could avoid this cost by choosing not to supply solar customers, which would reduce the competition in the retail market for solar customers.

In previous reviews, stakeholders have argued that:

- the value of solar customers' exports to retailers is equal to the retail price of electricity, and so solar feed-in tariffs should equal this price,
- solar customers' exports reduce wholesale electricity prices, and solar feed-in tariffs should include a value for lower wholesale prices,

- solar customers' exports create benefits for electricity networks, and solar feed-in tariffs should reflect the value of these benefits, and
- solar customers' exports create social benefits and solar feed-in tariffs should reflect the value of these benefits.

We do not agree with these arguments, for the reasons outlined below.

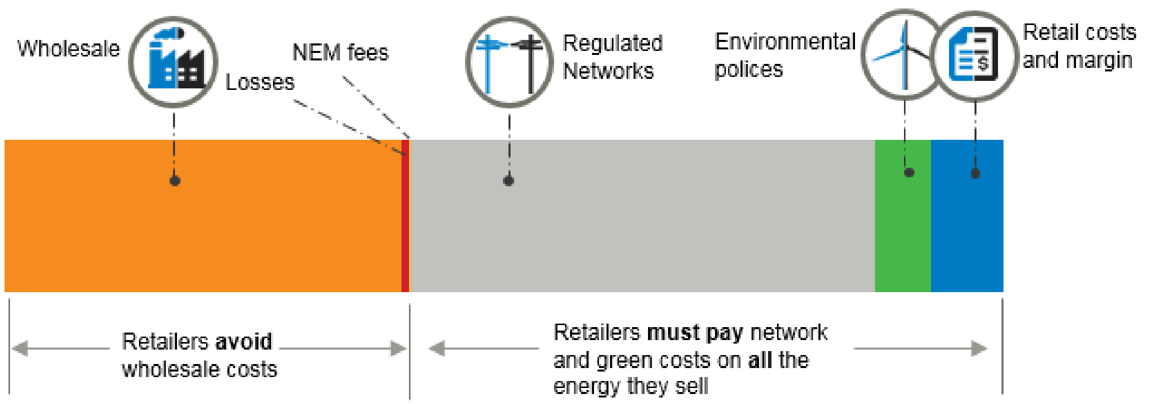
How do retailers save from solar exports?

The price retailers charge customers for the electricity they supply recovers a range of cost components, including:

- the wholesale costs of purchasing the electricity on the NEM, which include the wholesale price plus associated costs, fees and charges
- network costs, which retailers pay the network businesses for transporting the electricity to the customers' premises
- green scheme costs, including retailers' obligation to purchase renewable energy certificates (under the Commonwealth Renewable Energy Target) and energy savings certificates (under the NSW Energy Savings Scheme) in line with government environmental policies, and
- retail costs, which retailers incur in serving their customers, and which include costs related to billing, responding to customer inquiries, and complying with regulations.

For each kilowatt hour that solar customers export to the grid, retailers avoid paying the wholesale costs of purchasing this electricity on the NEM. Figure 3.1 shows that the wholesale costs of purchasing electricity on the NEM typically make up around 30-40% of retailers' total costs.

Figure 3.1 Cost components recovered in retail electricity prices, based on representative market offer price in NSW, 2017-18



Data source: AEMC, *2017 Residential Electricity Price Trends*, Final Report, 18 December 2017, p 100.

However, they cannot avoid the other costs. This is because the metering and settlement arrangements in the NEM mean that retailers incur network costs (which make up around half of retailers' costs) and green scheme costs for every kilowatt of electricity they supply to a customer, **regardless** of where and how the electricity was generated.

This means that while customers currently pay a retail price of around 30 c/kWh reflecting all of their costs, the solar feed-in tariffs offered by retailers are generally around 10-15 c/kWh (see section 2.3).

Should we include a value for lower wholesale prices?

As we show in Chapter 4, the increasing penetration of solar during the afternoon is resulting in prices lower than they otherwise would be, due to a reduction in the system-wide demand for electricity from the NEM at this time. As a result of these lower prices, retailers are paying less when they buy wholesale electricity during the afternoon. Stakeholders in previous reviews have argued that solar feed-in tariffs should reflect this saving to retailers. However, we are not proposing to adopt this approach because it would be inconsistent with how markets work.

In all competitive markets, prices reflect supply and demand. If a new retailer enters the market, and the increased competition lowers electricity prices for consumers, all customers in the market benefit. In the same way, all participants in the market benefit from lower wholesale prices due to the increasing penetration of solar during the afternoon. In these competitive markets existing customers do not compensate the new retailer or the solar panel exporters (by paying a higher price), because they receive the market price.

Should we account for network-related benefits of solar electricity?

Customers' solar exports could provide benefits to an electricity network if they reduce the network costs associated with managing peak demand. However, solar exports may also impose costs on networks by creating a need for additional investment in the network, for example to support bi-directional flows of electricity to handle the volume of solar exports.

But any such benefits or costs are realised by the network service providers, rather than retailers. In addition, while solar exports reduce the use of the transmission network (because they are delivered directly through the distribution network), any savings would be distributed across all customers – not just solar customers.

Due to metering arrangements, retailers are billed for network charges (the transmission charges are included in the distribution charges) on all electricity that they supply to their customers (regardless of its source). Therefore retailers do not receive any network-related savings when individual customers export solar electricity. As a result, including a value for network benefits in solar feed-in tariffs would mean that retailers pay more for solar exports than for purchasing electricity on the NEM. Rather than make a loss on these exports, they would either increase their retail prices to recoup the loss, or choose not to sell to solar customers, reducing competition in the retail market.

Even if retailers were able to realise any costs and benefits, Frontier found that across the distribution networks, solar exports are likely to make only a small contribution (relative to their capacity) to meeting peak demand on the network in summer, and are likely to make no contribution to meeting peak demand in winter. This is because in winter peak demand occurs after the sun has set.[10] When solar exports do contribute to reducing peak demand

10 Frontier Economics, *2018 Solar Feed-in Tariff Review – A Draft Report prepared for IPART*, March 2018, p 30.

this may not result in any material cost saving from avoided or deferred network investment in the short term, due to the spare capacity on much of the network.[11]

We consider that the costs or benefits of solar exports on the network are best accounted for through network prices (set by the Australian Energy Regulator (AER)), which could respond to these locational and temporal effects of solar exports. The Australian Energy Market Commission (AEMC) is currently considering network access and connection charging for distributed electricity resources in its 2018 Electricity Network Economic Regulatory Framework Review, due to report mid-year.[12]

Further analysis and discussion of network benefits and costs can be found in Frontier's report.[13]

How should we consider social benefits of solar electricity?

