IPART
New South Wales

Independent Pricing and Regulatory Tribunal

Solar feed-in tariffs

The subsidy-free value of electricity from small-scale solar PV units in 2015-16

Energy — Final Report
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1 Executive summary

Households and small businesses with solar photovoltaic units (PV customers) can earn feed-in tariffs for the electricity they export to the grid. Those who are part of the NSW Solar Bonus Scheme (SBS) receive a subsidised feed-in tariff of either 20 or 60 cents per kilowatt hour (c/kWh).[1] Those who are not part of this scheme can receive unsubsidised feed-in tariffs in the competitive retail electricity market.

The NSW Government has asked the Independent Pricing and Regulatory Tribunal of NSW (IPART) to review the subsidy-free value to retailers of the electricity PV customers export to the grid and determine:

- a benchmark range for unsubsidised feed-in tariffs that electricity retailers may voluntarily offer PV customers who are not part of the SBS, and
- the retailer contribution NSW electricity retailers must make towards the cost of the subsidised feed-in tariffs the Government pays PV customers who are part of the SBS.[2]

The SBS is legislated to end on 31 December 2016. Our terms of reference indicate that our Final Determination on the retailer contribution for 2015-16 will apply until the Scheme ends, or until it is replaced. Therefore, this is likely to be our last determination on the retailer contribution.

This report sets out our final decisions on solar feed-in tariffs for 2015-16 and explains how they differ from the draft decisions we released in August 2015. It also summarises stakeholders' comments on this review and our consideration of these comments, including additional analysis.

1.1 Our Final Determination

We have made a Final Determination that in 2015-16 the benchmark range for unsubsidised solar feed-in tariffs is **4.7 to 6.1 c/kWh** and the retailer contribution is **5.2 c/kWh** (Table 1.1).

Table 1.1 Final Determination on solar feed-in tariffs 2015-16 ($nominal, c/kWh)

	2014-15 Final decision	2015-16 Draft decision	2015-16 Final decision
Benchmark range	4.9 – 9.3 (value at all times: 5.6)	4.4 – 5.8 (value at all times: 4.8)	4.7 – 6.1 (value at all times: 5.1)
Retailer contribution	5.1	4.9	5.2

1 http://www.resourcesandenergy.nsw.gov.au/energy-consumers/solar/solar-bonus-scheme accessed 13 July 2015.

2 See Terms of Reference in Appendix A.

As in previous reviews, we have estimated the subsidy-free value of solar PV exports using the wholesale market value method to make our Final Determinations on the benchmark range and the retailer contribution. In particular, we set the benchmark range based on the wholesale market value of exports from net metered[3] customers because the benchmark range is most relevant to customers with net meters. For the retailer contribution, we had regard to the wholesale market value of exports from gross metered[4] customers. This is because the retailer contribution relates to customers in the SBS, and most of these customers have gross meters.

Our modelling this year incorporates historical spot prices and PV exports in financial years 2013-14 and 2014-15. Spot prices in financial years 2013-14 and 2014-15 were relatively low and flat throughout the day, contributing to lower solar premiums for 2015-16. In addition, our Final Determinations are based on the 25th percentile wholesale market values of PV exports. Our 2014-15 Final Determination was based on the median wholesale market values. We found that prices were unusually high in the middle of the day in 2009-10 and 2010-11 compared to other years, placing upward pressure on the value of PV exports. Market evidence suggests that the high prices observed in 2009-10 and 2010-11 are unlikely in 2015-16. Therefore, our 2015-16 Final Determination is based on the 25th percentile wholesale market values of PV exports instead of the median (ie, 50th percentile). This is consistent with our Draft Determination.

Our Final Determinations on the benchmark range and retailer contribution are slightly higher than our Draft Determinations in August 2015 as a result of our updated modelling. The forecast average wholesale spot price for 2015-16 has increased from $36.91/MWh to $39.07/MWh or by around 5% since our Draft Determination. As a result, our Final Determinations on the benchmark range and retailer contribution for 2015-16 are 0.3c/kWh higher than our Draft Determinations.

In making our Final Determinations, we considered stakeholders' submissions on our draft report. Our response to these submissions is provided in Chapter 2.

1.1.1 Final Determination on the benchmark range

The benchmark range reflects the forecast wholesale market value of PV electricity in 2015-16 at different times of day. The upper end of the range (ie, 6.1c/kWh) represents this value during the period when solar PV exports have the highest wholesale market value (ie, peak period). The lower end of the range (ie, 4.7c/kWh) represents this value at all other times excluding the peak period.

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3 Under **net metering** arrangements, electricity generated by a PV unit is first used to meet the customer's own energy needs at the time of generation. If there is excess electricity generation at any point in time, it will be exported to the grid.

4 Under gross metering arrangements, all the electricity generated by the customer is 'exported'.

The value across all times is 5.1c/kWh, and most closely represents a single all-time solar feed-in tariff.

Our Final Determination on the benchmark range for 2015-16 is lower than our determination for 2014-15 for two reasons.

- Our modelling this year incorporates historical wholesale spot prices and PV exports in financial years 2013-14 and 2014-15. Wholesale spot prices in financial years 2013-14 and 2014-15 were relatively low and flat throughout the day, resulting in lower solar premiums for 2015-16.
- We have made our Final Determination on the benchmark range based on the 25th percentile wholesale market value of PV exports. Our analysis shows that high prices in the middle of the day observed in 2009-10 and 2010-11, which place upward pressure on the value of PV exports, are unlikely in 2015-16.

Our determination on the benchmark range provides guidance on the likely value of the electricity exported by PV customers. This will assist customers in deciding whether to install a PV unit and comparing market offers. Like other components of electricity retailers' competitive offers, solar feed-in tariffs are not regulated by IPART. It is up to retailers to decide whether to offer them, and the rate per kWh to offer.

We consider that the availability and rate of solar feed-in tariffs are likely to be secondary considerations for PV customers with net meters.[5] In general, most of the electricity generated by a small scale PV unit is used to meet the customer's own energy needs at the time of generation, and the amount exported is relatively small. In addition, the customer is still likely to import electricity to meet their needs when the PV unit is not generating (eg, at night). Therefore, the primary financial benefit of having a PV unit is reduced electricity bills, and the most important financial consideration in selecting a market offer is likely to be the retail price of electricity. The uptake of battery storage will make it possible for PV customers to use more of the electricity they generate to meet their own needs. Appendix E provides our analysis that shows feed-in tariffs should be considered as part of an overall electricity market offer and that the offers with the highest feed-in tariff are not necessarily the best overall electricity deal for PV customers.

5 Under **net metering** arrangements, electricity generated by a PV unit is first used to meet the customer's own energy needs at the time of generation. If there is excess electricity generation at any point in time, it will be exported to the grid.

1.1.2 Final Determination on the retailer contribution

The retailer contribution reflects the financial benefit that retailers receive from their customers' participation in the SBS. The retailer contribution for 2014-15 was based on the value of PV exports at all other times excluding a 2-hour peak period (ie, off-peak period). The terms of reference this year require us to set the retailer contribution so that the total amount to be contributed by retailers reflects the estimated total value to retailers of the energy generated under the scheme. Therefore, our Final Determination on the retailer contribution is based on the value of PV exports **at all times** (ie, 5.2c/kWh).

Our Final Determination on the retailer contribution in 2015-16 is 0.1c/kWh higher than our Final Determination for 2014-15. Although the estimated solar premiums for 2015-16 are lower this year, resulting in a lower benchmark range, the retailer contribution in 2015-16 is higher than in 2014-15. This is because the retailer contribution is based on the value of PV exports at all times, rather than the value during the off-peak period only.

Our determination on the retailer contribution is binding on retailers, but does not affect the feed-in tariffs SBS customers receive under the scheme. The contribution is paid by these customers' electricity retailers to offset some of the costs of the scheme, which are funded by all electricity customers through a levy included in retail electricity prices.

Box 1.1 provides more information on our review.

1.2 Updating future benchmark ranges

From next year, we will provide an annual market update for the benchmark range. In these annual updates we will use the approach we have established to set the benchmark range in this review and use the most recent PV export data and other market data. We will consult on this methodology from time to time. For future updates we may also include solar PV export data from the Endeavour and Essential Energy network areas, subject to data availability. Our first annual market update will be released in May 2016, and will provide a benchmark range for 2016-17.

1.3 What does the rest of this report cover?

The rest of this report explains our review and Final Determination in more detail. It is structured as follows:

- Section 2 provides the terms of reference and our response to the main issues raised in the submissions we received from stakeholders.
- Section 3 discusses our estimate of the wholesale market value of PV exports and how we used this to make our Final Determination for 2015-16.

Box 1.1 What has IPART been asked to do?

Solar feed-in tariff review

NSW households with solar PV units can earn feed-in tariffs for electricity they export to the grid. If they are part of the Solar Bonus Scheme, they earn subsidised tariffs from the Government. If not, they may be able to earn unsubsidised tariffs from their energy retailer. The retailer contribution recovers some of the cost of the subsidised feed-in tariffs. The benchmark range provides a guide on a fair and reasonable value for the unsubsidised feed-in tariffs.

RETAILER CONTRIBUTION

Households who installed PV units when the SBS was open to new participants earn subsidised feed-in tariffs of 60 or 20 cents per kWh, depending on when they joined the scheme. This cost is recovered through:

- a levy on all electricity customers (included in electricity prices), and
- a retailer contribution that reflects the estimated value to retailers of the electricity generated under the scheme.

IPART sets the retailer contribution only. The subsidised tariffs are set in legislation, and will apply until the SBS ends on 31 December 2016.

BENCHMARK RANGE

Households who installed solar PV after the SBS was closed to new participants may be able to earn unsubsidised feed-in tariffs.

The majority of NSW retailers offer a voluntary feed-in tariff as part of their overall price offering for PV customers. Retailers set the level of this voluntary tariff within the competitive market. Consumers can compare retailers' price offerings, including feed-in tariffs, on **www.energymadeeasy.gov.au** to help them find the best deal for them.

IPART recommends a benchmark range for unsubsidised feed-in tariffs as a guide for retailers and consumers. This range reflects a fair and reasonable value for the electricity PV customers export to the grid.

2 Terms of reference and scope of this review

As in the past four years, the NSW Government has asked IPART to review the subsidy-free value to retailers of solar PV customers' exports to the grid. The terms of reference and scope for this review are similar to those of our 2014 review, but there are some differences.

2.1 Our terms of reference

The terms of reference provided by the Minister for Industry, Resources and Energy ask us to make a determination on the retailer contribution towards the costs of the SBS, and to recommend a benchmark range for retailers' voluntary unsubsidised solar feed-in tariffs. In doing so, we are required to consider the following:

- there should be no resulting increase in retail electricity prices
- the benchmark range should operate in such a way as to support a competitive electricity market in NSW, and
- the determination on the retailer contribution should broadly conform with the Council of Australian Government's *Revised National Principles for Feed-in Tariff Arrangements*.

In addition, in making the determination the terms of reference state that we should set the retailer contribution so the total amount "reflects the estimated total value to retailers of the energy generated under the scheme". This requirement was not included in last year's terms of reference.

In last year's review, we set the retailer contribution with regard to the estimated value of PV exports at different times of day. We estimated the value of PV exports during the two-hour block when the value is the highest, as well as the value at all other times. We based our Determination of 5.1c/kWh on the value at all other times.