In last year's review of solar feed-in tariffs, some stakeholders submitted that there should be a payment (or financial incentive) to reflect the environmental and health benefits that all solar electricity generation provides to the broader community. Other submissions considered that pricing should account for externalities including social costs and carbon pollution.

We do not propose to include a value for such social benefits in the benchmark range. Retail prices already include a subsidy to encourage the uptake of solar panels. The costs associated with the Australian Government's SRES (see Box 2.1) are recovered in the 'green scheme' cost component of these retail prices, which are paid by retailers and passed onto all electricity customers (whether they have solar panels or not). This subsidy takes account of community-wide benefits of clean renewable electricity.

In addition, as for network-related benefits, retailers do not capture the value of social and environmental benefits. Therefore including a value for them in solar feed-in tariffs would result in retailers paying more for solar exports compared to buying this electricity in the NEM. In turn, this would result in them either increasing retail prices for all customers or choosing not to supply solar customers.

3.3 How do we propose to use the value of solar exports to set a benchmark range?

The price of wholesale electricity sold on the NEM is set each half an hour, and depends on how much electricity is being used and the prices generators are offering it for at that time. The more electricity being used, the more generators need to supply the market, and the higher the price tends to be. Because the value of wholesale electricity sold on the NEM varies throughout the day, the wholesale market value of solar exports also varies depending on the time it is fed into the grid.

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11 Frontier Economics, *2018 Solar Feed-in Tariff Review – A Draft Report prepared for IPART*, March 2018, p 31.

12 AEMC, *2018 Economic Regulatory Framework Review*, Information Paper, 6 February 2018, pp 1-3.

13 Frontier Economics, *2018 Solar Feed-in Tariff Review – A Draft Report prepared for IPART*, March 2018, Section 7.

In previous years we set the benchmark range to account for this variation. We set the top of the range based on the value of solar electricity when wholesale prices are highest (peak), and the bottom of the range based on the value of electricity at all other times (off-peak). Therefore, setting a range helps guide retailers to set different feed-in tariffs at different times of the day. In previous years we found the peak was between 2 and 4 pm, but because higher prices have occurred later in the day in the last two years, the peak now occurs after 4 pm.

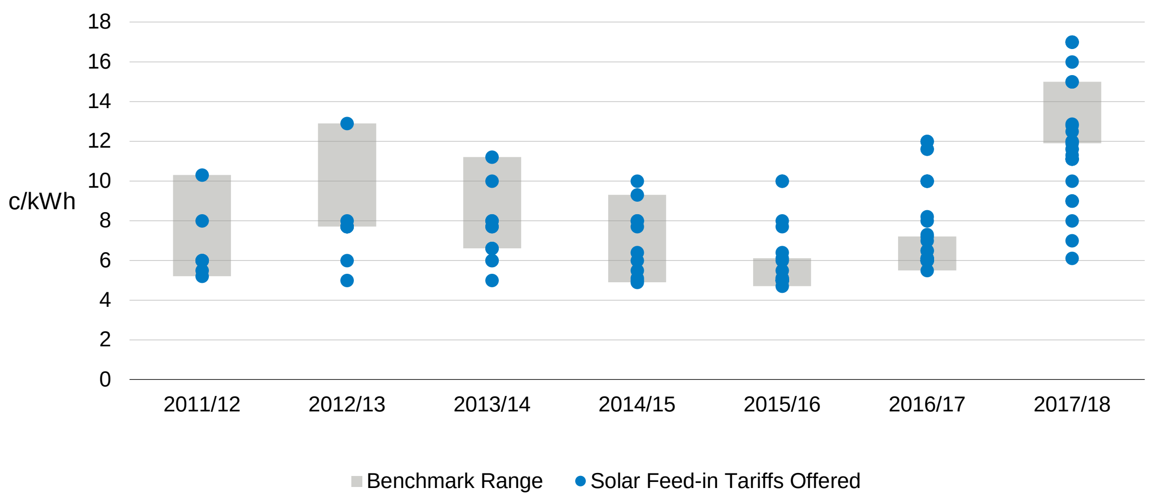
In practice, to date retailers have only offered a flat solar feed-in tariff across the whole day, rather than different solar feed-in tariffs for peak and off-peak times. For these customers being offered a flat feed-in tariff, a benchmark that reflects the value of solar exports across the day is the most relevant comparator.

Therefore we are proposing to publish an all-time benchmark, as well as time varying ranges. Such an all-time benchmark could be set using a range that reflects forecasting uncertainties, for example, the different probabilities of particular outcomes occurring, or different modelling outcomes when different inputs are used (for example, different years of data). However our preliminary modelling is showing very little variation based on these parameters.

3.4 How do we propose to update the range each year?

Just as the value of electricity varies over a day, it also varies from year to year. This will cause variation in the benchmark range over time, and the solar feed-in tariffs offered by retailers. To illustrate, Figure 3.2 shows this variation for previous years.

Figure 3.2 How feed-in tariffs have varied over time (2011-12 to 2017-18, nominal $)



Note: Our methodology for setting the benchmark range has changed since 2011-12.

Data source: IPART solar feed-in tariff determinations 2011-12 to 2017-18.

As outlined in Chapter 1, each year we will update the inputs to our estimate of the wholesale market value of solar electricity. These components include the forecast average wholesale price, the solar multiplier, and loss factors. The following chapter explains our approach to estimating these inputs.

Over the next two years (2019-2020 and 2020-2021), unless there are market or regulatory changes, we expect that our overall approach to estimating a benchmark range would stay the same. However we recognise that solar and electricity markets are dynamic. For example, the further uptake of solar panels and battery storage systems will continue to change how much electricity is needed from other generation sources at different times of the day. New policies such as the National Energy Guarantee may change how retailers purchase their electricity from generators (See Box 3.1). We will adjust our approach as necessary to respond to any major changes in the NEM.

Each year we would undertake public consultation. We will issue a fact sheet at the beginning of each calendar year (2019 and 2020), followed by a Draft Report with our draft benchmark ranges. We will provide our benchmark ranges to the Minister by 30 June in each year.

Box 3.1 How could the National Energy Guarantee impact on our methodology?

As explained in Chapter 4, we currently use ASX wholesale electricity prices to forecast the average wholesale price as the best public source of short-term forecasts. However the National Energy Guarantee (NEG) may change how retailers contract for electricity.

The NEG would place an obligation on retailers to meet their load obligations with a portfolio of resources which include a minimum amount of flexible dispatchable capacity, and an emissions level consistent with Australia's international emissions reduction commitments. This may require retailers to identify the generator with which they are contracting, which is not currently facilitated by ASX contracts. ASX Electricity contracts are derivatives contracts in which contract counterparties are not identified and in which no emissions level or generation type is specified.

While it is not an issue for 2019-19, over the next two years we need to ensure that there is sufficient liquidity in the ASX market to forecast wholesale prices.

Source: Frontier Economics, *2018 Solar Feed-in Tariff Review – A Draft Report prepared for IPART*, March 2018, p 14.

IPART seeks comments on the following

1. Do you agree with our overall approach to setting a benchmark range for solar feed-in tariffs? If not, why not?
2. What is the best way of setting a benchmark that reflects the average value of solar exports across a day? How should a benchmark range be set to reflect the value of solar exports at different times across the day?

4 The value of solar exports

The first step in our proposed approach for this review is to estimate the value of solar exports in 2018-19. As the previous chapter explained, this represents the wholesale costs of purchasing the electricity in the National Electricity Market (NEM), which retailers save when they supply their customers with solar exports.

The sections below provide an overview of the likely value of solar for 2018-19, which is made up of a number of components, including the forecast average price of electricity, a solar multiplier, losses, and NEM fees and charges. The sections that follow discusses each component, and the issues on which we particularly seek stakeholder comment.

4.1 What is the likely value of solar electricity for 2018-19?

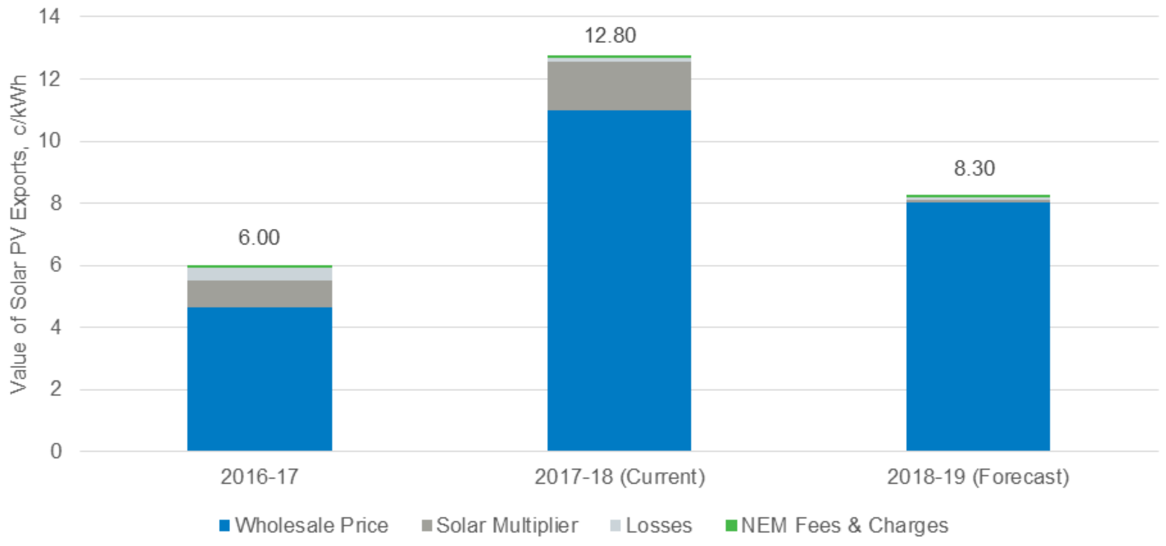
Our preliminary modelling is suggesting that in 2018-19, the value of solar exports is around 8-9 cents per kilowatt hour on average across the day. As explained in Chapter 3, this is what retailers would pay if they were buying this electricity in the wholesale market, instead of using solar exports to supply their customers.

Our forecast for 2018-19 is lower than our forecast of the value of solar electricity across the day for 2017-18, which was around 13 cents (Figure 4.1). The main reason for this is that ASX baseload electricity contract prices are indicating that average prices for wholesale electricity next year will be lower in 2018-19, as substantial new generation capacity enters the market (mainly large-scale renewables).[14] These suggest wholesale prices will fall to around 8c/kWh, compared to around 11c/kWh when we published our Final Report last year.

Figure 4.1 also shows that the solar multiplier is also decreasing, because the forecast price of wholesale electricity when solar is exporting is closer to the average price for the year. This is due to the lower number of wholesale electricity price spikes at the times that solar is exporting to the grid.

14 AEMC, *2017 Residential Electricity Price Trends - Final Report*, 18 December 2017, p 19.

Figure 4.1 Change in the value of solar exports over time (all-times of day)



Note: 2018-19 estimates based on loss factors for 2017-18, and projected fees and charges for 2018-19.

Data source: IPART.

Our preliminary estimates will be updated in our Draft and Final Reports to reflect:

- feedback from stakeholders (particularly around the calculation of the solar multiplier)
- the most up to date forecast average wholesale electricity price
- updated loss factors (to be published by the Australian Energy Market Operator (AEMO) by 1 April 2018), and
- updated fees and charges (to be finalised by AEMO by mid May 2018-19).

4.2 How should we forecast the average wholesale electricity price?

In line with previous years, we propose to forecast the average wholesale electricity spot price in NSW in 2018-19 by:

- sourcing price data from NSW baseload electricity futures contracts for this year traded on the Australian Stock Exchange (ASX)
- averaging this data over 40 trading days at 15 May 2018, and
- adjusting this average price down by 5% to reflect that contracts typically trade at a premium to spot prices.

We prefer to use publicly available data, and consider the baseload futures contracts published quarterly by the ASX are the best source of publicly available data on future wholesale electricity prices. These are contracts to trade a fixed amount of electricity for a certain price at all-times of the day over a future quarter. They represent the market's view of **average** wholesale electricity spot prices for that quarter. Most trade and liquidity in these contracts is around 12-24 months out[15] and, as they are exchange-traded and publicly

15 Australian Energy Regulator, *State of the Electricity Market 2017*, May 2017, p 60.

reported, there is more price transparency relative to trades that occur on a confidential basis directly between counterparties.