The terms of reference this year require us to set the retailer contribution so that the total amount to be contributed by retailers reflects the estimated total value to retailers of the energy generated under the scheme. Therefore, our Final Determination on the retailer contribution is made having regard to the value of PV exports at all times. Generally, adopting the value of PV exports at all times relative to our approach last year of using the value at 'all other times' increases the retailer contribution. This is discussed further in Section 3.

2.2 Our process for conducting this review

In June 2015, we made an interim determination on the retailer contribution of 5.1c/kWh and released an Issues Paper. The Issues Paper outlined the purpose and scope of the 2015 review, and sought comments from stakeholders on ways we could enhance our approach and methodologies. We received 17 submissions from energy retailers, a local council association, and individuals.

We released a Draft Report in August 2015, which explained our Draft Determinations and addressed the issues raised in the submissions on the Issues Paper. We received nine submissions on the Draft Report. We considered all the issues raised in submissions and conducted additional analyses in making the Final Determinations.

Our Final Determination on the retailer contribution will take effect from 15 November 2015. The Final Determination on the retailer contribution will replace the interim determination, and will remain effective until 31 December 2016 or until replaced.

2.3 Our responses to issues raised in submissions to our Draft Report

This section summarises issues raised in submissions to our Draft Report and our responses. Appendix F provides a summary of stakeholder submissions to the Issues Paper and our responses.

2.3.1 Setting feed-in tariffs based on the 25th percentile wholesale market value of PV exports

In their submission to our Draft Report, AGL and Origin Energy supported setting the retailer contribution and benchmark range based on the 25th percentile wholesale market value of PV exports.[6]

Public Interest Advocacy Centre (PIAC) submitted that it is unfair for PV customers that we set the retailer contribution and benchmark range based on a lower percentile value than the median because of lower wholesale electricity prices which are in part driven by more PV exports.[7] The Ethnic Communities' Council of NSW (ECC) submitted that it would be more reasonable to set the retailer contribution and benchmark range based on the median value of PV exports given the outlook for price volatility during the day remains uncertain.[8]

6 AGL submission, September 2015; Origin Energy submission, September 2015.
7 Public Interest Advocacy Centre submission, September 2015, p 3.
8 Ethnic Communities' Council of NSW Inc. submission, September 2015.

Our analysis shows that prices were unusually high in the middle of the day in 2009-10 and 2010-11 compared to the subsequent years in our sample. The values of PV exports including financial years 2009-10 and 2010-11 are substantially higher than the values excluding these years, indicating that prices in these years place upward pressure on our estimated value of PV exports. Also, forward contract prices for 2015-16 suggest that the high prices observed in these earlier years are unlikely to be seen over the coming years including 2015-16.

However, excluding prices in 2009-10 and 2010-11 from our modelling and selecting the median value of PV exports would decrease solar premiums by more than we consider reasonable. On balance, we decided to keep these years in our modelling, but set the retailer contribution and the benchmark range based on a lower percentile value than the median. We consider taking the 25th percentile values provides a reasonable balance between addressing the impact of high prices in 2009-10 and 2010-11 on the value of PV exports and providing a reasonable reduction for the retailer contribution and the benchmark range.

2.3.2 Methods for estimating the value of PV exports

Using a contract premium of 5% in estimating the forecast average wholesale spot price

The forward contract premium is the difference between expected wholesale contract prices and expected wholesale spot prices.[9] While in principle contract premiums can be either positive or negative, forward contracts are generally traded at a positive premium to the wholesale spot price.

In estimating the forecast average wholesale spot price for the coming year, we have removed an assumed contracting premium of 5% from the average ASX futures price. We consider a 5% contract premium to be reasonable. Based on advice from Frontier Economics, this assumption was used in our 2007, 2010 and 2013 retail electricity determinations and in past solar feed-in tariff reviews. More recently, the Australian Energy Market Commission (AEMC) used a 5% contract premium in its 2014 Retail Price Trends Report.[10]

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9 Forward contracts are an agreement to exchange the NEM spot price in the future for an agreed fixed price. Forward contracts are called swaps in the OTC markets and futures on the Sydney Futures Exchange.

10 Frontier Economics, *2014 Residential Electricity Price Trends – Final Report, A report prepared the Australian Energy Market Commission (AEMC)*, September 2014, p 9.

Origin Energy submitted that a 5% contract premium does not reflect the true discount between wholesale spot market and contract prices. It estimated contract premiums as the difference between ASX forward prices for the year preceding contract start dates, and the settled pool prices from Australian Energy Market Operator (AEMO) over the last seven years. It showed that the appropriate contract premium is 9%.[11] All else equal, using a higher contract premium would lower the wholesale market value of PV exports.

On balance, we do not consider that Origin's analysis provides sufficient evidence to change our assumption of a 5% contract premium. The contract premium is a forward looking concept and hence it should be estimated based on expected contract prices and expected spot prices. While there are publicly available sources of expected contract prices, there is no reliable market data to estimate expected spot prices. In its previous advice to IPART, Frontier commented that it is not possible to observe the true contract premium because expected spot prices are not directly observable.[12] Frontier also noted that there is no single contract premium that can be universally applied to retailers in all markets at all times, and that expectations around both the level and volatility of spot and contract prices evolve over time and differ by region.[13] For this reason, Frontier's advice on the 5% contract premium was based on its experience advising a range of generators and retailers in the National Electricity Market (NEM) over a number of years.

Accounting for the impact of PV generation on wholesale spot prices

PV generation could contribute to lower wholesale spot prices by reducing the demand for electricity across the NEM. This is referred to as the "merit order effect". In the NEM, generators submit offers to supply electricity every five minutes. AEMO stacks these bids from lowest to highest (ie, a merit order) with the aim to meet demand in the most cost effective way, and determines which generators will be required to produce electricity based on their bids. As more solar electricity is generated, retailers will need to purchase less electricity from the wholesale market to meet their customers' demand. This lower demand for electricity across the NEM could result in lower wholesale electricity prices, providing benefits to customers. An individual, I. Tooth, submitted that our feed-in tariffs do not take into account the fact that the reduction in wholesale electricity prices is partly due to increasing solar PV exports.[14]

11 Origin Energy submission, September 2015, pp 1-2.
12 Frontier Economics, *Energy Purchase Costs, A final report prepared for IPART*, March 2010, p 37.
13 Frontier Economics, *2014 Residential Electricity Price Trends – Final Report, A report prepared the Australian Energy Market Commission (AEMC)*, September 2014, p 9.
14 Submission from I. Tooth, 4 September 2015.

We agree that increasing solar PV exports are one of the factors driving lower wholesale electricity prices, and our analysis in Appendix C supports this view. However, we do not consider the merit order effect should be accounted for when estimating the value of PV exports. We consider decreasing wholesale prices due to a reduction in demand for electricity is a normal outcome of a competitive market. Any price effects from increasing solar PV exports would be shared by all electricity customers. Reallocating these benefits from all customers to only PV customers would increase electricity prices for non-PV customers. This would be contrary to our terms of reference for this review.

Including other benefits in estimating the value of PV exports

The Ethnic Communities' Council of NSW (ECC) and PIAC submitted that the wholesale market value of PV exports should include the value of other benefits. These include avoided transmission and distribution losses, avoided NEM fees, avoided network investment, and values for externalities, societal and environmental benefits of PV exports.[15]

We agree that feed-in tariffs should include a value for avoided NEM and ancillary service fees. Retailers are able to avoid these fees for the amount of electricity their customers export to the grid and we have included this value in our benchmark range for feed-in tariffs. Our wholesale market value of PV exports also includes avoided transmission and distribution losses.

We also agree that PV exports do not use the transmission network and this may help defer network investment. This issue was also discussed in our Draft Report. However, we have not included any avoided transmission expenditure in our wholesale market value because there is currently no mechanism available for retailers to claim avoided transmission costs on behalf of their PV customers. This means retailers receive no financial benefit from avoided transmission costs. The AEMC is currently reviewing a rule change which proposes a mechanism for PV customers to receive a benefit from avoided transmission network costs. See Appendix F for more information.

In relation to social and environment benefits of PV exports, our terms of reference require that there should be no resulting increase in electricity prices from our decisions. Including a value for social and environmental benefits in feed-in tariffs would require retailers to increase their electricity prices to all their customers to fund this payment. However, PV customers already receive financial incentives for renewable energy generation which are funded by all electricity consumers. Under the Small-scale Renewable Energy Scheme (SRES), solar PV customers are provided with a financial benefit for each megawatt hour (MWh) of electricity their PV unit is expected to generate over its lifetime. Eligible PV customers receive small-scale technology certificates (STCs)

15 Ethnic Communities' Council of NSW Inc. submission, September 2015, p 1; Public Interest Advocacy Centre submission, September 2015, p 2.

equivalent to the expected lifetime generation from their PV unit with one certificate representing one MWh of electricity. Total lifetime generation depends largely on the size of the PV unit and the location where it is installed. Commonly, STCs are assigned to the provider of the PV unit in exchange for an upfront discount off the cost of the system.[16] The table below provides estimated upfront financial benefits for PV customers with different unit sizes who are located around Sydney. Our estimates are based on PV systems having expected lifetime of 15 years and an average STC price of $35 per certificate.

Table 2.1 Estimated upfront benefit under the SRES

Unit size (kilowatts)	Number of STC entitlement	Estimated financial benefit
1	20	$700 (=20 x $35)
2	41	$1,435 (=41 x $35)
3	62	$2,170 (=62 x $35)
4	82	$2,870 (=82 x $35)
5	103	$3,605 (=103 x $35)

Note: Estimated STC entitlement based on postcodes ranging from 1001 to 2355. Estimated financial benefit calculated assuming an STC price of $35 per certificate.

Source: STC entitlement based on REC Registry calculator, available at https://www.rec-registry.gov.au/rec-registry/app/calculators/sgu-stc-calculator#, accessed 14 September 2015.

We note that the Queensland Productivity Commission (QPC) is currently undertaking a review to determine a fair price for solar which includes public and consumer benefits from exported solar PV generation. As part of this review QPC will consider whether households and businesses are already fairly compensated for public and consumer benefits (such as through existing government renewable energy programs and rebates and market contracts).[17]

2.3.3 Feed-in tariffs and battery technology

PIAC did not agree with our view that the uptake of battery storage systems would make feed-in tariffs less relevant. It considered that while battery storage would allow PV customers to use more of the electricity they generate to meet their own needs, it would also enable them to export PV electricity when it is most needed, and they would do so only if feed-in tariffs provide sufficient financial incentives.[18]

16 http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/How-the-scheme-works/Small-scale-Renewable-Energy-Scheme accessed 30 September 2015.

17 For more information see, http://www.qpc.qld.gov.au/inquiries/public-inquiry-into-solar-feed-in-pricing/, accessed 1 October 2015.

18 Public Interest Advocacy Centre submission, September 2015, p 4.

As noted in our Draft Report, companies are developing software that will enable PV customers to store PV electricity and sell it back to the grid when prices are high. This software will be able to be installed on battery storage units. Technologies such as this would allow PV customers to directly participate in the wholesale market and provide the potential for greater returns than through feed-in tariffs.[19]

2.3.4 Mandatory minimum feed-in tariffs

PIAC submitted that feed-in tariffs should be regulated. Where feed-in tariffs are not mandatory, retailers who also own generation assets (ie, gentailer) would not have financial incentives to compete with PV customers for electricity supply at peak price times and they would not provide fair feed-in tariffs.[20]

We do not agree with mandatory minimum feed-in tariffs. Any retailer has an incentive to obtain wholesale electricity at the best possible price. Similarly, any 'gentailer' also has a commercial incentive to source electricity at the best possible price (ie, cheapest). Therefore, any retailer, regardless of whether it is a gentailer or not, has an incentive to offer a fair price for a customer's PV exports or would risk losing these customers to competitors.