We are seeking stakeholder views on two issues related to how we use this data. The first is the period over which we average daily ASX contract prices. In previous reviews, some electricity retailers have called for a much longer averaging period to reflect common practice of buying contracts over time. However, our preliminary view is to continue to take the average over 40 trading days, based on the principle that prices in competitive markets should be determined by current market prices rather than historical costs. Prior to retail price deregulation in 2014, we also used a 40 day average when we regulated electricity prices.

The second issue is the extent to which we adjust ASX contract prices down to reflect spot prices. ASX futures contract prices typically trade at a premium to underlying spot prices. Because we are interested in wholesale electricity spot prices in the coming financial year, we need to make some adjustment to average contract prices. However, the contract premium cannot be directly observed. In line with expert advice, we have previously assumed that there is a contract premium of 5%. We also used this same assumption when we regulated retail electricity prices. Frontier have advised that 5% continues to be a reasonable assumption based on its recent analysis.[16]

IPART seeks comments on the following

3 Do you agree with our existing approach to forecast average wholesale electricity spot prices using a 40-day average of ASX baseload electricity contract prices and assuming a contract premium of 5%? If not, please provide evidence to support your views.

4.3 How should we estimate the solar multiplier?

As discussed above, the baseload futures contracts we use to forecast the average wholesale electricity spot price are for trading electricity at all-times of the day. However, most customers only export solar electricity when their solar panels are generating. As a result, the wholesale electricity costs that retailers save when they receive solar exports may be higher or lower than the average wholesale spot price across the whole day.

To adjust for this, we apply a solar multiplier to our estimate of the average wholesale electricity spot price (in previous years we referred to this as the solar ‘premium’). We calculate the solar multiplier as the ratio of the solar output-weighted wholesale electricity price to the time-weighted wholesale electricity price, where:

- the solar output-weighted electricity price is the average price across the year weighted by how much solar is exported at the time, and
- the time-weighted electricity price is the arithmetic average price across the year.

If more solar exports occur during times when spot wholesale electricity prices are relatively high, the solar multiplier will be greater than one. If more exports occur when wholesale prices are lower than average, then it will be less than one.

16 Frontier Economics, *2018 Solar Feed-in Tariff Review – A Draft Report prepared for IPART*, March 2018, p 15.

We consider that our approach to estimating the solar multiplier is reasonable and does not require updating. However, we are considering whether the sources of data we use for this calculation can be improved.

In our previous reviews, we estimated the value of solar electricity at the time it is exported based on the solar export profile of a random sample of 500 Ausgrid solar customers and spot prices for each year between 2009-10 to 2016-17. However, during this time, there have been changes in demand and supply which mean that it is possible that some of these years are no longer good predictors of the likely value of solar exports in the future. In addition, this is the first year that the Essential and Endeavour networks have had sufficient numbers of digital meters installed to provide a sample of solar export data for 500 customers. Therefore, the key issues for this review are:

- When considering historical data, how should our approach best account for changing conditions in the NEM?
- How many years of historical solar export data do we need for each network to incorporate it into our benchmark ranges, and should we have different benchmark ranges for each network?

We note that our Terms of Reference also ask us to consider forward looking measures of wholesale prices when solar electricity is likely to be exported. This would require market modelling. In our view, the best way to account for patterns of wholesale electricity prices continues to be through the use of historical data, because it captures all the factors that contribute to price volatility, whereas market modelling relies on assumptions which can be incomplete.

The sections below outline our modelling approach to calculating the solar multiplier, and then discusses the two issues outlined above.

4.3.1 What is our modelling approach?

Consistent with our approach in previous years, we are proposing to use a simulation process based on the Monte Carlo method that models the relationship between the historical wholesale spot prices when solar electricity has been exported, compared to the average price.

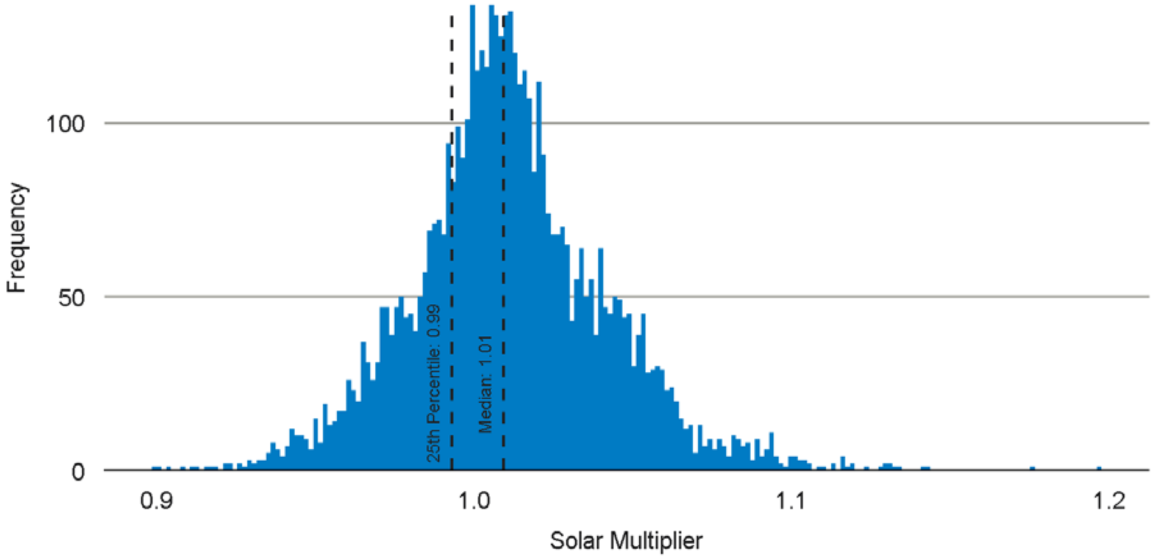
Using historical half-hourly spot prices in the NEM for NSW[17] and historical half-hourly solar export data, this simulation models 5,000 scenarios to generate a distribution of solar multipliers (Box 4.1). From this distribution we can calculate various summary statistics such as the median, 25th percentile and 75th percentile (shown in Figure 4.2). Using Ausgrid data from 2011-12 to 2016-17 shows a multiplier from the modelled distribution was 1.01, which indicates that typically the prices at the time when solar is exported will be 1% higher than the average spot price across the year.

These solar multipliers can be calculated based on solar data across the whole day, and also for discrete periods. In previous reviews, we estimated the solar multiplier for the two-hour

[17] The spot electricity price is referenced to the NSW regional reference node. Available from AEMO's website, http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Data-dashboard#aggregated-data

period when solar exports have the highest value on the wholesale market (the peak), as well as the solar multiplier at all-times other than this two hour period (the off-peak).

Figure 4.2 Example distribution of solar multipliers (Whole day, Ausgrid data 2011-12 to 2016-17)



Data source: IPART

Box 4.1 Monte Carlo Simulation modelling process

The modelling process involves the following four steps.

Step 1: Aggregation of solar profile data

We have historical half-hourly solar export profiles for a set of sampled solar customers. The first step in the simulation process is to create an aggregate half-hourly solar export profile for a year of data. This is calculated by taking the average solar electricity export for each half hour in the day, across all customers in the sample. For example, to create a half-hourly solar profile for 2016-17, we take the average half-hourly export of all customers at 9:00AM, on each different day, then at 9:30AM, on each different day, and so on for every half hour period in the day, for all days during the 2016-17 period. This process repeats for each unique date if we are using more than one year's worth of data.

Step 2: Normalisation of data to facilitate comparison between years

The resulting half-hourly solar export profiles are then normalised to 1 GWh per annum. Some years comprising the sampling pool could have more solar electricity exported than other years – for example, due to weather conditions. The normalisation of the sampled half-hourly solar export profiles enables us to easily compare the shapes of solar export profiles in different years. The normalisation process does not affect calculation of the solar export output-weighted electricity price since the correlation between solar exports and spot prices is preserved.

Step 3: Simulation

To estimate solar multipliers based on a Monte Carlo simulation, we generate 5,000 synthetic years for the forthcoming financial year from the historical data. A synthetic year consists of 365 days, and for each day in a synthetic year, we extract half-hourly price and solar export data from a pool of comparable historical days. Comparable historical days are defined in terms of day name and quarter. For example, a Monday in January is comparable to any other Monday in the first quarter. Our daily data contains half-hourly historical export profiles and prices. To preserve the intra-day solar export and electricity curve shapes (ie, the path of export or price patterns across any given day) we sample days as a whole. We also preserve the true correlation between real solar export volume and electricity price on any given day, in any given half hour, by sampling exports and prices jointly from the pool of comparable historical days.

Step 4: Calculate and generate a distribution of solar multipliers

This process results in 5,000 solar multipliers from which we can generate a distribution. From this distribution we can calculate various summary statistics such as the median, 25th percentile and 75th percentile.

Source: IPART.

4.3.2 Which historical data should we use?

We now have eight years of data that we can use to model the relationship between wholesale prices when solar panels are exporting to the grid, and average wholesale prices.

In previous reviews, we have used a set of historical solar export data and prices back to 2009-10, because this is when we started collecting information about when solar was being exported to the grid. However, there have been changes in demand and supply in the wholesale market which mean that the prices in some of these years no longer remain indicative of the likely value of solar exports in the future.

In selecting the historical data, we need to balance the likelihood that future years will continue to be like previous years, against having a sufficient data set to establish a representative relationship between average prices, and prices when solar is exporting to the grid.

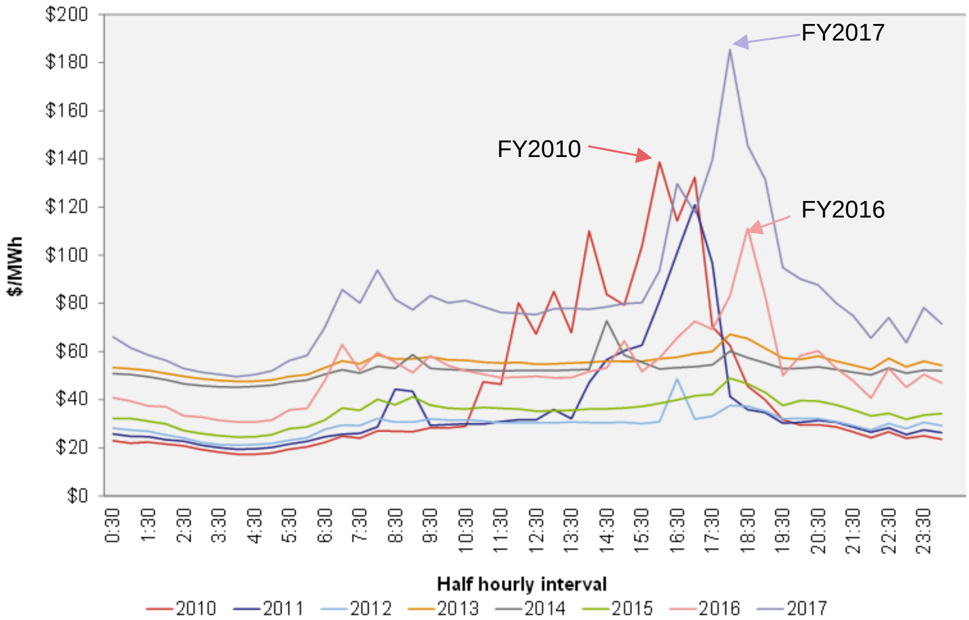
What has happened to wholesale electricity prices since 2009-10?

Figures 4.3 and 4.4 show how wholesale prices have changed since 2009-10. They show that during 2009-10 and 2010-11 there was quite a bit of volatility in the prices during the middle of the day when most solar exports occur. There were a significant number of high price events during 2009-10 and 2010-11 typically occurring between midday and 5:30 pm, which would contribute to higher solar multipliers.

Over the next four years from 2011-12 to 2014-15, prices were much more stable. During these years average prices tended to be a little higher during the afternoon and evening, but there was far less volatility. High price events were rare.