In our view, a competitive market is the best way to provide the fair value for PV exports, and the market should determine the fair value of PV exports via competition. Customers will shop around to obtain a better deal to maximise their return on the investment for their PV exports, and retailers which do not offer competitive prices will lose customers to other retailers.

Mandating feed-in-tariffs could preclude retailers from offering different tariffs such as time-of-export tariffs, leading to fewer offers that consumers can choose from. Fixing minimum feed-in-tariffs at a certain level will provide retailers with less incentive to innovate to reduce the costs associated with solar PV customers and offer competitive prices.

The feed-in tariffs currently available in the market support this view. We have examined a sample of voluntary feed-in tariffs on offer in all network areas in NSW (Table 2.2). Our Final Determination on the recommended benchmark range for 2015-16 is 4.7 to 6.1c/kWh. As the table shows, ten retailers, including the three largest gentailers (ie, AGL, EnergyAustralia and Origin) are currently offering feed-in tariffs that are within or above our benchmark range for 2015-16. We also found that since our Draft Determination, two retailers have started offering feed-in tariffs. Commander Power & Gas and Dodo Power & Gas were not providing any feed-in tariffs at the time of our Draft Determination (as

19 http://arena.gov.au/news/tesla-and-reposit-power-team-up-with-arena-supported-storage-solution/, accessed 27 July 2015.

20 Public Interest Advocacy Centre submission, September 2015, p 3.

reported in EnergyMadeEasy), but are now offering a feed-in tariff of 5 cents/kWh.

Table 2.2 Voluntary feed-in tariffs in NSW (nominal, c/kWh)

Retailer	Ausgrid	Endeavour	Essential
ActewAGL	NA	5.5	5.5
AGL	5.1	5.1	5.1
Click Energy	10	10	10
Commander Power & Gas	5	5	5
CovaU	0	0	0
Diamond Energy	8	8	8
Dodo Power & Gas	5	5	5
EnergyAustralia	5.1	5.1	5.1
Lumo Energy (NSW)	5	5	5
Momentum Energy	0	0	0
Origin Energy	6	6	6
Pooled Energy	0	0	NA
Powerdirect	7.7	7.7	7.7
Powershop	6.4	6.4	6.4
Red Energy	5	5	5
Sanctuary Energy	0	0	0

Note: Postcodes sampled in the Ausgrid, Endeavour and Essential areas 2066, 2147, 2795 respectively.
Source: www.energymadeeasy.gov.au accessed 30 September 2015.

2.3.5 IPART's role in setting feed-in tariffs

Several submissions commented on our role in setting feed-in tariffs. The Energy Retailers Association of Australia (ERAA) submitted that deregulated markets will provide the most appropriate feed-in tariff to PV customers, and that publishing a benchmark range is unnecessary.[21] However, the ECC and PIAC called for stricter monitoring on feed-in tariffs including collecting data and reporting on the levels of consumer acceptance and satisfaction of feed-in tariff offers by retailers and the level of cross-subsidies that householders with solar PV are providing retailers.[22]

21 Energy Retailers Association of Australia submission, September 2015.
22 Ethnic Communities' Council of NSW Inc. submission, September 2015; Public Interest Advocacy Centre submission, September 2015, p 3.

As part of the NSW Government's decision to remove retail electricity price regulation, we were given a new monitoring role in the retail electricity market. In July 2015, we released our Draft Report which provides our assessment of competition in the electricity market. It includes information on PV customer satisfaction and switching rates and development in the solar industry.[23]

2.3.6 Other issues raised in submissions

Several submissions from individuals stated that feed-in tariffs are too low. Mr N. Santone submitted that the recommended benchmark range is too low compared to the retail price of electricity, even after considering the costs that retailers cannot avoid.[24] Mr R. Sweetman submitted that feed-in tariffs are too low to recover the costs of solar system installation.[25] Retailers cannot avoid incurring certain costs on this electricity such as network, green scheme and retailing costs. These costs represent a substantial portion of the total cost of providing retail electricity. Therefore, the value of PV customers' exports to retailers is considerably less than the retail price. If feed-in tariffs were set too high, this would mean retailers would avoid serving PV customers, and this would not be in the customers' interests. A feed-in tariff set at the retail price of electricity would require a subsidy to be paid to PV customers. This would also not be consistent with our terms of reference which requires that our decisions support a competitive electricity market and that we estimate the 'subsidy-free' value of PV exports. (See Appendix F.5 for our responses to these issues provided in the Draft Report.)

Mr N. Santone also commented it is inefficient that solar PV consumer have to change their meters to an interval or smart meter and bear the costs of more than $300.[26] This is a system requirement for PV electricity generation. Since we are required to set a subsidy-free value of PV exports, we cannot take into account this cost in estimating the value of PV exports. As outlined above, PV customers are already provided with financial assistance under the SRES through a reduction in the cost of installing a PV unit.

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23 IPART, *Review of the performance and competitiveness of the retail electricity market in NSW – Draft report*, July 2015.

24 Submissions from N. Santone, August 2015 and September 2015.

25 Submission from R. J. Sweetman, July 2015.

26 Submission from N. Santone, September 2015.

3 Determining the retailer contribution and benchmark range

We have estimated the subsidy-free value of PV exports using the wholesale market value method and used this estimate to set both the retailer contribution and the benchmark range.

The section below summarises our final finding on the estimated wholesale market value of PV exports. The subsequent sections explain the data and methodology we used to estimate the value of PV exports and discuss in more detail how we made our Final Determinations on the benchmark range and retailer contribution.

3.1 Final finding on the estimated value of PV customer exports

Our final finding is that the estimated value of PV customer exports in 2015-16 range **from 4.7 to 6.1 c/kWh** (Table 3.1).

Table 3.1 Estimated value of PV customer exports ($nominal, c/kWh)

Meter type	2014-15 Final decision	2015-16 Draft decision	2015-16 Final decision
Net meter	4.9 – 9.3	4.4 – 5.8	4.7 – 6.1
Gross meter	5.1 – 10.0	4.9	5.2

Source: IPART.

For net meters, the upper end of the range for the 2015-16 estimated value of PV exports represents the 25th percentile value of PV export during a 2-hour block when the value is the highest (ie, 2 pm to 4 pm). The lower end of the range is the 25th percentile wholesale market value of PV export at all other times excluding the two-hour peak period.

For gross meters, the 2015-16 estimated value of PV customer exports represents the 25th percentile value of PV exports **at all times**. In the 2014-15 final decision, we estimated the value of PV exports for gross meters at different times of day, and established a range in the same way as we did for net meters. However, the terms of reference this year require us to set the retailer contribution so that the total amount to be contributed by retailers reflects the estimated total value to retailers of the energy generated under the SBS. This means we should set the retailer contribution with regard to the value of PV exports at all times.

3.2 Estimating the wholesale market value of PV exports

We have estimated the subsidy-free value of solar PV exports using the wholesale market value method. This method treats PV customers similar to other generators in the market, and estimates the value of PV exports as if they could be sold on the wholesale market at the time they were exported. This arrangement is hypothetical. Small scale PV customers cannot currently sell their exported energy on the spot market.

Our wholesale market value method calculates the value of PV exports (c/kWh) as follows:

Forecast average spot price × *solar premium* × *loss factor* + *NEM fees and charges*

Table 3.2 summarises our updated modelling for the 2015-16 final decision.

Table 3.2 Summary of wholesale market value parameters ($nominal)

	2014-15 Final decision	2015-16 Draft decision	2015-16 Final decision
Forecast average spot price	$36.32/MWh	$36.91/MWh	$39.07/MWh
Solar premium (by meter type)	Gross: 1.28 Net: 1.23 – 2.37	Gross: 1.21 Net: 1.09 – 1.44	Gross: 1.21 Net: 1.09 – 1.44
Loss factor	1.06	1.07	1.07
NEM fees and charges	$1.09/MWh	$0.89/MWh	$0.87/MWh

Source: IPART calculation.

We explain below how we have estimated these variables for the 2015-16 final decisions.

3.2.1 Forecasting average wholesale spot prices

Consistent with our approach last year, we have calculated forecast average spot prices for NSW in 2015-16 using market contract prices. We used daily prices of NSW Base Load electricity contracts for 2015-16 traded on the ASX. To estimate average spot prices from the ASX contract prices, we:

- calculated a 40-day trading average of the ASX contract prices for 2015-16 as at 25 September 2015, and
- removed an assumed contracting premium of 5% from the average price to arrive at a forecast average spot price of $39.07 for 2015-16.

3.2.2 Estimating solar premiums

The solar premium measures the relative value of solar PV output compared to a flat output profile (ie, an equal amount of PV export through the day). It is calculated as the ratio of solar PV output-weighted electricity price to time-weighted electricity price, where:

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

The solar premium captures how much solar PV exports occur at high or low price times. If more solar export occurs during the time when spot electricity prices are high, this will increase the output-weighted price relative to the time-weighted price and the resulting solar premium will be greater than one. If an equal amount of solar PV is exported throughout the day, the solar PV output-weighted price will be equal to the time-weighted price and will be one. Table 3.3 shows estimated solar premiums for 2015-16. We have made a final decision to set the retailer contribution based on the 25th percentile solar premium for the gross profile.

Table 3.3 Solar premiums at all times for 2015-16

	Gross profile	Net profile
5th percentile	1.10	1.09
10th percentile	1.13	1.11
25th percentile	**1.21**	1.19
Median	1.35	1.31
Mean	1.37	1.33
75th percentile	1.49	1.44
90th percentile	1.63	1.56
95th percentile	1.71	1.64

Source: IPART analysis.

As the most recent complete year of solar PV data (2014-15) was available for our draft decision, there are no changes to the solar premiums in this final decision.

Solar premiums are generally greater for gross metered customers than for net metered customers. Net metered customers tend to consume when prices are high, and so export less in high price times. Reductions in solar PV exports at high price times are reflected in a lower output-weighted price and hence lower solar premiums. The difference in the estimated solar premiums (and hence the values of PV exports) between gross and net metered customers is decreasing as prices in recent years have become less volatile with less high price events during the day.

As in our review last year, we have also examined how solar premiums differ during 2-hour blocks of the day. We found that solar premiums tend to be highest between 2pm and 4pm for both gross and net profiles. We refer to this 2-hour period as the 'peak' time and the other 22 hours as 'off peak'. Table 3.4 shows ranges of estimated solar premiums at different times of day. We have made a final decision to set the benchmark range based on the 25th percentile solar premiums for net profile. In particular, we set the upper end of the range using the 25th percentile value at peak time, and the lower end of the range using the 25th percentile value at off peak time. Appendix B provides more information about the methodology and the data we used to estimate solar premiums.