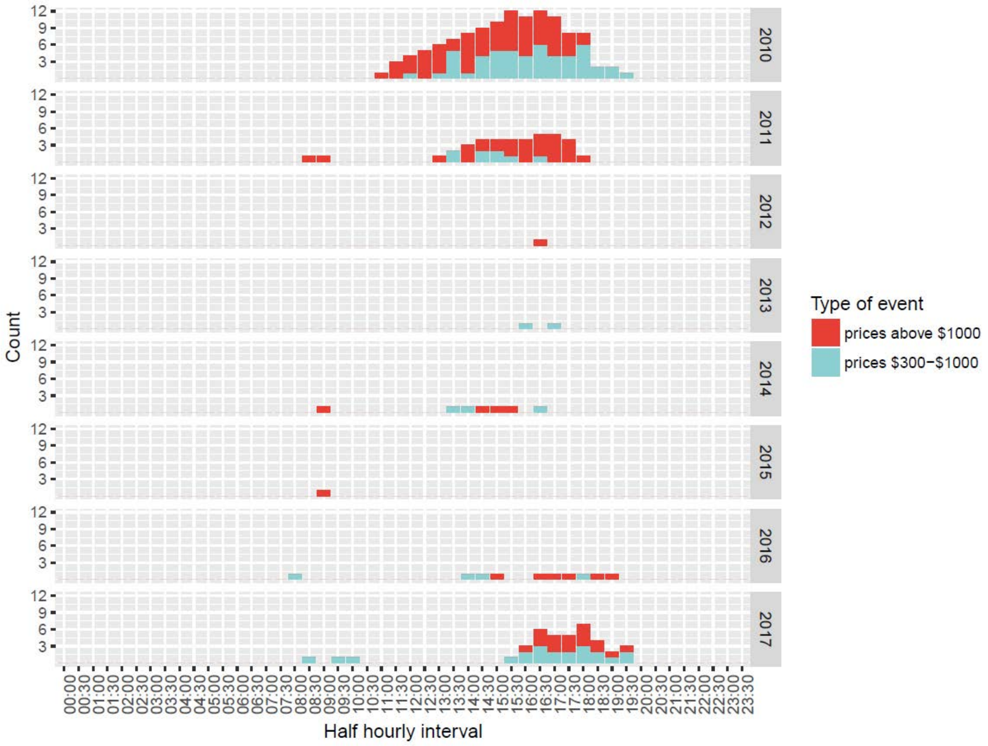
There were then substantial changes to the NEM in the most recent two years, for example several coal-fired power station closed, including the exit of Hazelwood from the market in March 2017 (representing 20% of Victoria's generation capacity), and gas prices were significantly higher. These factors produced more volatility and higher average prices, particularly in 2016-17. However, the higher prices tended to occur later in the day, with the high price events occurring between 3:30 pm to 7:30 pm. As explained in Chapter 2, the growing solar exports that are helping to serve demand across the afternoon is the key reason that higher prices are not occurring until later in the day.

Figure 4.3 Average daily price shape in NSW for FY2010 to FY2017 ($ nominal)



Data source: Frontier Economics, *2018 Solar Feed-in Tariff Review – A Draft Report prepared for IPART*, March 2018, p 24.

Figure 4.4 High price events in NSW for FY2010 to FY2017($ nominal)



Data source: Frontier Economics, *2018 Solar Feed-in Tariff Review – A Draft Report prepared for IPART*, March 2018, p 25.

How do the years that we use impact the value of solar exports?

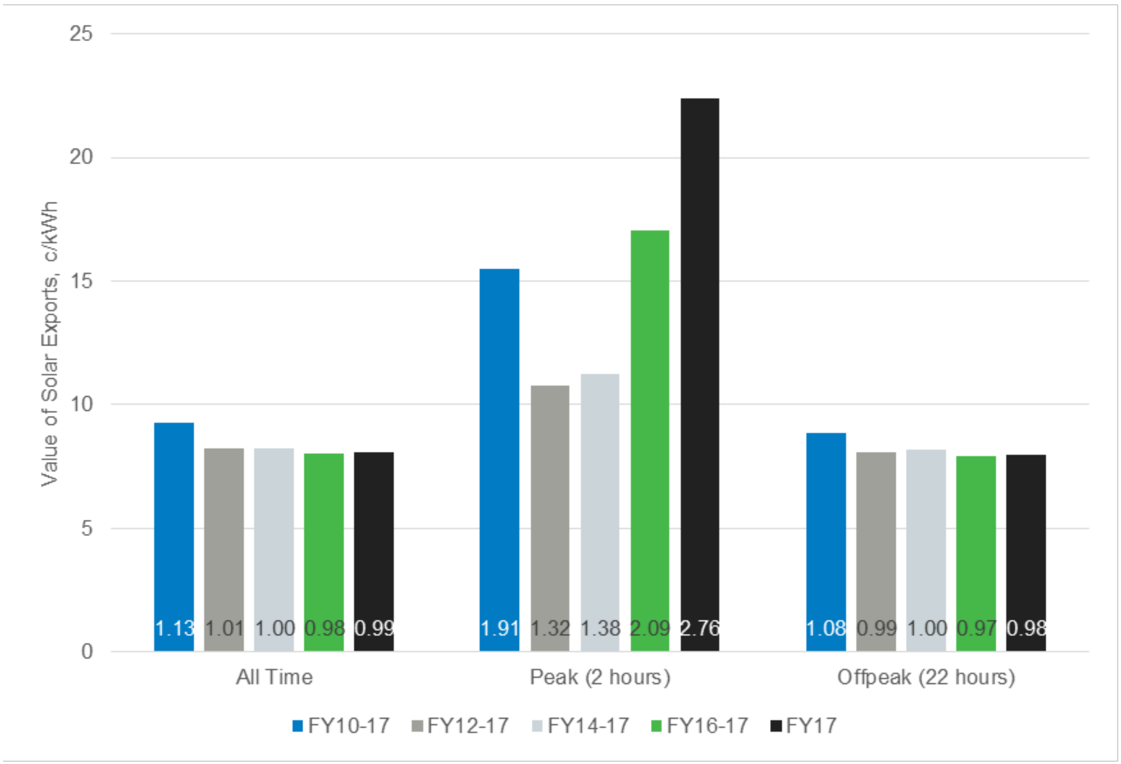
Figure 4.5 shows how the time period that is modelled affects the total value of solar electricity (or the solar feed-in tariffs). The graph measures the total value of solar electricity, and the solar multiplier is included on the label of the charts.

It shows that including the 2009-10 and 2010-11 data results in a solar multiplier of 1.13, which means that on average, prices when solar is exporting are around 13% higher than the average price across the day. Excluding these years from the data produces a solar multiplier of around 1, which means that the prices when solar is exporting is about the same as the average price across the day. Including 2009-10 and 2010-11 would mean a value of solar of around 9 cents per kilowatt hour, instead of 8 cents if it is not included.

Figure 4.5 also shows that there is significant variation in the value of solar exports in the peak time, depending on which years we include in the modelling. We define the peak time as the two hours in the day when the price of solar exports is the highest compared to the average price across the whole day. The high solar multiplier when the 2009-10 and 2010-11 data is included reflects the higher volatility in these years. However, if we model the value of solar electricity using the most recent (2016-17) data only, the solar multiplier is even higher, because in this year very high wholesale prices in the late afternoon occurred when solar was still exporting to the grid – and these are not moderated by the previous years which were less volatile.

When we model using 2016-17 data in isolation, the peak 'window' is between 5:30 and 7:30 pm in the evening. This compares to the peak window of 4 to 6 pm, when we model all years from 2009-10 to 2016-17.[18]

Figure 4.5 Value of solar exports with different years of data (based on the solar multiplier shown in column labels)



Data source: IPART.

As noted above, there are advantages and disadvantages of using more or less years of historical data. We consider that the recent changes in the market that are driving the higher peak prices later in the afternoon, including a tightened demand-supply balance and high gas prices are likely to continue to be representative of the market in the short to medium term. However, there are other factors such as weather and outages in power plants that drive price outcomes, and these are unlikely to be consistent between years. These relationships are more accurately captured over several years of data. We need to balance the recent changes in the market against having a sufficient data set to establish a representative relationship between average prices, and prices when solar is exporting to the grid.

Because solar exports have moderated prices during the afternoon and this trend is set to continue as solar continues to expand, Frontier have recommended excluding 2009-10 and 2010-11 from our modelling because these years are unlikely to be representative of future years.[19]

18 In our previous reviews, the peak window was between 2 and 4 pm, however it has shifted to after 4 pm with the addition of the 2016-17 data.

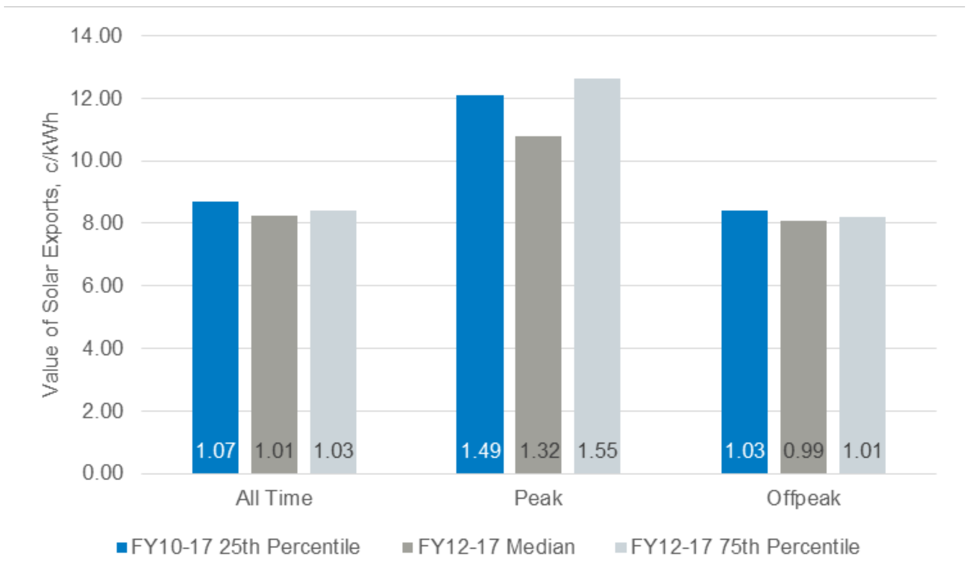
19 Frontier Economics, 2018 Solar Feed-in Tariff Review – A Draft Report prepared for IPART, March 2018, p 26.

However, we could also choose different points in the solar multiplier distribution to dampen the impact of particular years to the extent that we think that higher or lower prices experienced in the past are less likely to be indicative of the future. For example, in previous reviews, we considered that the volatility in the early 2009-10 and 2010-11 years were likely to overstate the multiplier going forward. Therefore, rather than choosing the median point of the solar multiplier distribution, we used the 25th percentile, which lowered the solar multiplier in line with future expectations.

Another option could be to exclude 2009-10 and 2010-11 because they are no longer representative, but to use the **75th percentile** of 2011-12 to 2016-17, if we thought that the remaining years in the sample were likely to **understate** conditions for 2018-19 because the tightening demand-supply conditions observed in 2016-17 are likely to continue – leading to more price spikes late in the afternoon.

Figure 4.6 shows these scenarios, combining different years of historical data, with different percentiles in the distribution of likely outcomes. Again, the graph measures the total value of solar electricity, and the solar multiplier is included in text on each scenario.

Figure 4.6 Value of solar exports with different percentiles and years of data (solar multiplier value on column labels)



Data source: IPART.

IPART seeks comments on the following

4 Do you agree with our preliminary view that historical data provides the best source of information on future patterns of wholesale electricity prices?

5 How much historical data should we account for when estimating solar multipliers, and which point in the solar multiplier distribution should we use?

4.3.3 Can we use data from different network areas?

In previous reviews we have relied on data from the Ausgrid network (which covers Newcastle and most of Sydney) to understand how much solar electricity is exported to the grid at different times of the day. This was because Ausgrid was the best source of half-hourly solar export data. Most solar customers in the Endeavour Energy network (in South-Western Sydney and Wollongong) and the Essential Energy network (which covers the rest of NSW) had accumulation meters or time-of-use meters that did not record data half-hourly.

This year, our Terms of Reference specified that we may incorporate half-hourly solar export data reflecting customers in all three network areas. As more digital meters have been installed in the Essential and Endeavour networks in the previous financial year, for the first time we have been able to collect a sample of 500 customers' half-hourly solar export data from these network areas for 2016-17.

We consider that we would need to collect at least another year of data from each of these networks before we incorporate it into our benchmark ranges, however we are interested in how we could use the data in future years.