Table 3.4 Solar premiums at different times of day for 2015-16

	Gross profile		Net profile	
	Peak	**Off peak**	**Peak**	**Off peak**
5th percentile	1.14	1.05	1.12	1.04
10th percentile	1.24	1.07	1.22	1.05
25th percentile	1.48	1.11	**1.44**	**1.09**
Median	1.91	1.18	1.84	1.15
Mean	2.00	1.21	1.89	1.19
75th percentile	2.40	1.29	2.24	1.26
90th percentile	2.91	1.40	2.65	1.39
95th percentile	3.19	1.46	2.91	1.45

Source: IPART analysis.

The estimated solar premiums this year are lower than in the 2014-15 decision for two reasons.

Firstly, we have updated our dataset to include recent updated spot prices and PV exports for the 2013-14 and 2014-15 financial years. Spot prices in these years were generally flat throughout the day with few high price events during day time. As a result, including these recent years resulted in lower solar premiums.

Secondly, we have made our final decisions based on the 25th percentile solar premiums, whereas the 2014-15 final decision was based on the median solar premiums. Our analysis shows that prices were unusually high in the middle of the day in 2009-10 and 2010-11 compared to other years, and that this places upward pressure on our estimated value of PV exports. Market evidence suggests that the high prices observed in 2009-10 and 2010-11 are unlikely to be seen over the coming years including 2015-16. While we considered excluding financial years 2009-10 and 2010-11 from our modelling, we recognised that this would decrease solar premiums by more than we considered reasonable given that the outlook for price volatility during the day remains uncertain. On balance, we decided to keep these years in our modelling, but adopt an approach of setting the retailer contribution and the benchmark range based on lower

percentile values than the median. We consider that taking the 25th percentile values provides a reasonable balance between addressing the impact of high prices in 2009-10 and 2010-11 on the value of PV exports and providing a reasonable reduction in our decision on the retailer contribution and the benchmark range. Appendix C provides details of our analysis of historical spot prices.

3.2.3 Calculating a weighted average loss factor

PV exports tend to be consumed close to where the electricity is produced, so the energy 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 gross up solar PV generation to the NSW node using an estimated loss factor. This ensures the benefit of being located close to where PV exports occur is included in the value we estimate.

In our review last year, we used loss factors from Ausgrid's network area. This year we have estimated a weighted average loss factor across all three distribution network areas in NSW, accounting for both transmission and distribution line losses. In particular, an overall loss factor is calculated as $MLF \times DLF$, where:

- *MLF* is transmission line losses between the Regional Reference Node (RRN) and each bulk supply connection point for 2015-16, weighted by actual energy consumption at each connection point, excluding industrial customers.
- *DLF* is distribution loss factors for small customers (estimated by network businesses), weighted by customers' actual consumption.

Table 3.5 sets out weighted average transmission and distribution loss factors and the overall loss factor applied to our calculation of the wholesale market value of PV exports. The overall loss factor is 1.0723 and is unchanged from our draft decision. This is slightly higher than our estimate last year of 1.0647. This is because this year we have accounted for losses in the Endeavour Energy and Essential Energy network areas as well as the Ausgrid network area. The estimated loss factor in the Essential Energy network area is higher than in other areas, but its contribution to the overall loss factor is small due to a smaller consumption volume.

Table 3.5 NSW weighted average loss factors for 2015-16

	Transmission loss factor (MLF)	Distribution loss factor (DLF)	Overall loss factor
NSW average	1.0028	1.0693	1.0723

Source: Ausgrid, Endeavour Energy, Essential Energy, AEMO and IPART analysis.

3.2.4 Updating NEM fees and ancillary charges

Retailers pay NEM fees, which include market fees and ancillary charges based on the amount of electricity they purchase from the NEM. Because these charges are levied on retailers' net purchases as measured by AEMO, they avoid having to pay these costs for the amount of electricity their customers export to the grid. NEM fees are very small compared to the other costs of supply, so avoiding them provides a small financial gain to retailers.

Our updated NEM fees and ancillary charges for 2015-16 is 0.087c/KWh, which is the sum of:

- NEM fees for 2015-16 of 0.038c/kWh as reported by AEMO, and
- our estimated ancillary service charges of 0.049c/kWh given by the average ancillary service charges from 1 January 2013 to 25 September 2015 (reported by AEMO).

Last year we used a long term average of ancillary service costs, which was around 0.07c/kWh. We observed that over the past few years ancillary service charges have been lower (around 0.05c/kWh) and therefore we consider that a shorter term average would be the best estimate for 2015-16. Since the draft decision, we have updated ancillary service charges to 25 September 2015. This had no impact on the estimated ancillary charges for 2015-16.

3.3 Setting the benchmark range and retailer contribution

Based on the estimates of the wholesale market values for 2015-16, we have made final decisions on the benchmark range and retailer contribution as shown in Table 3.6.

Our Final Determination on the benchmark range and retailer contribution are slightly higher than our Draft Determination in August 2015 as a result of our updated modelling. The forecast average spot price for 2015-16 has increased by around 5% since our Draft Determination, resulting in 0.3 c/kWh increase in both the benchmark range and retailer contribution for 2015-16.

Table 3.6 Final decisions on the benchmark range and retailer contribution in 2015-16 ($nominal, c/kWh)

	2014-15 Final decision	2015-16 Draft decision	2015-16 Final decision
Benchmark range	4.9 – 9.3 (value at all times: 5.6)	4.4 – 5.8 (value at all times: 4.8)	4.7 – 6.1 (value at all times: 5.1)
Retailer contribution	5.1	4.9	5.2

Source: IPART.

Our Final Determination on the benchmark range is based on our estimate of the wholesale market value of PV exports for net metered customers. The benchmark range is most relevant to customers who are not part of the SBS, and these customers mostly have net meters. In establishing the range, we have accounted for the value of PV exports **at different times of day**. The upper end of the benchmark range reflects the estimated value of PV exports during a 2-hour block when the value is the highest (ie, peak period) and the lower end of the range reflects the estimated value of PV exports at all other times excluding the 2-hour peak period.

Our Final Determination on the benchmark range for 2015-16 is lower than our determination for 2014-15 for two reasons.

- Our modelling incorporates historical spot prices and PV exports in financial years 2013-14 and 2014-15. Spot prices in financial years 2013-14 and 2014-15 were relatively low and flat throughout the day, contributing to lower solar premiums for 2015-16.
- The benchmark range is based on the 25th percentile wholesale market value of PV exports. This is based on our analysis that the high prices observed in 2009-10 and 2010-11, which placed upward pressure on the value of PV exports, are unlikely in 2015-16.

Although the forecast average spot price has increased by 8% since our Final Determination last year, the substantial reduction in solar premiums results in an overall decrease in the benchmark range.

Our Final Determination on the retailer contribution reflects the wholesale market value of PV exports **at all times** for gross metered customers. Our final decision on the retailer contribution last year was based on the value of PV exports for gross metered customers **at all other times of day** excluding the two-hour peak period. We have changed our approach this year because our terms of reference have changed and require us to set the retailer contribution so that the total amount to be contributed by retailers reflects the estimated total value to retailers of the energy generated under the scheme.

Our Final Determination on the retailer contribution is 0.2c/kWh higher than our Final Determination for 2014-15. Although the estimated solar premiums for 2015-16 are lower this year, the retailer contribution is higher than last year because the retailer contribution is based on the value of PV exports **at all times**, rather than the value during the off peak period.

Appendices

A Terms of reference

The Hon Anthony Roberts MP
Minister for Industry, Resources and Energy

NSW GOVERNMENT

V15/3001

RECEIVED
- 5 JUN 2015
INDEPENDENT PRICING & REGULATORY TRIBUNAL

IPART
Doc No .....
File No .....

Mr Peter J Boxall AO
Chairman
Independent Pricing and Regulatory Tribunal
PO BOX Q290
QVB POST OFFICE NSW 1230

Dear Mr Boxall

I write with regard to my recent reference to the Independent Pricing and Regulatory Tribunal (IPART) to set the retailer contribution for the NSW Solar Bonus Scheme (the Scheme) and set a fair and reasonable benchmark tariff for electricity exported from complying generators to the distribution network.

Thank you for advising that the current determination for the retailer contribution will lapse on 30 June 2015. So as to ensure continuity of a retailer contribution for the Scheme I am withdrawing the current reference in accordance with section 43EA (5) of the *Electricity Supply Act 1995* (the Act) and am referring new terms of reference pursuant to section 43ECA of the Act. The new Terms of Reference will allow IPART to make an interim determination to apply from 1 July 2015 until replaced by a subsequent determination.

You will also note that the subsequent determination remains in effect until 31 December 2016 or until replaced.

Pursuant to section 43ECA of the Act, I refer the attached Terms of Reference to IPART for determination.

In developing the proposed Terms of Reference I have given consideration to:

- IPART's previous consultation
- the degree to which the benchmarking method for NSW conforms with the Council of Australian Government's *Revised National Principles for Feed-in Tariff Arrangements*
- observations, including consumer feedback, on the state of retail offers in the market
- allowing consideration of additional factors or changes to methodology where this might enhance the rigour or completeness of establishing a fair and reasonable value and an appropriate retailer contribution to the costs of the Solar Bonus Scheme.

GPO Box 5341, Sydney NSW 2001
Phone: (02) 8574 5600 Fax: (02) 9339 5544 www.nsw.gov.au/ministercontactform/minister-roberts

The enclosed Terms of Reference differ from the reference for the 2014/15 period in that IPART is to set the retailer contribution so that the total amount to be contributed by retailers reflects the estimated total value to retailers of the energy generated under the Scheme. This is to address concerns that setting the contribution at the lower-range estimate of the wholesale market value does not fulfil the intent of the introduction of the retailer contribution. I have not prescribed a method that IPART must adopt.

I note that for 2014/15, IPART's calculation of the retailer contribution was based on the value of exports from gross metered customers. I expect that the vast majority of Scheme customers will remain on gross meters for most of the remainder of the Scheme. However, I will advise if I become aware that Scheme participants are switching to net meters in significant numbers.

IPART advised on a benchmark range for time-of-export based feed-in tariffs in its 2014/15 report. Although no retailers have offered time-based feed-in tariffs to date, such an exercise may assist innovation in retail offerings if significant numbers of smart meters begin to be deployed in the future.

In its 2014/15 review IPART identified both a benchmark range, to have regard to the value of PV exports at the time of day of export, and a single (all time) rate. There is merit in repeating both of these approaches and I would encourage IPART to give prominence to both the range and a single rate in its report and subsequent publications.

If you require further information please contact Ms Claudia Huertas, Director Operations and Programs on (02) 9995 0628.

Yours sincerely

03 JUN 2015

Anthony Roberts MP
Minister for Industry, Resources and Energy

Encl.

TERMS OF REFERENCE

Investigation and determination by IPART of a retailer benefit component and benchmark range for feed-in tariffs from 1 July 2015

Reference to IPART under section 43ECA of the *Electricity Supply Act 1995*

I, Anthony Roberts, Minister for Industry, Resources and Energy, refer to the Independent Pricing and Regulatory Tribunal (IPART) under section 43ECA of the *Electricity Supply Act 1995* (the Act) for investigation and report, the determination of:

1) The component payable by a retailer to a customer for electricity produced by a complying generator and supplied to the distribution network by a customer under the Solar Bonus Scheme (the retailer contribution); and

2) The voluntary benchmark range for solar feed-in tariffs paid by retailers for electricity produced by complying generators and supplied to the distribution network (the voluntary benchmark range).

IPART is to issue an interim determination of the retailer contribution (Interim Determination) to apply from 1 July 2015 until replaced by a subsequent determination.

IPART is to issue a subsequent determination in respect of the retailer contribution and the voluntary benchmark range (Subsequent Determination) as soon as practicable after the Interim Determination takes effect. The Subsequent Determination is to apply from the date the determination takes effect under section 43EC(1) of the Act until 31 December 2016 or until replaced.

Conduct of investigation

In making the Subsequent Determination, IPART is to consider the following matters:

- There should be no resulting increase in retail electricity prices
- The benchmark range should operate in such a way as to support a competitive electricity market in NSW
- The determination should be broadly in conformance with the Council of Australian Government's *Revised National Principles for Feed-in Tariff Arrangements*.

In making the Interim Determination, IPART may set the retailer contribution at the same rate that it determined for the 2014/15 period or may set a different rate.

In making the Subsequent Determination, IPART should set the retailer contribution so that the total amount to be contributed by retailers reflects the estimated total value to retailers of the energy generated under the Scheme.

Reporting

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

Consultation

In making the Interim Determination and the Subsequent Determination, IPART may undertake such consultation as it sees fit.

Definitions

"Solar Bonus Scheme" means the Scheme established under section15A of the Act.

B Estimating solar premiums

In this section, we provide more information about the methodology and data we used to estimate solar premiums.

B.1 Data

To estimate solar premiums, we have used:

- historical half-hourly PV export data from 2009-10 to 2014-15, and
- historical half-hourly spot prices in the NEM from 2009-10 to 2014-15.

Historical half-hourly PV exports

Consistent with previous reviews, we have used half-hourly PV exports in the Ausgrid network area from 2009-10 to 2014-15. We consider this area provides the best available data as it includes a large number of solar PV customers with time-of-use meters that record PV generation or exports every half-hour. The data on half-hourly PV export in the Endeavour Energy and Essential Energy network areas is insufficient for our needs, as most PV customers in these areas have accumulation meters or time-of-use meters that do not record data half-hourly.

For prior reviews, Ausgrid has provided data for around 1,000 and 10,000 PV customers over the 2009-10 and 2010-11 financial years, respectively. It has also provided a random sample of around 2,000 PV customers for 2011-12, and 1,000 PV customers for financial years from 2012-13 to 2014-15. These customers included business and residential PV customers with gross and net meters and a range of PV unit sizes (in kW).

Historical half-hourly spot prices

In NSW, the spot electricity price is referenced to the NSW regional reference node (RRN). We have obtained half-hourly spot prices for the NSW RRN for financial years from 2009-10 to 2014-15 from AEMO's website.[27]

[27] http://www.aemo.com.au/Electricity/Data/Price-and-Demand/Aggregated-Price-and-Demand-Data-Files accessed 6 August 2015.

B.2 Modelling methodology

To estimate solar premiums, we have used a Monte Carlo simulation process. This is consistent with the approach used in last year's review and includes the following three steps:

Step 1: Aggregation

We have historical half-hourly PV export profile for a set of sampled PV customers with net and gross meters. The first step in the simulation process is to create an aggregate half-hourly PV export profile for each meter class and year of data. This is calculated by summing the half-hourly exports of each sampled customer in a given half hour in a given day. For example, to create net metered half-hourly PV profile for 2013-14, we sum half-hourly exports of all net metered customers for each half hour for a given day during the 2013-14 period.

The resulting half-hourly PV export profile for each year and meter class is then normalised to 1 GWh per annum. Some years could have more solar PV energy exported than other years – for example, due to weather conditions. In addition, customers with gross meters generally export more solar PV than those with net meters due to the nature of the metering arrangements. The normalisation of the half-hourly PV export profiles enables us to easily compare the shapes of solar PV export profiles in different years and meter classes. The normalisation process does not affect calculation of the solar PV output-weighted electricity price since the correlation between solar PV exports and spot prices is preserved.

Step 2: Simulation

To estimate solar premiums based on a Monte Carlo simulation, we generate 5,000 synthetic years for 2015-16 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 PV 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 profile and prices. To preserve the intra-day correlation between PV export and electricity price, we sample days as a whole.

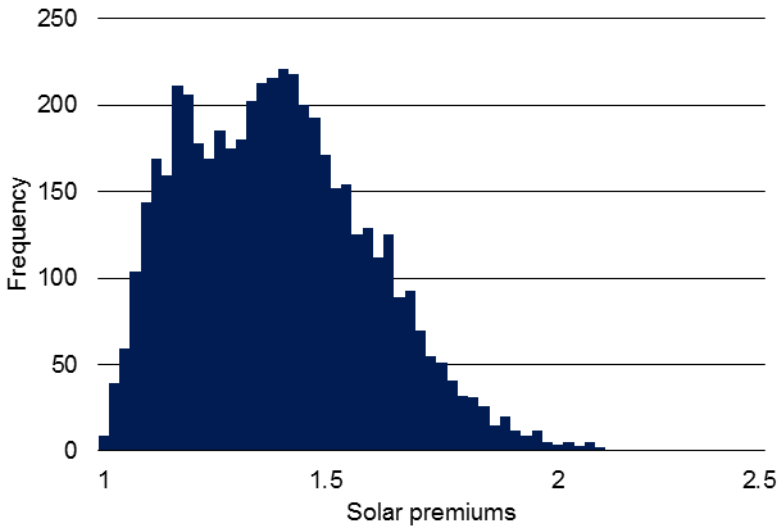
Step 3: Calculate and generate a distribution of solar premiums

For each of the 5,000 synthetic years we calculate a solar premium for each meter class (ie, gross and net meters). The solar premium is calculated as the ratio of the solar PV output-weighted price to the time-weighted price, where:

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

This process results in 5,000 solar premiums from which we can generate a distribution for both gross and net meters (for example, see Figure B.1). From this distribution we can calculate various summary statistics such as the median, 25th percentile and 75th percentile.

Figure B.1 Distribution of solar premiums using gross profile



Data source: IPART analysis.

C Analysis of historical spot prices

As discussed in Section 3.2.2, we have made our final decisions based on the 25th percentile value of PV exports. This section presents our analysis and evidence we considered in making our final decision.

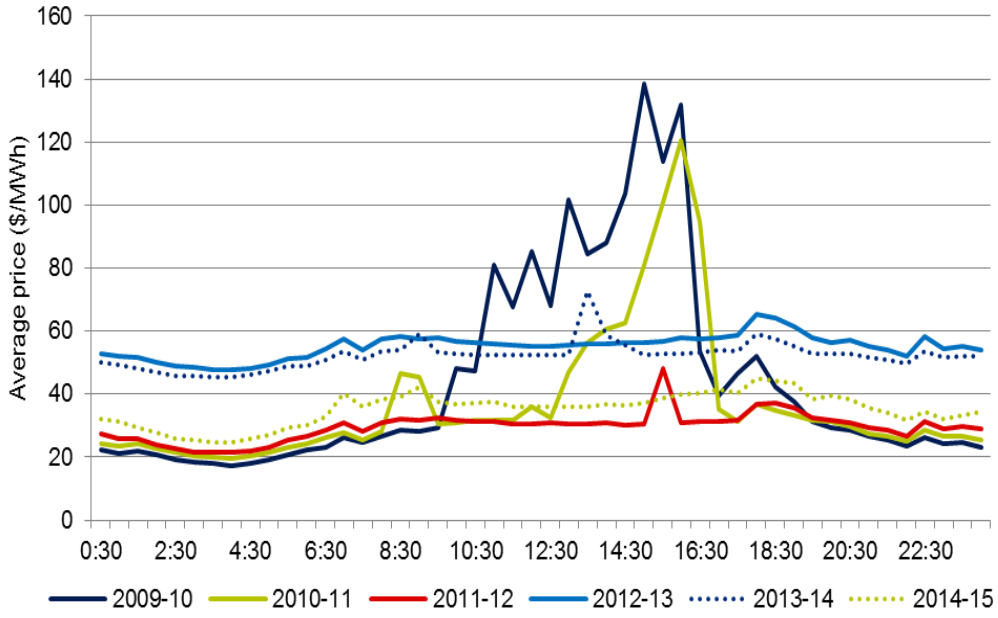
C.1 Analysis of historical spot prices

Figure C.1 shows the shape of average half-hourly spot prices throughout the day for each financial year from 2009-10 to 2014-15.

Most years were characterised by relatively low average prices during the middle of the day, although some years experienced a price spike later in the evening. However, financial years 2009-10 and 2010-11 were characterised by unusually high spot prices during the middle of the day relative to other years.

- In 2009-10, the average half-hourly spot prices from late morning until late afternoon were significantly higher than any other year, being consistently above $50/MWh. The average spot prices in the middle of the day were particularly high, reaching around $140/MWh.
- In 2010-11, average prices were relatively low until early afternoon, but gradually increased in late afternoon, with the average price reaching $120/MWh.

Figure C.1 Average half-hourly NSW spot prices from 2009-10 to 2014-15

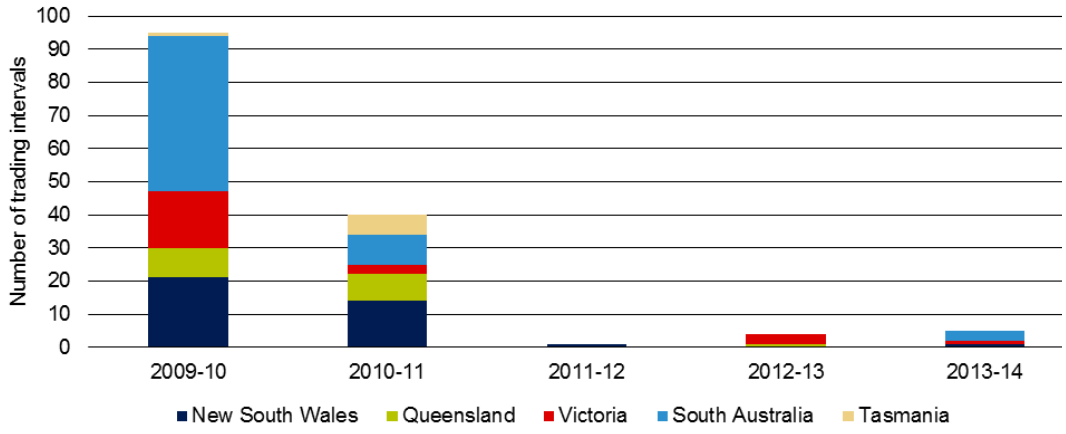


Data source: AEMO and IPART analysis.

According to the AER, a relatively tight supply and demand balance during periods of peak demand contributed an escalating trend of extreme price outcomes (ie, prices above $5,000/MWh) in the NEM from financial year 2009-10, peaking at 95 events in 2009-10 as shown in Figure C.2.[28] The AER reports that in the following years declining electricity demand and the rising penetration of renewable generation caused surplus capacity in most regions, resulting in a significant reduction in such extreme prices. Only one such event occurred in 2011–12, four events in 2012–13 and five events in 2013-14.

[28] AER, *State of the Energy Market 2014*, December 2014, p 14. The AER is required under the National Electricity Rules to report on prices of over $5000/MWh in the NEM.

Figure C.2 Frequency of prices above $5,000/MWh in NEM



Data source: AER, http://www.aer.gov.au/Industry-information/industry-statistics/wholesale accessed 4 August 2015.

C.2 Impact of spot prices in 2009-10 and 2010-11 on the value of PV exports

To understand the impact of the high prices in the middle of the day in 2009-10 and 2010-11 on the value of PV exports, we have estimated solar premiums including and excluding prices in these years and calculated the value of PV exports. Table C.1 shows the distribution of the value of PV exports at all times including and excluding financial years 2009-10 and 2010-11. Key findings are that:

- The values of PV exports with financial years 2009-10 and 2010-11 are materially higher than those without, regardless of the meter type.
- The distribution of the value of PV exports without financial years 2009-10 and 2010-11 is much less dispersed.
- The reduction in the value of PV exports is more pronounced at higher percentiles.

Overall, these results provide evidence that the high correlation between high prices and PV exports in 2009-10 and 2010-11 is highly likely to be driving up our estimated value of PV exports.

Table C.1 Value of PV exports at all times including and excluding 2009-10 and 2010-11 ($2015-16 c/kWh)

	Value of PV exports *including* 2009-10 and 2010-11		Value of PV exports *excluding* 2009-10 and 2010-11	
	Gross profile	Net profile	Gross profile	Net profile
5th percentile	4.7	4.7	4.4	4.4
10th percentile	4.8	4.7	4.4	4.4
25th percentile	5.2	5.1	4.4	4.4
Median	5.7	5.6	4.5	4.4
Mean	5.8	5.7	4.5	4.5
75th percentile	6.3	6.1	4.6	4.5
90th percentile	6.9	6.6	4.7	4.7
95th percentile	7.2	7.0	4.8	4.7

Source: IPART analysis.

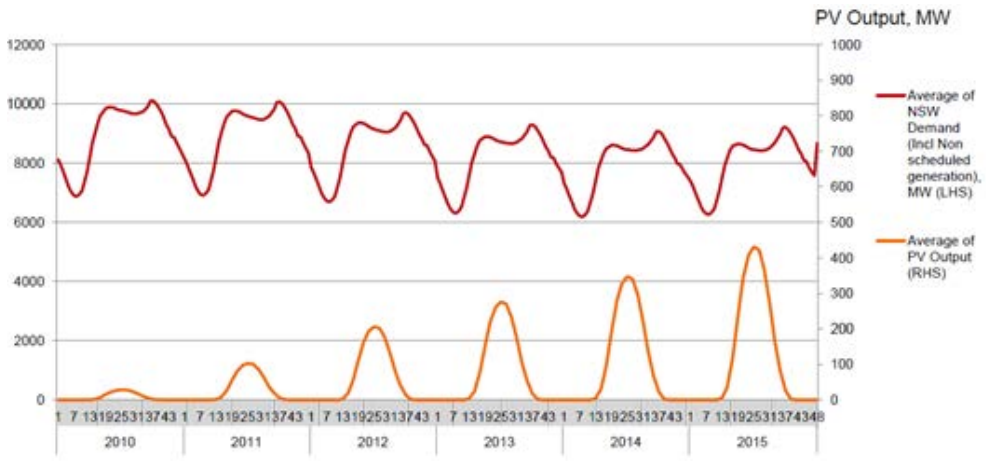
C.3 Likelihood of high prices in the middle of the day in 2015-16

Given the impact of the high prices in 2009-10 and 2010-11 on the value of PV exports, it is important to understand whether those high price events represent likely price outcomes for 2015-16. We have analysed *historical electricity demand profile* and *peak swap contract premiums*, and conclude that high prices in the middle of the day are unlikely to occur in 2015-16.

Declining peak time demand implies high prices in the middle of the day are unlikely

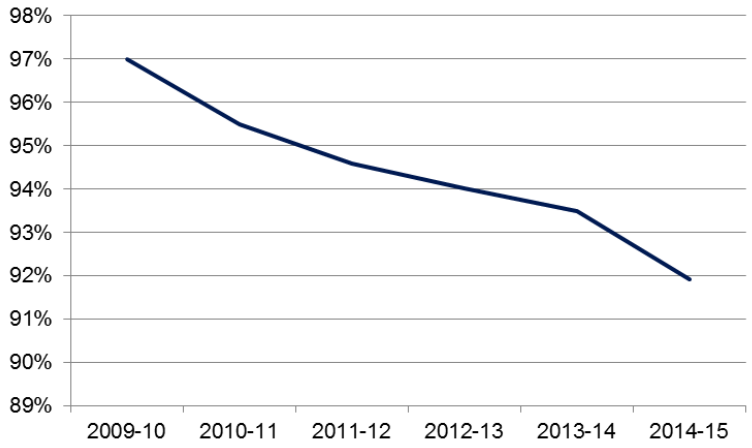
Figure C.3 shows the average demand profile and PV output for each financial year from 2009-10 to 2014-15. A typical day's electricity demand features two peaks – one in the morning and a larger one in the afternoon, and there is a trough period between them. While this pattern is maintained, overall electricity demand has been declining since 2011-12, coinciding with the rapid growth in PV output.

Figure C.3 Average daily profile of system demand and PV output



Data source: Origin Energy.

Figure C.4 Ratio demand at midday vs maximum demand



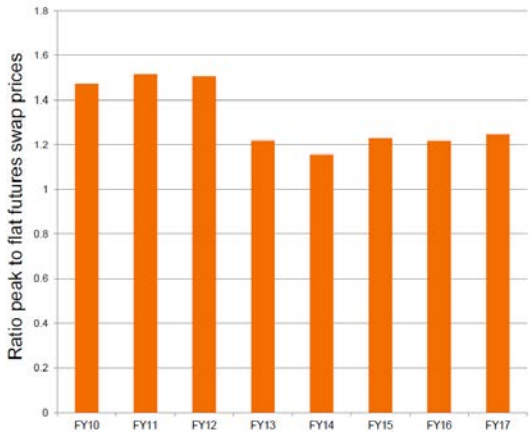
Data source: AEMO and IPART analysis.

The growth in PV output is particularly affecting the maximum demands at the peak periods and the midday period. As Figure C.4 shows, the midday period demand was almost as high as the maximum demand in 2009-10. As more electricity is produced by solar panels, the midday demand has gradually declined to 92% of the maximum demand in 2014-15. The declining demand during the peak periods implies there is less likelihood of high price events in the middle of the day.

Lower peak swap contract premiums imply high prices in the middle of the day are unlikely

Generally, if high price volatility and demand are expected during peak periods, this would be reflected in greater peak swap contract premiums relative to flat swap contracts.[29] Figure C.5 shows that in financial years from 2009-10 to 2011-12, peak swaps were traded at around 150% premium to flat swaps. However, peak swaps have been trading at a much lower premium relative to flat swaps since 2012-13. Over the next two years, the market seems to be expecting little price volatility as premiums attached to peak swap contracts continue to remain low, at around 120%.

Figure C.5 Peak to Flat Swap ratio



Data source: Origin Energy.

[29] Peak swaps cover the hours from 7:30am to 10:00pm on weekdays and flat swaps cover all 48 half-hour periods.

D Decisions on feed-in tariffs in other jurisdictions

Feed-in tariffs in other jurisdictions, except for South East Queensland, are mandatory and regulators set minimum feed-in tariffs. The minimum feed-in tariffs in other jurisdictions in 2015 or 2015-16 are lower than last year mainly due to a reduction in prices of electricity in the wholesale electricity market.

Table D.1 Decisions on feed-in tariffs in other jurisdictions

	Period	Rate (c/kWh)	Mandatory/voluntary
Regional Queensland (QCA)	2015-16	6.348	Mandatory minimum
South Australia (ESCOSA)	2015	5.3	Mandatory minimum
Victoria (ESC)	2016	5.0	Mandatory minimum
Tasmania (OTTER)	2015-16	5.5	Mandatory minimum

Note: In Australian Capital Territory and South East Queensland, feed-in tariffs are voluntary and retailers set rates as they see fit.

Source: QCA, *Estimated solar feed-in tariff for regional Queensland – Final decision*, June 2015, p 5; ESCOSA, http://www.escosa.sa.gov.au/article/newsdetail.aspx?p=16&id=1311 accessed 6 August 2015; ESC, *Minimum electricity feed-in tariff to apply from 1 January 2016 – Final decision*, August 2015; OTTER, http://www.energyregulator.tas.gov.au/domino/otter.nsf/elect-v/30 accessed 6 August 2015.

E Additional analysis on solar PV market offers

We have considered electricity offers available to solar PV customers who are not part of the Solar Bonus Scheme (SBS) to analyse whether electricity contracts with higher voluntary feed-in tariff would mean better deals. Our analysis shows that the electricity contract with the highest feed-in tariff does not necessarily provide the best overall deal for PV customers. This suggests that voluntary feed-in tariffs should not be considered in isolation, but rather as part of an overall electricity package.

The analysis in this Appendix relies on several assumptions which are outlined below. The results will change if these assumptions change. The analysis should not be considered financial advice and customers should undertake their own research before taking up a market offer.

Sample

We have assessed different electricity offers available to PV customers in the Ausgrid network area in NSW. In total, there were 43 electricity contracts available to PV customers, and 30 of these electricity contracts provided voluntary feed-in tariff. [30] These contracts were obtained from the EnergyMadeEasy website using a postcode of 2066. From the website, we have also obtained estimated annual bills including and excluding all available discounts based on annual consumption of 6,500 kWh. Where a retailer offers multiple electricity contracts, we have selected the contract with the lowest estimated annual bill. In total, our sample includes 15 electricity contracts.

Methodology

Our aim is to analyse whether electricity offers with higher feed-in tariffs are better than those with bigger discounts on usage and/or supply charges but with lower feed-in tariffs. To do so, we have calculated an expected annual bill, accounting for any savings from PV generation as follows:

Annual bill including all discounts as estimated by EnergyMadeEasy
– Total bill savings from consuming PV generation
– Total gain from exporting the remaining PV generation

[30] These offers were available on 30 September 2015.

For simplicity, we have estimated annual bills for the following three scenarios, where a PV customer:

- consumes all PV generation on site
- exports 35% of the total PV generation,[31] and
- exports all PV generation.

Since each retailer provides different usage charges for different consumption levels, for simplicity we have calculated an average usage charge and used it to approximate total bill saving from consuming PV generation and total gain from exporting the remaining PV generation. An average usage charge per kWh is calculated as total annual bill estimated by EnergyMadeEasy less total annual supply charge divided by total annual consumption.

Results and conclusion

Table E.1 shows estimated bills for three scenarios based on retailers' electricity contracts and voluntary feed-in tariffs. In the table, the numbers in brackets show rankings from the highest to the lowest.

We find that an electricity contract with a higher feed-in tariff does not necessarily deliver a better value to solar PV customers. For example, for an average PV customer who consumes 65% of PV generation and exports the rest, the contract from Retailer J with a six cent feed-in tariff is a better offer than that from Retailer B which offers a 10 cent feed-in tariff. In some cases, PV customers may be better off taking up contracts that do not offer any voluntary feed-in tariffs. This is because some retailers are offering contracts with a bigger discount on supply and/or usage charges, instead of offering high voluntary feed-in tariffs. This indicates that customers should consider voluntary feed-in tariffs as part of an overall electricity market offer.

[31] IPART's 2012 Solar Review found that an average solar PV customer with a 1.5 kW unit generates 1,882 kWh per annum, consumes 65% of her/his total generation onsite and exports the remaining 35%.

Table E.1 Best-priced electricity contracts for PV customers

Retailer	Voluntary feed-in tariff (cents/kWh, ranking)	Estimated annual bill including all discounts ($nominal, ranking)	Estimated bills for an average PV customer ($nominal, ranking)		
			Consume 65% Export 35%	Consume 100%	Export 100%
A	5.1 (6)	1,469 (7)	1,209 (7)	1,121 (7)	1,373 (6)
B	10 (1)	1,673 (14)	1,348 (12)	1,275 (14)	1,485 (11)
C	5 (8)	1,432 (6)	1,179 (6)	1,094 (6)	1,338 (5)
D	0 (12)	1,377 (2)	1,170 (5)	1,058 (2)	1,377 (7)
E	5 (8)	1,392 (3)	1,146 (2)	1,064 (3)	1,298 (4)
F	5.1 (6)	1,364 (1)	1,119 (1)	1,039 (1)	1,268 (1)
G	5 (8)	1,485 (8)	1,222 (8)	1,131 (8)	1,391 (8)
H	0 (12)	1,646 (12)	1,387 (14)	1,248 (13)	1,646 (13)
I	6 (5)	1,410 (5)	1,157 (4)	1,082 (4)	1,297 (3)
J	0 (12)	1,648 (13)	1,387 (13)	1,246 (12)	1,648 (14)
K	7.7 (3)	1,640 (11)	1,331 (11)	1,242 (11)	1,495 (12)
L	6.4 (4)	1,403 (4)	1,155 (3)	1,087 (5)	1,282 (2)
M	5 (8)	1,485 (8)	1,222 (8)	1,131 (8)	1,391 (8)
N	0 (12)	1,915 (15)	1,603 (15)	1,435 (15)	1,915 (15)
O	5.1 (6)	1,469 (7)	1,209 (7)	1,121 (7)	1,373 (6)

Note: Excluding GST. The estimated annual costs are based on offers available in postcode 2066 and annual consumption of 6,500 kWh.

Source: EnergyMadeEasy accessed 30 September 2015.

F A summary of stakeholder submissions to the Issues Paper and our responses

In this section, we provide a summary of stakeholder submissions in response to our Issues Paper, and our responses.

F.1 Wholesale market value approach

Submissions from retailers broadly agreed with our proposed wholesale market value approach, but made several suggestions in relation to:

- estimating a weighted average loss factor
- using the wholesale market value of PV exports for 2015-16 to set the retailer contribution until December 2016
- removing an assumed contract premium of 5% from the forecast spot price, and
- data requirements for estimating solar premiums.

Using a weighted average loss factor

In our Issues Paper, we proposed to use a weighted-average loss factor across the three network areas in NSW (Ausgrid, Endeavour Energy and Essential Energy) in estimating the wholesale market value of PV exports. Last year we used a loss factor for the Ausgrid network area.

Origin Energy supported using a weighted average loss factor for NSW.[32] AGL commented that using a weighted average loss factor is reasonable as long as spot prices and solar PV exports are sourced from all three network areas in NSW.[33]

The spot prices used in our wholesale market value modelling are NSW electricity spot prices, so they reflect prices across all network areas. In relation to solar PV export data, the only comprehensive source of information on half-hourly PV exports is available in the Ausgrid network area. It includes a large number of solar PV customers with time-of-use meters that record PV generation or exports each half-hour. Neither Endeavour Energy nor Essential Energy routinely collects and stores half-hourly data either because basic accumulation meters are in use, or time-of-use meters record data less frequently than half-hourly.[34] Therefore, we have made our draft decision to estimate the value of PV

32 Origin Energy submission, July 2015, p 1.
33 AGL submission, July 2015, p 1.
34 IPART, *Solar feed-in tariffs: The subsidy-free value of electricity from small-scale solar PV units from 1 July 2013 - Final Report,* June 2013, p 19.

exports using half-hourly NSW spot prices and half-hourly PV export data from the Ausgrid network area.

Using the value of PV exports for 2015-16 to set the retailer contribution until 31 December 2016

Our Final Determination on the retailer contribution this year will apply until 31 December 2016 (or until replaced). In our Issues Paper, we proposed that our analysis for the wholesale market value method be based on the 2015-16 financial year as a proxy for the 18-month period, noting that the NSW Government can replace the terms of reference if required.

AGL commented that the average spot price forecast and solar premiums should be estimated for the same period to account for any seasonality.[35]

We have examined whether there is any material difference in solar premiums and forecast average spot price between two periods: 2015-16 and July to December 2016. The median solar premium for 2015-16 is only marginally higher than for July to December 2016. Also, ASX NSW Base Load electricity contract prices for the third and fourth quarters of 2016 are not materially different from the prices for 2015-16, indicating that the market is not expecting any substantial change in electricity prices over these periods. As of 12 August 2015, the 40-day average ASX NSW Base load electricity contract prices are $38.8, $39.9 and $41.2 for 2015-16, 2016 Q3 and 2016 Q4, respectively.

On balance, we consider that the value of PV exports for 2015-16 is a reasonable proxy for the 18-month period to December 2016. As noted above, the NSW Government can replace our terms of reference and ask us to make a new determination for July to December 2016 if required.

Removing an assumed contract premium of 5% from the forecast spot price

Our approach to estimating the wholesale market value of PV exports includes removing an assumed contract premium of 5% from the forecast average spot price in 2015-16.

Origin Energy commented that we should consider increasing the assumed contracting premium to reflect the non-firm nature of solar PV energy.[36]

We do not agree with Origin Energy. Our wholesale market value method calculates the value of PV exports if they could be sold on the NEM. The method assumes PV customers are like a single large-scale generator who sells electricity on the wholesale market. Therefore, the non-firm nature of solar PV energy should not affect the contracting premium.

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35 AGL submission, July 2015, p 2.

36 Origin Energy submission, July 2015, p 1.

Data requirements for estimating solar premiums

Origin Energy commented that IPART's modelling should account for two issues that put upward pressure on solar premiums until 2013-14, but that will diminish from 2014-15. The first is that spot prices in financial years 2012-13 and 2013-14 included the carbon price and the second is that there were unusually high spot prices in 2009-10.[37]

On balance, we do not think an adjustment for the carbon price is necessary. An important determinant of the value of PV exports in our Monte Carlo simulation modelling is the correlation between spot prices and PV exports, not the level of spot prices. Spot prices in 2012-13 and 2013-14, which included the carbon price, were relatively flat, and showed a low correlation with PV exports. This means solar premiums for these years are unlikely to be much different with or without carbon. Further, we consider trying to calculate a set of carbon exclusive prices for 2012-13 and 2013-14 would introduce errors.

Based on our analysis, we agree with Origin Energy that spot prices in 2009-10 and 2010-11 in our sample period are unlikely price outcomes for 2015-16 and that they result in unusually high solar premiums. To account for this, we have set the retailer contribution and the benchmark range based on the 25th percentile value of PV exports. In our review last year, the retailer contribution and the benchmark range were based on the median value of PV exports.

F.2 Setting the retailer contribution

In our Issues Paper, we sought comment on setting the retailer contribution based on either the 25th percentile, median or mean or some alternative measure of the wholesale market value of PV exports at all times.

AGL recommended setting the retailer contribution at a lower percentile such as the 25th percentile. It commented that while a higher retailer contribution can reduce the costs of the SBS only marginally, there is the risk associated with setting the mandatory contribution too high. Since the terms of reference requires that there should be no resulting increase in retail electricity prices due to this determination, AGL considered taking a lower percentile value such as the 25th percentile would provide a more balanced outcome.[38] Origin Energy suggested setting the retailer contribution at the median value, consistent with our usual approach.[39]

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37 Ibid.

38 AGL submission, July 2015, p 2.

39 Origin Energy submission, July 2015, p 1.

As discussed above, we made a draft decision to adopt an approach of setting the retailer contribution for 2015-16 based on the 25th percentile wholesale market value of PV exports. This results in a lower retailer contribution compared to using the median wholesale market value of PV exports. This is discussed in detail in Section 3.

F.3 Setting the benchmark range

In our Issues Paper, we sought comment on a proposal to continue to set the benchmark range based on the wholesale market value of PV exports during a 2-hour period when the solar premium is highest and during all other periods excluding the 2-hour period.

AGL considered that it is arbitrary to set the upper and lower ends of the benchmark range based on the value of PV exports during a two-hour period when the value is the highest and the value of PV exports at all other times. It suggested adopting a range of percentiles, for example the 10th to the 90th percentile.[40] Origin Energy commented that our proposed approach may not assist customers with assessing different feed-in tariffs. It stated that setting the upper end based on the value of PV exports during a 2-hour period when the value is the highest suggests to customers that this represents a fair value at all times of day.[41]

We do not agree with these views, and have made a draft decision to continue to set the upper end of the benchmark range at the value of PV exports during a 2-hour block when the value is the highest and the lower end at the value of PV exports at all other times excluding the 2-hour peak period. We consider that setting the benchmark range this way reflects the value of PV exports at different times of day, as required by our terms of reference.

Consistent with our review last year, we also state that a single all-time solar feed-in tariff would be most closely represented by the value of PV exports across all times. Therefore, we do not agree that the upper end of our benchmark range suggests this represents a fair value at all times of day.

F.4 Annual market update for the benchmark range

In our Issues Paper, we proposed that for future solar reviews we would provide an annual market update for the solar feed-in tariff benchmark range. In these annual updates, we would use the approach we establish to set the benchmark range following our consultations in this review and use the most recent PV export data and other market data. Our first annual market update in May 2016 would provide a benchmark range for 2016-17.

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40 AGL submission, July 2015, p 2.

41 Origin Energy submission, July 2015, p 1.

Origin Energy agreed with publishing an annual market update for the benchmark range.[42] However, the Southern Sydney Regional Organisation of Councils (SSROC) is concerned that there will not be consultation on annual market updates.[43]

Our current approach has been established after extensive consultation and analysis over several years. In addition, the annual market update on the benchmark range is not binding and is to provide market guidance on the likely value of PV exports. However, we propose to consult on our methodology from time to time.

F.5 Some stakeholders commented that current feed-in tariffs are too low

We have received 14 submissions from individuals who commented that current feed-in tariffs are too low compared to the price of retail electricity.[44] Some submissions suggested that feed-in tariffs be set at between 30% to 90% of the retail price of electricity, or be the same as the retail price electricity (ie, '1 for 1 credit'). Submissions noted several reasons why feed-in tariffs should be higher. These submissions are summarised below.

PV exports decrease transmission congestion

One submission commented that PV exports decrease transmission congestion as PV electricity tends to be consumed close to where they were injected into the grid, and this should be reflected in the value of solar PV exports.[45]

We agree that solar PV electricity can contribute to a reduction in peak demand in the transmission network. The National Electricity Rules provide a mechanism for certain embedded generators connected directly to the distribution network to receive a payment for avoided Transmission Use of System (TUoS) charges. These avoided TUoS payments were originally intended for large embedded generators whose PV exports help to reduce peak demand in localised areas of the network. Avoided TUoS payments to large embedded generators are typically negotiated directly between the network operator and the generator as part of their connection agreement. However, currently there is no mechanism available for retailers to claim avoided TUoS payments on behalf of their PV customers. This means retailers receive no financial benefit from avoided transmission costs that should be included in the calculation of a subsidy-free feed-in tariff. In addition, under current regulatory arrangements

42 Ibid.

43 Southern Sydney Regional Organisation of Councils submission, July 2015, p 3.

44 Submissions from T. Baird, M. Hessen, J. Rasmussen, G. Russell, C. Tyler, and two anonymous individuals, June 2015; Submissions from P. Edney, D. Leadbitter, P. Maslen, I. Naylor, M. Vorstermans, M. Whitehouse, and anonymous individual, July 2015.

45 Southern Sydney Regional Organisation of Councils submission, July 2015, p 2.

TransGrid (ie, the NSW transmission business) is regulated under a revenue cap with an unders and overs account. Under these arrangements, avoided TUoS charges are simply relocated and recovered in the next financial year from distribution network operators. This would result in higher retail electricity prices in the next financial year.

The Australian Energy Market Commission (AEMC) recently received a rule change proposal in relation to this issue. The rule change proposes that distribution businesses implement a local generation network credit (LGNC). The LGNC is a price signal for exported electricity to reflect the long-term benefit to distribution businesses, including reduced or avoided transmission costs. The LGNC would be available to PV customers of any size. More information is available on the AEMC's website.[46]

PV exports avoid electricity losses

Some submissions commented that the value of solar PV exports should be higher to reflect the fact that PV exports reduce loss of electricity as it is consumed close to where they were injected into the grid.[47]

Our current approach accounts for avoided losses by grossing up the wholesale market value of solar PV by a 'loss factor'. This recognises the value of PV electricity in reducing transmission and distribution loss of electricity. All else being equal, applying a loss factor increases the value of PV exports.

Setting the feed-in tariff as a fixed percentage of the retail price of electricity

One stakeholder commented that electricity should be priced equally regardless of whether it is generated by coal-fired generation plant, wind power or solar energy.[48] While it considered '1-for 1 credit' would be overly generous, SSROC suggested that the benchmark range should be set at a comparable rate with any other power generator and reflect the actual value that the retailers are getting from the solar PV exports.[49] A number of stakeholders said that a fair feed-in tariff would be equal to or some percentage of the retail price.[50]

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46 http://www.aemc.gov.au/Rule-Changes/Local-Generation-Network-Credits, accessed 21 August 2015.

47 Submissions from M. Hessen, June 2015; M. Vorstermans, July 2015, p 1.

48 Submission from P. Maslen, July 2015.

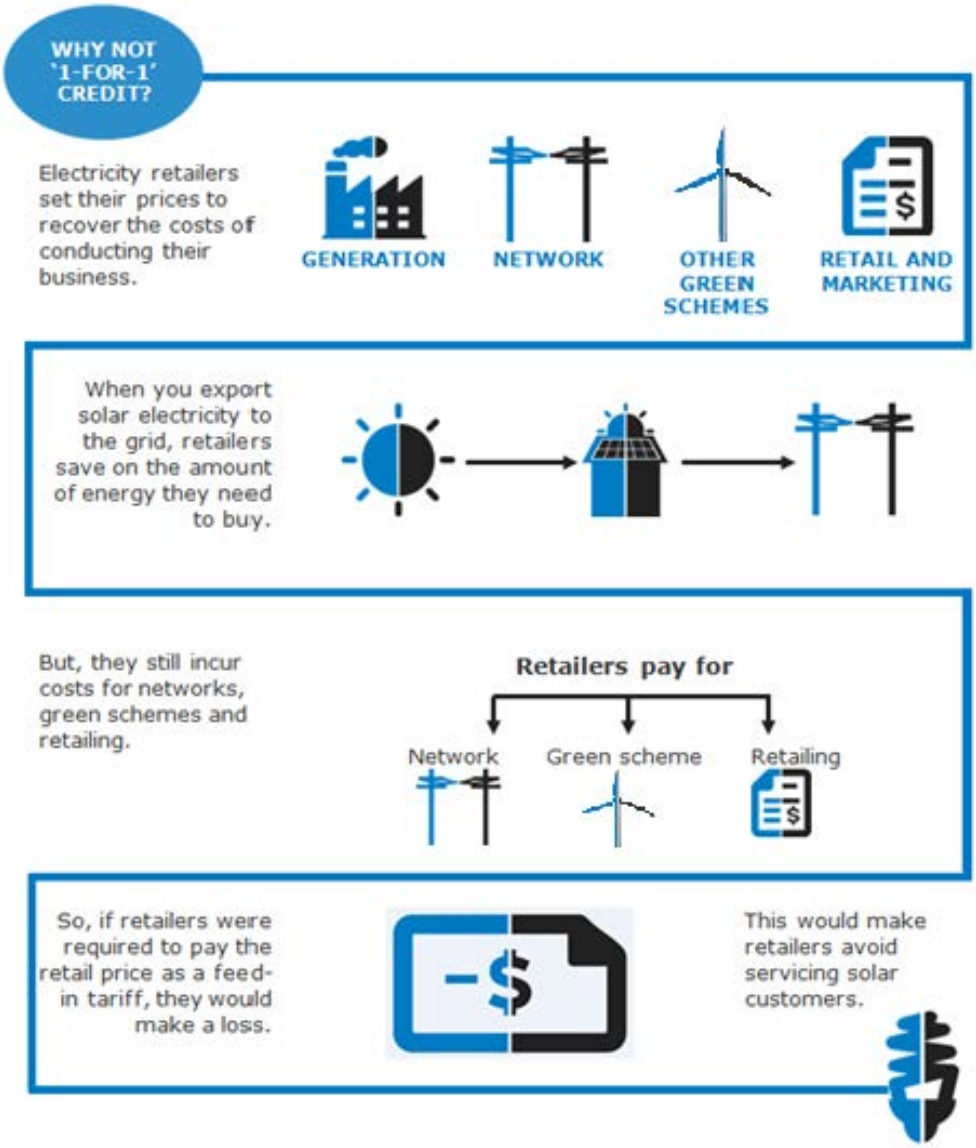
49 Southern Sydney Regional Organisation of Councils submission, July 2015, p 2.

50 Submissions from T. Baird, M. Hessen, J. Rasmussen, G. Russell, and two anonymous individuals, June 2015; Submissions from I. Naylor, M. Vorstermans, M. Whitehouse, and anonymous individual, July 2015.

If we were to require retailers to pay the retail price or a fixed percentage of the retail price that exceed the subsidy-free value, they would incur a loss. When solar electricity is exported to the grid, retailers can save on the amount of electricity they need to purchase from the wholesale electricity market. However, retailers cannot avoid incurring certain costs on this electricity such as network, green scheme and retailing costs. These costs represent a substantial portion of the total cost of providing retail electricity. Therefore, the value of PV customers' exports to retailers is considerably less than the retail price. Box F.1 illustrates why the solar feed-in tariff should be less than the price of electricity.

If feed-in tariffs were set too high, this would mean retailers would avoid serving PV customers, and this would not be in the customers' interests. A feed-in tariff set at the retail price of electricity would require a subsidy to be paid to PV customers. This would also not be consistent with our terms of reference which requires that our decisions support a competitive electricity market and that we estimate the 'subsidy-free' value of PV exports.

Box F.1 Why is the solar feed-in tariff less than the price of electricity?



PV customers are treated unfairly

Some submissions commented that electricity retailers can (and do) provide an unfair deal to PV customers with prices of electricity offers with feed-in tariffs being higher than those without.[51]

[51] Submission from C. Tyler, June 2015.

We have not found that electricity retailers charge higher usage rates and supply charges when they offer a voluntary feed-in tariff. Assuming annual consumption of 6,500 kWh, the estimated annual bills of electricity offers with a voluntary feed-in tariff are on average approximately $81 lower than those without, before any discounts. Even after applying all discounts, electricity offers with a voluntary feed-in tariff are on average approximately $25 cheaper per annum than those without.[52]

Providing financial incentives to PV customers

Some stakeholders commented that some form of incentives should be provided to PV customers for the costs of purchase and ongoing maintenance of PV system or in setting feed-in tariffs we should account for these costs.[53] One submission said that it would take longer to recoup investment associated with solar PV unit at the current feed-in tariff.[54]

PV customers continue to receive upfront incentives under the Small-scale Renewable Energy Scheme. However, the terms of reference for our review require that our recommendations be subsidy-free. Also, the primary benefit of having a solar PV unit is a reduced electricity bill. This should be the biggest financial incentives and. as mentioned earlier, the uptake of battery storage will mean PV customers will be able to use more of the electricity they generate to meet their own needs.

Innovations in the solar industry

One submission to our Issues Paper commented that Australian power companies need to become more innovative in response to the latest developments in the renewable energy industry.[55]

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52 The estimated annual bills include usage rates and supply charges only, and do not include any savings that may come from PV exports. Offers available as at 3 August 2015 for postcode 2048.

53 Two anonymous submissions, June 2015.

54 Submission from T. Baird, June 2015.

55 Submission from D. Leadbitter, July 2015.

As outlined in our Issues Paper, electricity retailers are increasingly offering more diverse solar products to their customers, including zero upfront cost PV systems, zero interest payment options and battery storage. For example:

- AGL's Solar Smart Plan involves a zero upfront cost solar system and AGL agrees to maintain the system over its lifetime. AGL guarantees that the system will supply a minimum amount of solar energy to the customer, and the customer pays a predetermined monthly amount for this energy. Any extra energy generated during the day is provided to the customer for free.[56]
- Several retailers have announced or are trialling battery storage products that will enable PV customers to store the excess electricity they produce during the day rather than export it to the grid. These products will enable customers to use all their production to meet their own needs, further reducing the amount they need to import from the grid. AGL launched its first battery product, 'Power Advantage' in May 2015. This product can store 6 kWh of solar energy and is suitable for households with PV units of 3-4.5 kW.[57] Origin Energy has announced it will launch a battery product later this year.[58]
- Tesla and Reposit Power are developing technology that would allow PV customers to participate in the wholesale market. It involves integrating software into battery systems to allow consumers to buy electricity from the grid when wholesale prices are low and store it to use when these prices are high, and store their own solar power to use at another time or sell to the market when prices are high.[59]
- New competitors known as 'alternative energy sellers' are emerging. These businesses typically offer an arrangement where they install solar panels at a customer's home or business, and sell the energy produced by these panels to the customer. The AER may grant these businesses an exemption from the requirement to hold an electricity retailer authorisation under the National Energy Retailer Law.[60]

These new products will make solar PV accessible to a broader range of customers, and make it possible for PV customers to use more of the electricity they generate to meet their own needs. The structure of some of these products may mean that traditional feed-in tariffs become less relevant over time.

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56 http://aglsolar.com.au/payment-options/, accessed 27 July 2015.

57 http://www.agl.com.au/about-agl/media-centre/article-list/2015/may/agl-is-first-major-retailer-to-launch-battery-storage accessed 27 July 2015.

58 Sydney Morning Herald, *Energy retailers climb on board with Panasonic for battery trials*, 2 June 2015 available at http://www.smh.com.au/business/energy-retailers-climb-on-board-withpanasonic-for-battery-trials-20150602-ghellb.html accessed 27 July 2015.

59 http://arena.gov.au/news/tesla-and-reposit-power-team-up-with-arena-supported-storage-solution/, accessed 27 July 2015.

60 AER, *Statement of Approach: Regulation of alternative energy sellers under the National Energy Retail Law*, June 2014, p 9.