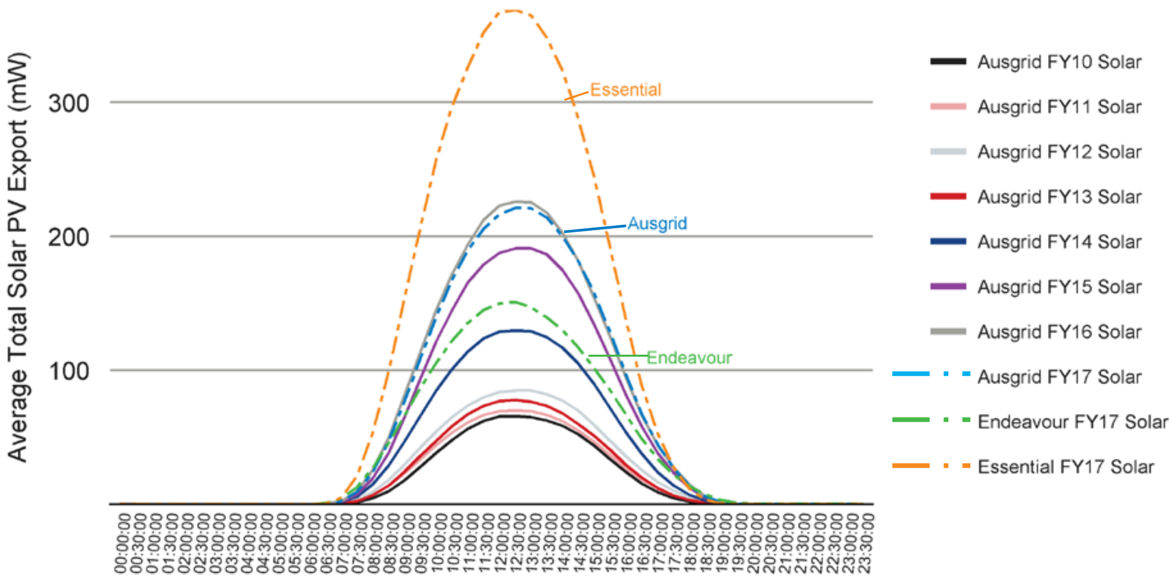
Our view is that more than one year is required to ensure that the data provided is representative. It is not currently possible to assess whether or not the solar export profiles of Endeavour and Essential customers are 'typical' of those networks areas, and using them runs the risk of relying on an outlier year to forecast for next year.

In addition, we consider that more than one year of data is required to model the relationship between average prices and prices when solar is exporting to the grid. As noted above, any one year can be impacted by factors such as weather and power plant outages which may not be consistent between years, and so are more accurately captured over several years of data.

4.3.4 Is there a difference in the solar export profiles between network areas?

Figure 4.7 shows the average solar export by time of day between each network based on the data received to date for a sample of 500 customers. It shows that the level of solar exported in the Ausgrid network has varied over time, and that significantly more solar is generated in the Essential network region compared to the other networks. These differences could reflect the number of sunny days throughout the year, differences in panel sizes, and the positioning of the panels, and whether they are obstructed by shade.

Figure 4.7 Average daily solar exports for 500 customers by network area by half hour



Data source: Data received from Ausgrid 22 February 2018, Essential Energy, 8 February 2018, Endeavour Energy, 7 February 2018.

IPART seeks comments on the following

6 What is the minimum number of years that we should consider using to incorporate the Essential and Endeavour solar export data?

4.4 How should we calculate the loss factors?

Solar exports tend to be consumed close to where the electricity is produced, so the electricity losses that usually arise as electricity flows through the transmission and distribution network are avoided. To account for the value of these avoided losses, we are proposing to gross up solar generation to the NSW node using an estimated loss factor. This ensures the benefit of being located close to where solar exports occur is included in the value we estimate.

We are proposing to calculate a loss factor accounting for both transmission and distribution line losses, calculated as *MLF* × *DLF,* where*:*

- *MLF* is transmission line losses between the Regional Reference Node and each bulk supply connection point for the coming financial year, weighted by actual electricity consumption at each connection point, excluding industrial customers.
- *DLF* is distribution loss factors for small customers for the coming financial year, weighted by customers' actual consumption.

Consistent with our approach in previous years, for a state-wide value of solar exports, we would use a weighted average loss factor across the three distribution networks.

The loss factors are published by AEMO in March each year, and will be included in our draft benchmark ranges.

4.5 How should we estimate NEM fees and charges?

Retailers pay NEM fees and ancillary charges based on the amount of electricity they purchase from the wholesale market. Because these charges are levied on retailers' net purchases as measured by AEMO, they avoid having to pay these costs for the amount of solar electricity their customers export to the grid. These fees and charges are very small compared to the other costs of supply, so avoiding them provides a small financial gain to retailers. As in previous years, we are proposing to estimate them for the coming financial year based on information reported by AEMO.

The fees and charges for 2018-19 will be finalised by AEMO in mid-May and will be included in our draft benchmark ranges.

IPART seeks comments on the following

7 Are there any other improvements we can make to our approach for calculating the wholesale market value of solar exports?

A Terms of Reference

The investigation and determination by the IPART on annual benchmark range for feed-in tariffs for the next three financial years (FY2018-19, FY2019-20 and FY2020-2021)

Reference to the IPART under section 9 of the Independent Pricing and Regulatory Tribunal Act 1992

With the approval of the Hon. Gladys Berejiklian MP, Premier of NSW and Minister administering the Independent Pricing and Regulatory Tribunal Act 1992 (IPART Act), pursuant to section 9(2) of the IPART Act, the Independent Pricing and Regulatory Tribunal (IPART) will enter into arrangements with the Department of Planning and Environment (the Department), for investigation and report, the determination of:

- The voluntary benchmark range for solar feed-in tariffs paid by retailers for electricity produced by complying generators and supplied to the distribution network.
- Time dependent benchmark ranges paid by retailers for electricity produced by complying generators and supplied to the distribution network during different times of the day.

Conduct of investigation

In conducting this investigation, the IPART is to consider the following key parameters:

- There should be no resulting increase in retail electricity prices; and
- The benchmark range should operate in such a way as to support a competitive electricity market in NSW.

In conducting this investigation, IPART may incorporate;

- Half-hourly solar export data reflecting customers in all three network areas; and
- Forecasted electricity wholesale cost fluctuations instead of historical data.

Reporting

The IPART is to report the feed-in tariff offered by each retailer at the time of writing its report and to note whether that tariff was within the benchmark for the preceding financial year.

Consultation

In making its determination on the benchmark range, IPART may consult on any matter that it regards as material.

Timing

The IPART is to provide its determination by 30 June of each year for the next three years starting from 2018. The Department may amend the Terms of Reference to align with the government policies and to remain relevant in the energy market.

Signed:

Don Harwin MLC
Minister for Energy and Utilities
Date: