IPART
New South Wales

Independent Pricing and Regulatory Tribunal

Solar feed-in tariffs

Setting a fair and reasonable value for electricity generated by small-scale solar PV units in NSW

Energy — Draft Report
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Invitation for submissions

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

Submissions are due by 23 January 2012.

We would prefer to receive them by email <ipart@ipart.nsw.gov.au>.

You can also send comments by fax to (02) 9290 2061, or by mail to:

Solar feed-in tariffs
Independent Pricing and Regulatory Tribunal
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1 Introduction and executive summary

In recent years, government schemes have provided generous subsidies to customers installing solar photovoltaic units (PV units). The Federal Government's Renewable Energy Target provides an up-front subsidy on PV units, while the NSW Government's Solar Bonus Scheme provided subsidised feed-in tariffs for the electricity produced by PV units.

At the same time as these subsidies were available, the cost of installing PV units fell significantly. As a result, over 150,000 customers have installed over 340 megawatts (MW) of PV generation capacity in NSW.[1]

The uptake of small-scale PV units has been much greater than anticipated by Government. As a result, the costs of the subsidy schemes are also greater than expected. These costs have already contributed to higher retail electricity prices in NSW,[2] and will continue to put pressure on prices for the life of the schemes.[3]

In an environment of already increasing electricity prices, the NSW Government closed the Solar Bonus Scheme to new participants on 1 July 2011. It then asked IPART to recommend a 'fair and reasonable' value for a feed-in tariff for customers who export electricity to the grid but are not eligible for the Solar Bonus Scheme, and a mechanism to implement this value in NSW. However, it stipulated that our recommendations:

- should not result in an increase in electricity prices in NSW, and
- should not require funding from the NSW Government budget.

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1 The installed capacity and customer numbers reflects eligibility the Renewable Energy Target scheme and the Solar Bonus Scheme. Source: Industry & Investment NSW, *NSW Solar Bonus Scheme, Statutory Review, Report to the Minister for Energy*, October 2010, p 10, http://www.dtiris.nsw.gov.au/energy/sustainable/renewable/solar/solar-scheme/applications, and information provided by Distribution Network Service Providers as at 9 September (Endeavour Energy), 7 October (Ausgrid), and 9 October 2011 (Essential Energy).

2 The increased costs incurred by retailers in complying with government green schemes added 6% to regulated retail electricity prices on 1 July 2011. The vast majority of this increase was associated with the Federal Government's Small-scale Renewable Energy Target. See IPART, *Changes in regulated electricity retail prices from 1 July 2011, Final Report*, June 2011, p 3.

3 The NSW Government has announced that it will increase the Climate Change Fund levy to recover the costs of the Solar Bonus Scheme (NSW Budget 2011/12 – Budget Paper 2, chapter 5, p 3). Further, electricity retailers need to buy the certificates created upon installation of eligible PV units under the Federal Government's Renewable Energy Target scheme.

In other words, any future feed-in tariff for these customers must be subsidy-free.

The Government also asked us to undertake 2 related tasks. These were to:

- Examine the impact of PV on the costs of electricity distribution network businesses and recommend whether further detailed modelling is warranted to understand this impact.
- Recommend a contribution that retailers could make towards the costs of the Solar Bonus Scheme, reflecting the benefit to retailers of the energy produced by PV generators. This contribution would lessen the electricity price increases required to cover the costs of the scheme.

We have completed our draft review, and seek comment from stakeholders on our draft findings and recommendations before we make our final recommendations. This report sets out our draft recommendations, and explains how and why we reached them.

1.1 Fair and reasonable value and mechanism for implementing a subsidy-free feed-in tariff in NSW

In summary, we recommend a fair and reasonable feed-in tariff of 8 to 10 cents per kilowatt hour (c/kWh) in 2011/12. This value will increase after the introduction of a carbon pricing mechanism on 1 July 2012, but we cannot provide an estimate for 2012/13 until June 2012.

We think that the best way to implement the feed-in tariff is to make it a benchmark range. However, we are not recommending that retailers be obliged to offer feed-in tariffs within the benchmark range. We expect that the publication of the benchmark range will exert competitive pressure on those retailers who do not currently offer a feed-in tariff.

We are still considering whether Standard Retailers should be required to offer a feed-in tariff to their regulated customers. Currently 2 of the 3 Standard Retailers do not offer a feed-in tariff (except the statutory rate for customers eligible under the Solar Bonus Scheme). Such an obligation would mean that a PV customer could remain on the regulated price and receive a feed-in tariff. However, if we decide they should be obliged to offer feed-in tariffs to regulated customers, we propose that Standard Retailers set their own rates. We are seeking comment on the likely costs and benefits of requiring Standard Retailers to offer feed-in tariffs to regulated customers.

1.1.1 Fair and reasonable value for a subsidy-free feed-in tariff

The value of a feed-in tariff can be calculated in several different ways. The two ways which we have considered are first, basing the feed-in tariff on the direct financial gain which retailers make from PV exports and second, basing the feed-in tariff on the wholesale market value of PV exports at the time of day of export.

Our recommended fair and reasonable value for a subsidy-free feed-in tariff of 8 to 10 c/kWh in 2011/12 is based on the direct financial gain the retailers make from PV exports. We also considered the wholesale market value of PV exports at the time they are exported. We estimated that this value is in the range of 5.2 to 7 c/kWh in 2011/12 and 7 to 9.8 c/kWh in 2012/13.[4]

However, we chose to base our recommendation on the financial gain to retailers because it more closely reflects the benefits that PV exports provide to retailers.

During consultations for our review, many stakeholders raised the view that retailers should pay PV customers a feed-in tariff in line with the retail price they charge these customers. This suggests these stakeholders believe the direct financial gain to retailers from PV exports is equal to the retail price – or that retailers get this electricity 'for free'. However, this is not the case. Retailers still incur a range of costs for PV exports, including network costs and green scheme costs. Therefore, their direct financial gain for these exports is equal to the retail price they charge minus these costs that they still incur.

In addition, we considered whether PV exports are likely to reduce network costs or provide other benefits that could be captured in determining the fair and reasonable value. We found that PV exports are unlikely to provide system-wide benefits that will materially reduce network costs in NSW. Any benefits that arise are likely to be location- and time-specific. Further, at current levels of PV installation these benefits are likely to be small. They may also be offset by system-wide cost increases as a result of the uptake of small-scale PV.

We also found that other potential benefits of PV exports, such as reductions in electricity losses and changes to the pool price and load shape, could not feasibly be captured due to the practical arrangements within the electricity industry. Moreover, including these benefits in determining a future feed-in tariff could lead to increased electricity prices, and so would not be consistent with our terms of reference.

4 This applies to all customers, not just regulated customers.

1.1.2 Mechanism for implementing a subsidy-free feed-in tariff

We think that it is appropriate to set a benchmark range for the feed-in tariff, supplemented with improved customer information. We consider that this approach, rather than a mandatory feed-in tariff, best supports the competitive market as it minimises the risk of regulatory error,[5] which could make PV customers unattractive to retailers.[6] With knowledge of the benchmark range and better information, customers should be able to access a fair and reasonable value for their exports.

Our proposed approach provides guidance for:

- retailers, but allows them to design their own feed-in tariff offers after considering the characteristics of their PV customers (such as location, PV unit size, consumption patterns and metering arrangements)
- customers, making it easier for them to assess retailers' feed-in tariff offers and seek out an offer that best suits their circumstances.

In contrast, it would be difficult for us to get a mandatory rate exactly right because of the individual characteristics of retailers and their PV customers. Setting the feed-in tariff too high could affect the attractiveness of PV customers in the market and potentially affect the financial viability of retailers.

Our benchmark value covers a range of customer locations and types and lets the retailers set their specific feed-in tariffs, which they may choose to vary according to their customers characteristics.

1.1.3 Supporting actions

This benchmark range approach will better deliver fair and reasonable feed-in tariffs if customers can access clear, concise and accurate information about feed-in tariff offers. We think that better information is necessary to help customers assess retailers' feed-in tariff offers and identify the best offer for their circumstances. In turn, more effective customer participation will increase competitive pressure on retailers.

We have recommended amending the price disclosure guidelines and marketing code to clarify that retailers are required to specify the feed-in tariff rate they offer (even when this rate is equal to zero). Additionally we want to ensure that retailers provide *accurate, clear and concise* information to customers about feed-in tariffs, particularly through their call centres and door-to-door marketers.

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5 The risk of regulatory error is the risk that the regulator will set prices too high or too low compared to the service providers' efficient costs.

6 Retailers might then avoid PV customers or provide different offers to those that they provide to non-PV customers.

We have also recommended the NSW Government and the solar industry provide accurate and readily-accessible information to improve customers' understanding of the financial consequences of installing small-scale PV. Further, we have included information on the characteristics of PV customers in Chapter 4 and our fact sheet *Customers with solar PV units in NSW-producing consuming electricity*.

1.2 Impact of solar PV on the costs of electricity distribution network businesses

We found that PV exports are unlikely to materially reduce network costs in NSW. Any benefits that arise are likely to be location- and time-specific (in areas that need upgrading). At current levels of PV installation these benefits are likely to be small because the current level of PV exports cannot offset the need for network upgrades. In addition these potential network benefits may be offset by system-wide cost increases as a result of the uptake of small-scale PV. For these reasons, our draft recommendation is that no comprehensive network system modelling is warranted at this stage.

However, the potential for location- and time-specific benefits (and costs) may increase as more PV is installed. We are recommending that the National Electricity Rules and guidelines be reviewed to ensure small-scale renewable generation is appropriately incorporated into the policy and regulatory framework. This review is warranted because the embedded generation provisions within the National Electricity Rules may not be well tailored to small-scale generation such as PV units (due to its rarity at the time that the National Electricity Rules were developed) and the increasing penetration of PV across the National Electricity Market.

1.3 Retailer contribution to the costs of the Solar Bonus Scheme

As noted above, the generous subsidies offered by governments contributed to a much higher than anticipated uptake of PV in NSW, and led to higher than anticipated costs. The former NSW Government responded by reducing the feed-in tariff under the Solar Bonus Scheme from 60 c/kWh to 20 c/kWh in October 2010, and the current Government closed the scheme to new participants in July 2011.[7] Nevertheless, the large costs of the Solar Bonus Scheme will be recovered through electricity prices over the coming years. This means that all electricity customers in NSW will face higher electricity prices to cover the costs of the Solar Bonus Scheme.

7 The scheme was suspended on 28 April 2011 and subsequently closed on 1 July 2011. See: http://www.trade.nsw.gov.au/energy/sustainable/renewable/solar/solar-scheme/customers, accessed on 14 November 2011.

We have previously recommended that all retailers with PV customers be required to contribute towards the costs of the scheme, to reflect the benefit they receive from supplying customers who are participants in the Solar Bonus Scheme.[8] A contribution from retailers will mean lower electricity price increases in the future. In this review, the Government asked us to recommend a contribution from retailers in line with this benefit.

Our draft recommendation is that each retailer should contribute for each eligible kWh from its customers under the Solar Bonus Scheme. The rate should be 7.5 c from implementation until 30 June 2012 and then be reviewed for 2012/13 in June 2012 (and annually thereafter)[9]. These recommendations reflect our view that:

- each retailer's contribution should be based on the direct financial gain it makes from its Solar Bonus Scheme customers' participation in the scheme
- the contribution should be a statutory obligation on every retailer serving Solar Bonus Scheme customers to ensure the contributions are made, and that there is no impact on the competitive market.

We estimated the financial gain using the same method we used to estimate retailers' financial gain from PV customers' exports, discussed above. We found that this gain ranges from 8.3 to 10.3 c/kWh, based on regulated prices. We chose to set the contribution slightly below the lower bound of this range to reflect discounting in the market and to ensure that the mandatory contribution does not make these customers unattractive to retailers.

We recognise that if these recommendations are implemented, retailers that are currently voluntarily offering their SBS customers 6 to 8 c/kWh on top of the statutory feed-in tariff rate are unlikely to continue to offer this premium.

We consider that retailers should make a contribution towards the costs of the Solar Bonus Scheme. This will reduce future electricity price increases by reducing the amount of the costs of the scheme that need to be recovered from electricity customers.[10]

This contribution will ensure that customers and taxpayers do not have to fund the entire costs of the Solar Bonus Scheme. It will ensure that retailers who do not pay a voluntary premium to customers of the Solar Bonus Scheme do not benefit financially.

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8 IPART, *Change in regulated electricity retail prices from 1 July 2011 – Final Report and Determination*, June 2011, p 14.

9 If retail price regulation continues beyond 30 June 2013, IPART can provide advice on the appropriate contribution. If retail price regulation does not continue, then the Government should consider arrangements for setting the contribution.

10 The NSW Government has announced that it will increase the Climate Change Fund levy to recover the costs of the Solar Bonus Scheme (NSW Budget 2011/12 – Budget Paper 2, chapter 5, p 3). This will further increase electricity prices.

Solar Bonus Scheme customers will continue to receive their existing statutory feed-in tariffs, which are subsidised.

For illustrative purposes we estimated the contribution that retailers would have made in 2011/12 towards the costs of the scheme. We are not suggesting a retrospective contribution, rather we are demonstrating the proportion of cost savings that would arise if such a contribution had been made. If retailers had paid our recommended contribution for 2011/12, their contributions would have saved around $29 million, or 14% of the Solar Bonus Scheme's costs (as estimated by IPART) for that year. Because retail prices are not set until June for the following financial year, we cannot currently recommend the contribution for 2012/13, but it is likely to be higher due to the introduction of the carbon pricing mechanism.

1.4 How stakeholders can provide comment on our draft report and recommendations

As is IPART's usual practice, we are conducting this review as a public process. In August 2011 we released an Issues Paper and received 39 submissions. We considered these submissions in our deliberations for this Draft Report.

We invite all interested stakeholders to make written submissions in response to this Draft Report by 23 January 2012. In addition, we will hold a round-table discussion on 12 December 2011 and invite specific interested stakeholders to participate, and the general public to observe proceedings.

We will release our final report by early April 2012.

Table 1.1 sets out the timetable for this review.

Table 1.1 Timetable for review

What	When
Received terms of reference	4 August 2011
Release Issues Paper	11 August 2011
Submissions on Issues Paper due	12 September 2011
Release Draft Report	24 November 2011
Public forum	12 December 2011
Submissions on Draft Report due	23 January 2012
Release Final Report	Early April 2012

1.5 What does the rest of this report cover?

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

- Chapter 2 explains the terms of reference the Government provided for this review and provides important contextual information
- Chapter 3 sets out our analytical approach to this review
- Chapter 4 describes the characteristics of PV systems in NSW
- Chapter 5 discusses our recommendations on a fair and reasonable value for a subsidy-free feed-in tariff and provides an overview of the findings and analysis that led to those recommendations
- Chapters 6 to 8 explains our analysis and findings on a fair and reasonable value for a subsidy-free feed-in tariff in detail, including on:
  - the value of PV exports, based on the direct financial gain to retailers from these exports and their wholesale market value
  - the potential for PV exports to reduce network distribution costs and whether comprehensive network system modelling is warranted to understand their impact on distribution network costs
  - the potential for PV exports to provide other benefits to parties other than the PV customer or its retailer or network business
- Chapter 9 discusses our analysis and recommendations on a mechanism for implementing a subsidy-free feed-in tariff in NSW
- Chapter 10 explains our analysis and recommendations on a contribution from retailers towards the costs of the Solar Bonus Scheme.

For easy reference, a complete list of our draft recommendations is also provided below.

1.6 Complete list of draft recommendations

Draft Recommendations

A fair and reasonable feed in tariff

1 A fair and reasonable value for a subsidy-free feed-in tariff in NSW is in the range of 8 to 10 c/kWh for 2011/12. 38

4 The appropriate mechanism for implementing a fair and reasonable value feed-in tariff in NSW is the publication of benchmark range for this tariff. This benchmark range will: 84

- inform PV customers of the potential fair and reasonable value of their electricity exports in the coming financial year 84
- better enable PV customers to assess retailers' feed-in tariff offers 84
- encourage retailers to voluntarily offer competitive feed-in tariffs that reflect the fair and reasonable value of the electricity exported by PV customers. 84

5 If the NSW Government decides to introduce new obligations for retailers' in relation to feed-in tariffs, it will need to consider how these new obligations can be implemented when retailers transition to the national framework for the sale and supply of energy under the National Energy Consumer Framework. 84

6 To enhance the effectiveness of publishing a benchmark range for a fair and reasonable value feed-in tariff, the following action should be taken to improve the quality and accessibility of information available to customers on feed-in tariffs: 93

- The Retail Price Disclosure Guideline and NSW Marketing Code of Conduct should be amended to clarify that retailers (and their marketers) must specify the amount of the feed-in tariff rate they offer (even when this rate is equal to zero). The NSW Marketing Code of Conduct should also be amended to require the amount of the feed-in tariff rate to be disclosed to customers before they enter into a contract with retailers. IPART will publish these rates on our price comparison website. 93
- In complying with obligations under the price disclosure guidelines and NSW Marketing Code of Conduct, retailers should ensure that the information provided to customers, is accurate and presented in a clear and concise manner. This includes information provided via call centres and door to door marketers. 93
- The NSW Government and the solar industry provide clear information to customers about small-scale solar PV, including the potential financial consequences to households and small business customers who choose to install PV units. 93

7 IPART should set the benchmark range for a fair and reasonable value feed-in tariff for 2012/13 in June 2012. 94

8 If the NSW Government decides to continue price regulation beyond 2013, IPART should review and update the benchmark for 2013/14 as part of our review of regulated retail tariffs for the next determination period. 94

9 If only Standard Retailers are required to offer a feed-in tariff to customers on standard contracts, eligibility for this tariff should be limited to who have: 96

- installed solar PV units of 5kW or less on their premises, and 96
- net metering arrangements. 96

Retailer contribution to the Solar Bonus Scheme Costs

10 The NSW Government should impose a statutory obligation on all retailers to contribute to the costs of the Solar Bonus Scheme until the scheme ceases in 2016. This contribution should be a specified rate for every kWh generated by their customers that is eligible for a statutory feed-in tariff Solar Bonus Scheme. 105

11 The appropriate rate for such a mandatory retailer contribution is 7.5 c/kWh from implementation until 30 June 2012. 105

12 The NSW Government should set the rate for the mandatory retailer contribution for 2012/13 following advice from IPART in June 2012. 105

13 The NSW Government should update the contribution rate annually until 2016. If price regulation continues beyond 2013, IPART should provide advice on the updated rate. If price regulation ceases in 2013, the Government should consider how this rate will be setting in determining its transitional arrangements. 106

14 The NSW Government, retailers and IPART should work together to ensure that customers understand why the voluntary premiums paid by some retailers reduce or are eliminated once retailers are required to contribute to the costs of the Solar Bonus Scheme. 106

Network expenditure

2 Comprehensive network system modelling is not warranted to calculate the impact of small-scale solar PV on the distribution network businesses' costs. 65

3 The National Electricity Rules and guidelines governing DNSPs should be reviewed to ensure they appropriately incorporate small-scale embedded PV generation into the policy and regulatory framework. This review should consider: 65

- the impact of PV exports on network costs 65
- the most appropriate way to reflect the impact of PV exports on network costs in the prices paid by those customers who install PV 65
- the relationship between embedded generation and the economic regulation provisions within the National Electricity Rules. 65

Draft Findings

Comments sought

2 Terms of reference and context for this review

To understand this report and make informed comments on our draft recommendations, stakeholders need to understand the terms of reference for the review – including what we have been asked to do, the key parameters for our recommendations, and the factors we must consider in reaching these recommendations. These terms of reference influence and, in some cases, limit what we can recommend. It's also helpful to understand the general background to the review.

2.1 What IPART has been asked to do

The terms of reference provided by the NSW Government ask us to complete 2 tasks. The first task relates to a feed-in tariff for the electricity generated by customers (PV customers) who install small-scale solar PV units **outside** the Solar Bonus Scheme. We are to independently investigate and recommend:

- a 'fair and reasonable' value for the electricity generated by PV customers outside the Solar Bonus Scheme, consistent with the Council of Australian Governments' national principles for feed-in tariff schemes (see Box 2.1), and
- the mechanism(s) by which this fair and reasonable value could be implemented in NSW.

In relation to recommending a 'fair and reasonable' value for the electricity generated by PV customers, the terms of reference specify that our recommendations:

1. should not result in any increase in electricity prices in NSW
2. should not require any funding from the NSW Government budget
3. should result in a price that is administratively simple and take into account the impact on business operations of administering such pricing, and
4. should operate in a way that supports a competitive electricity market in NSW.

In investigating this value, the terms of reference specify that we must consider:

- the benefit gained by customers and retailers from electricity produced from small-scale solar PV units
- whether a fair value should be linked to particular metering arrangements
- whether the facilitation of retailer competition would require any supporting arrangements
- whether a fair value should be limited in application to generators of a particular size or in a particular location
- the impact of small-scale solar PV, if any, on the costs of network distribution businesses, including capital and operating costs (but only to the extent necessary to recommend whether comprehensive network system modelling is warranted to assess this impact).

In relation to the mechanism(s) by which a fair and reasonable value could be implemented in NSW, the terms of reference indicate that the recommended mechanism should potentially be able to transition to a national feed-in tariff scheme if one is established. In reaching our recommendations, we must consider:

- how a fair and reasonable feed-in tariff could be implemented in NSW, for example, whether it should be a mandated floor price, a mandated price range, at the discretion of the competitive market, or an advisory benchmark
- the need for predictability for customers wanting to install small-scale solar PV units
- the place of an independently derived fair and reasonable value within a competitive market with a mixture of regulated and market-determined price offerings
- arrangements for reviewing the fair and reasonable value at appropriate intervals, and
- similar pricing and mechanisms in other jurisdictions.

The second task relates to mitigating the ongoing costs of the Solar Bonus Scheme to the Government, taxpayers and electricity customers over the remaining 5 years of the scheme's life. While the Solar Bonus Scheme is closed to new participants, it will continue to operate and generate costs until 31 December 2016. We are to investigate the level of contribution that retailers could be required to make towards these costs, to reflect the benefit they currently receive from the scheme due to metering and payment arrangements. Please note that we **will not** review or make recommendations about the statutory feed-in tariffs paid to participants in this scheme.

The full terms of reference are provided at Appendix A.

Box 2.1 National principles for feed-in tariff schemes established by the Council of Australian Governments

In 2008, the Council of Australian Governments (COAG) established national principles for feed-in tariff schemes. Of these principles, the following 2 are relevant to our review:

1. Micro-renewable generation should receive fair and reasonable value for exported energy.
2. The feed-in tariff policy should be consistent with previous COAG agreements, particularly the Australian Energy Market Agreement.[a]

The first principle means that all residential and small business consumers who install small-scale renewable generation units (PV customers) should be paid by market participants (such as retailers) for that exported electricity. Further, this payment should be at least equal to the value of that electricity in the relevant electricity market and the relevant electricity network it feeds into, taking into account the time of day that it is exported.

The second principle listed above means that the government's feed-in tariff policy:

- should not deter competition for PV customers' business from electricity retailers in jurisdictions where there is full retail contestability, or innovation in the tariff offerings available to PV customers
- should not interfere with the regulation of distribution tariffs or the operation of the National Electricity Market under the National Electricity Law, or duplicate the regulatory arrangements that are part of that Law
- should be subject to independent regulatory oversight according to clear principles, and
- should be consistent with implementation of other intergovernmental agreements relating to energy, competition policy or climate change.

a http://www.ret.gov.au/Documents/mce/_documents/quicklinks/Final%20Amended%20AEMA%20as%20at%202%20July%202009.pdf

2.2 Background to the review

The background to this review, and its terms of reference, includes 3 important aspects:

- the market and regulatory environment in which a future feed-in tariff would apply
- the potential for a future feed-in tariff to impact on retail electricity prices or the NSW budget, and
- the arrangements for PV customers who are not participants in the Solar Bonus Scheme.

2.2.1 Market and regulatory environment in which a future feed-in tariff would apply

The retail market for electricity in NSW is open to full retail competition, but is still partly regulated to protect residential and small business customers while the effectiveness of competition develops. All retailers licensed to operate in NSW can compete for customers by offering to supply them with electricity on a market-based contract, for a market-based price. However, Standard Retailers[11] are also obliged to supply customers in their supply area on a standard contract for a regulated price, if the customer has not signed a market-based contract, or wishes to return to a standard contract. In early 2010, around one-third of customers had entered into a market-based contract, and the other two-thirds were on a standard contract.

IPART is responsible for regulating the retail prices the Standard Retailers charge their customers on standard contracts. One of the key parameters in these terms of reference is that regulated prices must reflect the efficient costs the retailer incurs in supplying customers on regulated contracts. These costs include 4 major components:

- **network costs,** which reflect the charges the retailers pay the network businesses for using the transmission and distribution networks to transport electricity from the generators to their customers
- **energy costs,** which include the costs of purchasing wholesale electricity from generators on the National Electricity Market (NEM) and other costs
- **green scheme costs**, which represent the costs of complying with several climate change mitigation schemes, as required by the Federal and NSW Governments
- **retail costs**, which include the costs of running the retail business and making an appropriate return.

While the regulated prices are paid only by customers on standard contracts, in practice our price regulation also influences the market-based prices paid by other customers. For example, retailers often use the regulated price as a benchmark, and set their market-based prices with reference to that price (eg, they might set their prices at a certain percentage less than the regulated price).

The future of price regulation in NSW is also uncertain. In 2012, the Australian Energy Market Commission (AEMC) will begin a review of the competitiveness of the State's retail electricity market. The purpose of that review is to recommend to the NSW Government whether retail price regulation should be removed. Depending on the outcome of that review and the NSW Government's response, retail price regulation may cease on 30 June 2013 when our current determination expires.

11 The Standard Retailers are EnergyAustralia (owned by TRUenergy) and Integral Energy and Country Energy (both owned by Origin Energy).

If the NSW Government determines that the market is sufficiently competitive to remove retail price regulation, then arguably, there would be no need to regulate a feed-in tariff. Further, any transitional arrangements that the Government would make in relation to price regulation could specifically affect feed-in tariff arrangements.

2.2.2 Potential impact of feed-in tariffs on retail electricity prices

As indicated above, one of the components of retail electricity costs – and therefore one of the drivers of retail electricity prices – is green scheme costs. These are the costs the retailers incur in complying with climate change mitigation schemes where required by either the Federal or NSW Government.

In recent years, these costs have increased significantly, especially those of complying with the Federal Government's Renewable Energy Target (RET) scheme[12], which provides an upfront subsidy to customers who install solar PV units.[13] These increases are a major cause of rising electricity prices. For example, in our 2011 annual review of regulated retail electricity prices in NSW, we determined electricity prices to increase by an average of around 17 percentage points on 1 July 2011.[14] As Figure 2.1 illustrates, around 6 of these percentage points were due the increase in green scheme costs.

The costs of complying with the NSW Government's Solar Bonus Scheme are significant. However, those costs did not directly contribute to the 1 July 2011 price increases. This is because the NSW Government has committed to recovering these costs by using uncommitted funds in the Climate Change Fund and by increasing the levies collected under the Climate Change Fund from 1 July 2012.[15] Therefore, we expect that these costs will add further upward pressure to retail electricity prices at a time when a range of other factors are also driving prices higher, including the introduction of the Federal carbon pricing mechanism and rising network prices.

Given this environment, the Government has made it very clear in the terms of reference for this review that any future feed-in tariff for PV customers outside the Solar Bonus Scheme must not result in an increase in retail electricity prices, nor be dependent on government funding.

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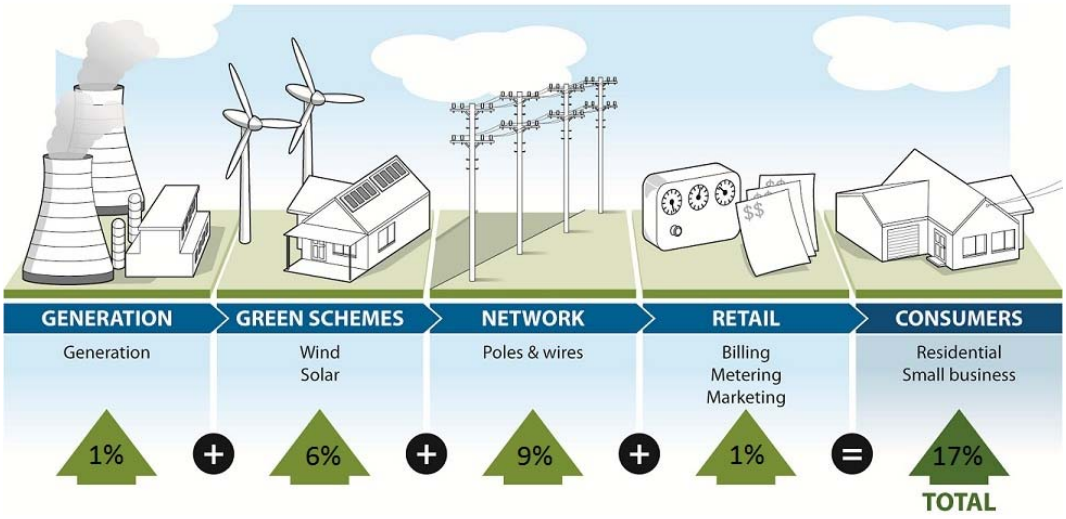
12 The RET scheme is established by the *Renewable Energy (Electricity) Act 2000* (Cth).

13 The RET scheme provides an upfront subsidy to customers who install solar PV units by allowing them to create renewable energy certificates based on the amount of renewable energy their PV units can produce. Retailers must buy the renewable energy certificates created by customers with PV units to meet their obligations under the RET scheme. The cost to the retailers of purchasing these certificates is passed onto customers through higher electricity prices.

14 IPART, *Changes in regulated electricity retail prices from 1 July 2011, Final Report*, June 2011, p 2.

15 The Solar Bonus Scheme alongside other State, Territory and Federal Government subsidies did result in a significant up-take in small-scale solar PV and the creation of a significant number of renewable energy certificates. As already mentioned, retailers purchase these certificates to comply with the RET scheme, and pass on the costs of doing so to customers through higher electricity prices.

Figure 2.1 Contributions from the supply chain to overall electricity price increases on 1 July 2011



Note: Green Schemes include the Federal Government's RET scheme and the NSW Government's Greenhouse Gas Reduction Scheme and Energy Savings Scheme. However it is the changes to the RET scheme that results in additional green costs and higher electricity prices. The generation and retail costs increases are broadly consistent with inflation.

Source: IPART, *Changes in regulated electricity retail prices from 1 July 2011, Final Report*, June 2011, p 3.

Box 2.2 The NSW Solar Bonus Scheme

The NSW Solar Bonus Scheme entitles participating PV customers to receive a specified feed-in tariff from their electricity distributor (via their electricity retailer) for the electricity their PV unit produces until the scheme ceases on 31 December 2016.

The scheme opened on 1 January 2010 and initially, the feed-in tariff was set at 60 c/kWh. However, it was reduced to 20 c/kWh for customers entering the scheme in October 2010, due to the higher than expected participation rates and escalating costs of the scheme. The ability for new participants to enter the scheme was suspended from April 2011 for the same reasons. The scheme was subsequently closed from 1 July 2011.

These feed-in tariffs, particularly the initial tariff, are significantly higher than the unsubsidised value of that energy which is currently around 8 to 10 c/kWh. However, Solar Bonus Scheme participants are subsidised by the NSW Government (who will ultimately recover the costs through higher electricity prices) so have not added to retailers' costs.

The scheme operates predominately on a **gross metering basis**.[a] This means that the electricity produced by participating customers' PV units is independently metered, and they are paid the relevant feed-in tariff for **all** the electricity that their PV units produce. Participating customers' consumption is also independently metered, and they are billed for **all** the electricity they use (their **gross** consumption). A relatively small number of Solar Bonus Scheme participants have net metering arrangements. Under net metering arrangements, the electricity produced by PV units is first used in the house and, if it is not required for consumption at the time of production, it is then exported to the grid. Appendix E describes net and gross metering.

For more information on the Solar Bonus Scheme, see Appendix H.

a While customers could connect with gross or net metering arrangements under the Solar Bonus Scheme, the vast majority of customers were installed under gross metering arrangements.

2.2.3 Current arrangements for PV customers who are not participants in the Solar Bonus Scheme

Currently, NSW customers who buy and install solar panels can access a one-off rebate through the Federal Government's RET scheme to subsidise their upfront capital costs. They are usually able to connect their new system to the electricity grid, so they can **potentially** export electricity to the grid. Now that the Solar Bonus Scheme is closed, they cannot receive the subsidised feed-in tariff discussed in Box 2.2 above. While there is no obligation for their retailer to pay them any feed-in tariff for the electricity they generate or export, we are aware that some retailers are voluntarily paying a feed-in tariff of around 6 c/kWh to 8 c/kWh for the electricity these customers export to the grid. Other retailers are not offering to pay a feed-in tariff to customers.[16]

16 For more information on voluntary feed-in tariffs see Appendix G.

Without access to a subsidised feed-in tariff, PV customers are likely to be better off financially under **net metering arrangements** (rather than the gross metering arrangements under the Solar Bonus Scheme). Under net metering arrangements, any electricity generated by PV customers will be used to meet the customer's own energy needs at the time of production. If this generation exceeds the customer's needs at this time, then the excess electricity will be exported to the grid[17] and potentially attract a feed-in tariff.[18] (For more detailed information on these arrangements, see Chapter 4.)

In general, the main benefit of net metering arrangements is that they reduce the amount of electricity the customer has to import from the grid (and purchase from their retailer) over a billing period, and so reduce the customer's total electricity bill. For every kWh of electricity PV customers produce and consume at the time of production, they avoid having to pay a retail all-time tariff of around 20 c/kWh to 30 c/kWh. Chapter 4 provides information on production, consumption and exports for PV customers.

A key task of this review relates to valuing energy that is exported by PV customers. The exported electricity has a value to the PV customer's retailer (which some retailers recognise by offering voluntary feed-in tariffs). Therefore, it is appropriate that the retailer be encouraged to pay the customer a 'fair and reasonable' value for this electricity (in the form of a 'feed-in' tariff). Our task is to investigate and recommend what this 'fair and reasonable' value is, and how the Government might ensure or encourage retailers to offer a feed-in tariff that reflects this value.

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17 For example, this might occur on a sunny week-day, when the panels are producing at their peak, but consumption is low as few members of the household are at home.

18 Therefore customers on net metering arrangements will receive the feed-in tariff for significantly less energy than those on gross metering arrangements. While those on gross metering arrangements attract the feed-in tariff for 100% of the energy they generate, estimates suggest those on net metering arrangements typically export around 32-50% of their production. However, these net customers will be billed for less electricity imported from the grid because they have consumed some or all of their PV generation. See Chapter 4, Appendix E and our fact sheet *Customers with solar PV units in NSW- producing and consuming electricity* for more detail.

3 The analytical approach IPART used for this review

To complete the 2 tasks required of us in this review, we carefully considered the terms of reference and context for the review. We then developed an analytical approach for reaching our findings and recommendations that would ensure these are consistent with terms of reference. This approach included the following major steps:

1. **Sought information on PV customers' characteristics, including consumption and PV production and exports.** For this first step, we collected and analysed data on PV generation and PV customer consumption in NSW, and estimated the amount of electricity that 'typical' PV customers are likely to export to the grid. We used this information to estimate the wholesale value of energy (discussed below). This analysis also provided information on how important the income earned from a feed-in tariff is likely to be for customers relative to the other benefits of PV generation.
2. **Considered the value for a feed-in tariff for PV customers** in NSW and checked that this is consistent with the terms of reference for the review. In this step, we investigated and considered:
   a) **The value of the electricity exported by PV customers using 2 alternative methods**:
      i) Estimating the direct financial gain to retailers from their PV customers' exports, based on the changes in the Standard Retailers' costs and revenues arising from the exports of PV customers on regulated prices.
      ii) Estimating the wholesale market value of their PV customers' exports, based on the price that PV exports would receive if they were sold on the National Electricity Market (NEM) at the time they are exported.
   b) **The potential for PV exports to reduce network costs** and whether this impact should be included in the fair and reasonable value. As part of this step we also determined whether comprehensive modelling is warranted to better understand the impact of small-scale solar PV on distribution network costs.

c) **The potential for PV exports to provide other benefits** and whether it is possible and appropriate to include them in the value of a feed-in tariff. These sources of value include:
   i) Reductions in the average level of electricity losses, which occur when electricity is transported for long distances from the point of generation to end consumption.
   ii) Changes in the shape of retailers' load.
   iii) Changes in the system load shape, and therefore spot prices (the 'merit order effect').

3. **Determined the most appropriate mechanism(s) for implementing a fair and reasonable value feed-in tariff within NSW**. In reaching our decision, we considered a range of potential regulatory interventions (from light-handed to heavy-handed) and assessed them against guiding principles that closely reflect the terms of reference for this review and the principles of good regulation. These are that the mechanism should:
   a) Enhance the chances of PV customers receiving a fair and reasonable value feed-in tariff.
   b) Support a competitive retail electricity market in NSW, and does not deter competition for or innovation in the tariff offerings available to PV customers.
   c) Improve the predictability of future feed-in tariffs for customers considering installing PV units.
   d) Be relatively simple for the Government and/or the regulator to implement, without the need for complex or costly supporting regulatory arrangements.
   e) Be easy for customers to understand.
   f) Be simple for retailers to administer, with low impacts on their business operations.
   g) Be able to potentially transition to a national feed-in tariff scheme.
4. **Established a benchmark range for the fair and reasonable feed-in tariff** after considering the value of PV exports established under step 2 and the form of regulation under step 3.
5. **Determined an appropriate retailer contribution to the costs of the Solar Bonus Scheme** based on:
   a) our estimate of the direct financial gain to the retailer from its customers' participation in this scheme (using the same approach we used in step 2.a)i) above)
   b) the estimated financial benefits to the NSW Government of requiring retailers to contribute this amount
   c) considering the impact of such a requirement on electricity prices, on retailers and their Solar Bonus Scheme customers and the competitive market.

4 Solar PV units in NSW

More than 150,000 household and small business customers have installed solar PV units in NSW, creating additional generation capacity of over 340 MW.[19] These PV units generate electricity by converting sunlight into low voltage electricity. In most cases, they are also connected to an 'inverter' which allows the energy they generate to be converted into a form suitable for use in households and businesses.

In addition, most customers with PV units are connected to the grid, which allows them to:

- **import** electricity at times when their consumption exceeds the generation from their PV unit, such as during the evening (when the unit is not operating), and the times when the unit is in shadow or the cloud-cover is heavy (when the unit is operating at low capacity) or when they are using a number of appliances simultaneously during the day
- **export** electricity at times when the generation from their PV unit exceeds their consumption, such as the times when the sun is shining directly on the panels (when the unit is operating at high capacity) and nobody is at home.[20]

Customers typically use most of the electricity they generate in their own premises to meet their demand at the time the electricity is generated. If this demand is higher than the amount they are generating, they import the additional energy they need from the grid. If their demand is lower than the amount they are generating, they export their excess energy to the grid. Importantly, this process of importing and exporting electricity occurs throughout the day, and is instantaneously recorded on the customer's meter.

As the first step in our analytical approach for this review, we sought information from the NSW Standard Retailers and distribution network service providers (DNSPs) on the number of customers who had installed PV units in NSW, and the

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19 The installed capacity and customer numbers reflects eligibility the Renewable Energy Target scheme and the Solar Bonus Scheme. Source: Industry & Investment NSW, *NSW Solar Bonus Scheme, Statutory Review, Report to the Minister for Energy*, October 2010, p 10, http://www.dtiris.nsw.gov.au/energy/sustainable/renewable/solar/solar-scheme/applications, and information provided by Distribution Network Service Providers as at 9 September (Endeavour Energy), 7 October (Ausgrid), and 9 October 2011 (Essential Energy).

20 This description of imports and exports applies to PV customers with net metering.

generation, consumption and net export patterns of these customers. We then analysed this information extensively to understand:

- the patterns of electricity exports among all customers with PV units in different locations and with different unit sizes
- the potential financial consequences of installing PV units for **PV customers** under different metering arrangements.

Our findings on the patterns of exports were central to determining the wholesale value of PV electricity exported to the grid (discussed in Chapter 6). Our findings on the potential financial consequences allowed us to gauge the relative importance of revenue from a future, subsidy-free feed-in tariff for PV customers, which was important for determining an appropriate mechanism for implementing such a tariff in NSW (discussed in Chapter 9). These findings also have important implications for customers considering installing a PV unit, as the savings in customers' electricity bills is more significant than the revenue from an unsubsidised feed-in tariff.

The section below provides an overview of these findings.

4.1 Overview of findings on PV units

In terms of size (or maximum generation capacity),[21] the average PV unit installed in NSW is around 2.3 kW, while the median unit is 1.7 kW. On average, customers in the Essential Energy supply area have installed the largest units, and those in the Ausgrid area have installed the smallest units.

Typically, PV units in NSW only generate electricity at around 14% of their capacity over a year.[22] This is lower than the average suggested in many renewable energy industry documents, most likely because the industry tends to base estimates on units operating under laboratory or 'ideal' conditions.[23]

Based on our analysis of customers in Ausgrid's distribution area (the area for which we had the most extensive data), those with a 1.5kW system tend to consume around two-thirds of their annual PV generation within their home at the time of generation, and export the remaining third to the grid. However, the proportion of generation individual customers export varies widely, as it depends on their household's pattern of consumption during the times when their unit is producing electricity.

21 See section 4.2.3 for a more detailed explanation of PV unit size.

22 See section 4.3.1 for a more detailed explanation of PV unit capacity factor.

23 For example, the Clean Energy Council's consumer guide provides average daily production of common grid-connected systems, which translates to a 16% capacity factor for Sydney. This is for a true north facing array with a 20°tilt and average inverter/wiring efficiency using long term average solar irradiation and temperature data, available at: http://www.cleanenergycouncil.org.au/cec/resourcecentre/Consumer-Info/solarPV-guide

For information for customers considering installing a PV unit in NSW, see our fact sheet *Customers with solar PV units in NSW- producing and consuming electricity*. This is available at www.ipart.nsw.gov.au.

4.2 Customers who have installed PV units in NSW

Based on the information provided by the NSW DNSPs, more than 150,000 small retail customers have already installed solar PV units in NSW. These customers are spread evenly across the 3 distribution network supply areas in NSW, with between 45,000 and 50,000 in each area. However, as there are considerably more total customers in the Ausgrid area (Sydney central, Central Coast and the Hunter region), the number of customers with PV units per capita is higher in the Endeavour Energy and Essential Energy areas.

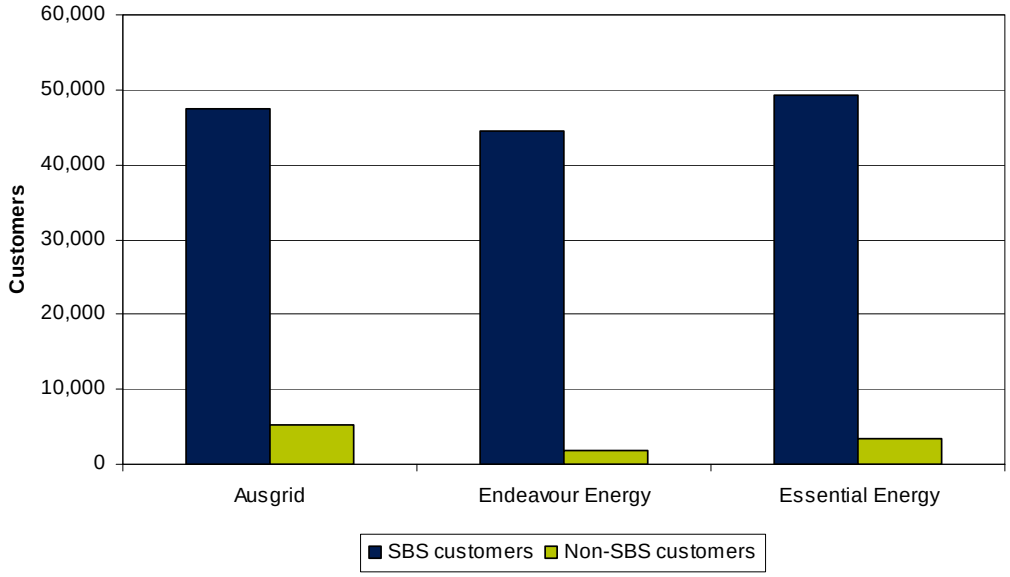
4.2.1 How many are receiving and not receiving a subsidised feed-in tariff?

More than 90% of the customers who have installed a PV unit to date are participants in the Solar Bonus Scheme (Figure 4.1). These Solar Bonus Scheme customers (SBS customers) receive a subsidised feed-in tariff of either 60c or 20c/kWh (depending on when they joined the scheme). Some also currently receive an additional 6 to 8c/kWh, as their retailers voluntarily offer them a 'premium' on top of the statutory subsidised feed-in tariff they are entitled to.[24]

The remaining PV customers - who total more than 10,000– installed their PV unit outside of the Solar Bonus Scheme and so are not eligible for a subsidised feed-in tariff (non-SBS customers). Some of these PV customers currently receive a voluntary unsubsidised feed-in tariff from their retailer of 6-8c/kWh, while others do not (refer to Appendix G for further details).

[24] In general, retailers offering such a premium are 'sharing' the financial benefit they currently receive from their Solar Bonus Scheme customers' generation activities, due to the arrangements under the National Electricity Market. For more information, see Chapter 10.

Figure 4.1 Number of PV customers in NSW, by distribution network supply area



Note: Includes all PV units installed in the Ausgrid, Essential Energy and Endeavour Energy supply areas as at October 7, October 9 and September 9 2011 respectively.

Data source: Ausgrid, Essential Energy, Endeavour Energy.

4.2.2 What are their metering arrangements?

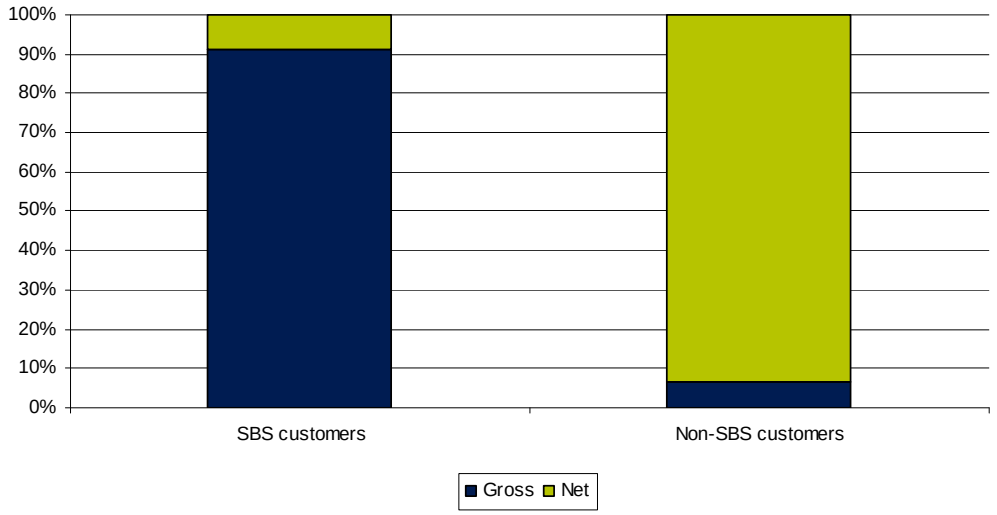
As noted above, customers with net metering use the electricity they generate to meet their own demand at the time of generation. They import electricity from the grid when this demand exceeds their generation, and export to the grid when this generation exceeds demand. However, the way their exports and imports are measured for billing purposes varies, depending on whether they have gross or net metering arrangements.

Under gross metering arrangements, all the electricity generated by the customer is measured independently from all the electricity consumed in the customer's premises. The customer earns the applicable feed-in tariff for all the electricity they generate, and pays the applicable retail price for all the electricity they consume.

Under net metering arrangements, the electricity generated by the customer that is exported to the grid and the electricity consumed by the customer that is imported from the grid are independently measured. The electricity generated and consumed in the customer's premises at the time of generation is not metered, and the customer pays nothing for this electricity. Whenever generation exceeds the customer's demand at a point in time, the excess amount is exported to the grid, and the customer may earn an unsubsidised feed-in tariff for this exported electricity (if their retailer voluntarily offers them one). Whenever the electricity being generated is insufficient to meet this demand, the extra electricity required is imported from the grid, and the customer pays the applicable retail price for this imported electricity.

As Figure 4.2 shows, more than 90% of SBS customers have gross metering arrangements. This reflects the fact that these customers are financially better off under these arrangements. This is because the subsidised feed-in tariff they earn is either higher than or similar to the retail price they pay for electricity. In contrast, the majority of PV customers who are not eligible for the SBS have net metering arrangements. These customers are financially better off under these arrangements, because they are not eligible for a subsidised feed-in tariff. The unsubsidised feed-in tariff they can potentially earn is much lower than the retail price they pay for electricity. Therefore, they can save more by using the electricity they generate to meet their own demand than they could earn by exporting this electricity to the grid.

Figure 4.2 Customers with gross and net metering arrangements in NSW



Note: Includes all PV units installed in the Ausgrid, Essential Energy and Endeavour Energy supply areas as at October 7, October 9 and September 9 2011 respectively.

Data source: Ausgrid, Essential Energy, Endeavour Energy.

More information about gross and net metering arrangements is provided in Appendix E. There is further discussion on why the financial benefits differ under gross and net metering arrangements in section 4.3.3 below.

4.2.3 What size PV units have they installed?

A PV unit's size is a key determinant of how much electricity it can produce. For example, a 1 kW PV unit has a maximum generation capacity of 1 kW at any point in time. If it produced electricity at 100% of this capacity for an hour, it would produce 1 kWh.

Most customers in NSW have installed PV units that range from 1 kW - 4 kW. However, some customers have installed units as large as 10 kW (which was the cap

for eligibility under the Solar Bonus Scheme). As Table 4.1 shows, the average unit size is around 2.3 kW, and the median unit size is 1.7kW.

Table 4.1 Average and median PV unit size in each standard supply area (kW)

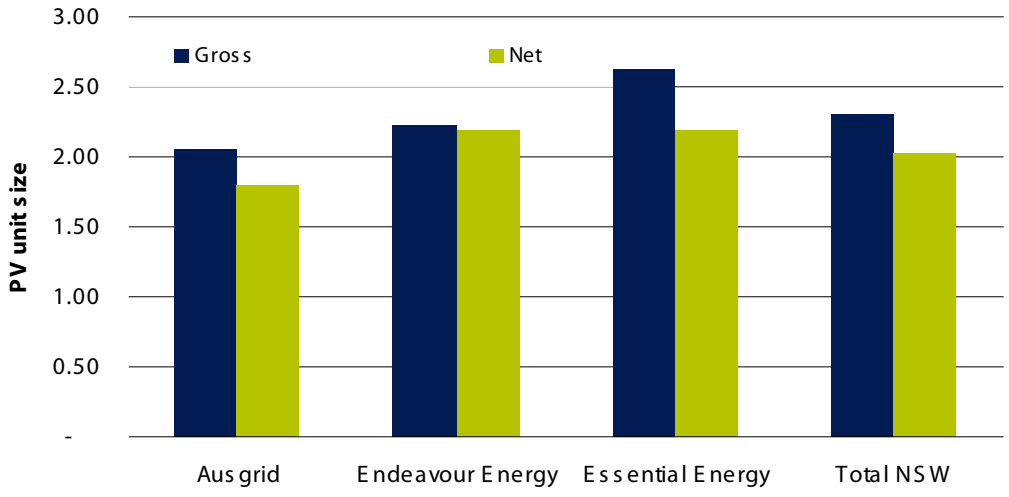
	Average unit size kW	Median unit size kW
Ausgrid	2.0	1.5
Endeavour Energy	2.3	2.0
Essential Energy	2.6	1.9
Total	2.3	1.7

Data source: Ausgrid, Essential Energy, Endeavour Energy.

This table also shows that on average, customers in the Essential Energy distribution network service supply area have installed the largest units, while those in the Ausgrid area have installed the smallest. These differences are likely to reflect the size and other characteristics of customer premises in the different areas – for example, customers in rural areas like the Essential Energy area are more likely to have larger roofs with larger areas not affected by shadowing throughout the day than customers in built-up areas, and so can install more panels.

In addition, Figure 4.3 below shows that on average, SBS customers with gross metering arrangements have installed larger PV units than SBS customers with net metering. This difference is most significant in the Essential Energy supply area.

Figure 4.3 Average PV unit size for customers under the Solar Bonus Scheme (kW)



Note: Includes all PV units installed in the Ausgrid, Essential Energy and Endeavour Energy supply areas as at October 7, October 9 and September 9 2011 respectively.

Data source: Ausgrid, Essential Energy, Endeavour Energy.

4.3 These customers' generation, consumption and net export patterns

To understand the generation, consumption and net export patterns of customers who have installed PV units in NSW, we analysed half-hourly data provided by each distribution business for 2010/11.[25] Because Ausgrid collects half-hourly data from its PV customers, we based our findings largely on the data provided by Ausgrid on residential customers, in line with the approach Frontier Economics used in estimating the wholesale market value of the electricity PV customers export to the grid (discussed in Chapter 6). Frontier found that these data were the most comprehensive, complete and suitable for the purpose of this review.[26]

In summary, the data from Ausgrid:

- provides a large sample of over 8,300 residential customers with a range of PV unit sizes
- includes only those customers whose PV unit was connected to the grid for the entire 2010/11 financial year, and so provides complete information on their behaviour over different seasons and weather conditions.[27]

In addition, to enable us to consider generation, consumption and net exports separately, we used Ausgrid's data on its gross metered customers only. The data on net metered customers was not suitable for this, as it only included information on net consumption and net exports (from this data it is not possible to know the proportion of electricity generated and used in the property).

4.3.1 How much electricity do PV customers generate, and what is their pattern of generation?

As noted earlier, one of the factors that determines the amount of electricity a PV unit can produce is its size. Its size represents its maximum generation capacity at any point in time.

However, the amount of electricity a PV unit actually generates is determined by a range of other factors, including how much of the time it is operating and how efficiently it operates during this time. In turn, these are influenced by:

- the solar radiation levels and weather conditions in the area in which it is located
- the technology of the PV module
- temperature

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25 The half-hourly PV generation data are drawn from time-of-use meters.

26 For example, Frontier found that business customers tended to use most of the electricity they generate, so export very little to the grid. It also found that the data from Essential Energy and Endeavour Energy provided a much smaller sample of customers, particularly of customers who had a PV unit installed for the entire year. Frontier Economics, *Market value of solar PV exports – A draft report prepared for IPART*, November 2011, pp 10-11.

27 The solar radiation at Observatory Hill in Sydney was higher in 2010/11 than it was for the 22-year average. See Appendix J for details.

- the orientation of the panels on the customer's roof, and
- the extent to which the panels are shaded by surrounding buildings or trees.

Given a PV unit can only generate when the sun is shining on its panels, its actual generation over a year is likely to be well-below its maximum generation capacity for this period.

Table 4.2 indicates the median amount of electricity generated by customers with the PV units of different sizes in 2010/11. The table also shows the median capacity factor for each unit size. The capacity factor is the ratio of the actual generation to the maximum generation capacity over the year. The renewable energy industry often uses capacity factors to give customers considering installing a PV unit an indication of how much electricity (in kWh) a certain PV unit size (kW) is likely to produce over a year.[28]

Table 4.2 Median PV generation by residential customers with gross metering in Ausgrid's distribution area, 2010/11

PV unit size	Median annual generation (kWh)	Median daily generation (kWh)	Median annual capacity factor
1.0 kW	1,282	3.5	14%
1.5 kW	1,882	5.2	14%
2.0 kW	2,546	7.0	14%
3.0 kW	3,716	10.2	14%
4.0 kW	4,699	12.9	13%
5.0 kW	5,687	15.6	13%

Note: For each category we have also included systems that are within +/-0.1 kW to provide a larger sample.
Source: Ausgrid, IPART.

Not surprisingly, the table suggests that larger PV units typically generate more kWhs of electricity.

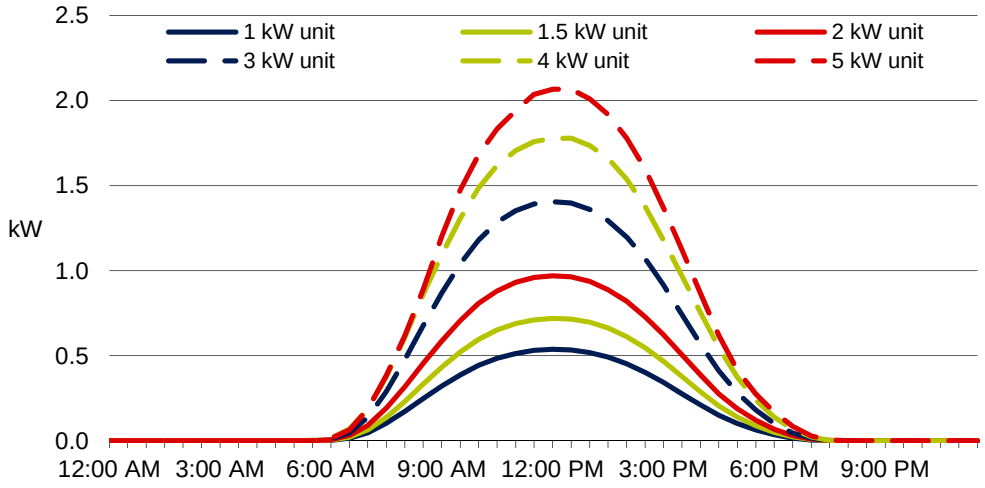
In addition, it suggests that the capacity factors achieved by PV units of all sizes are typically lower than some industry documents suggest. This is most likely because the capacity factors cited by the industry tend to be based on tests run on units operating under optimal conditions for efficient generation. As indicated above, the efficiency of units installed on customers' roofs is affected by a range of factors, including the orientation of the panels and the extent to which they are shaded during the day.

Figure 4.4 indicates the average generation by customers with PV units in each half-hour of the day in 2010/11. It suggests the pattern of generation throughout the day is fairly consistent. In general, a PV unit begins to produce electricity early in the

[28] For example, a 1 kW unit with a capacity factor of 14% is likely to produce around 1,226 kWh per year (ie, 14% of the 8,760 kWh it could produce if it operated at maximum capacity for the entire year).

morning with output increasing up until the middle of the day then diminishing throughout the afternoon until sunset.

Figure 4.4 Average PV generation by residential customers with gross metering in Ausgrid's distribution area, 2010/11 (kW)



Note: Data is an annual average for each half-hour.
Source: Ausgrid, Frontier Economics, IPART.

4.3.2 How much electricity do customers with PV units consume, and what is the pattern of their consumption?

A customer's total consumption and the patterns of this consumption are influenced by weather, as well as other factors such as household income, number of household members and household behaviour (including when family members are home, when appliances are used etc).

Table 4.3 indicates the median levels of consumption by customers with PV units in 2010/11. It shows that customers who have installed larger systems tend to consume more electricity.

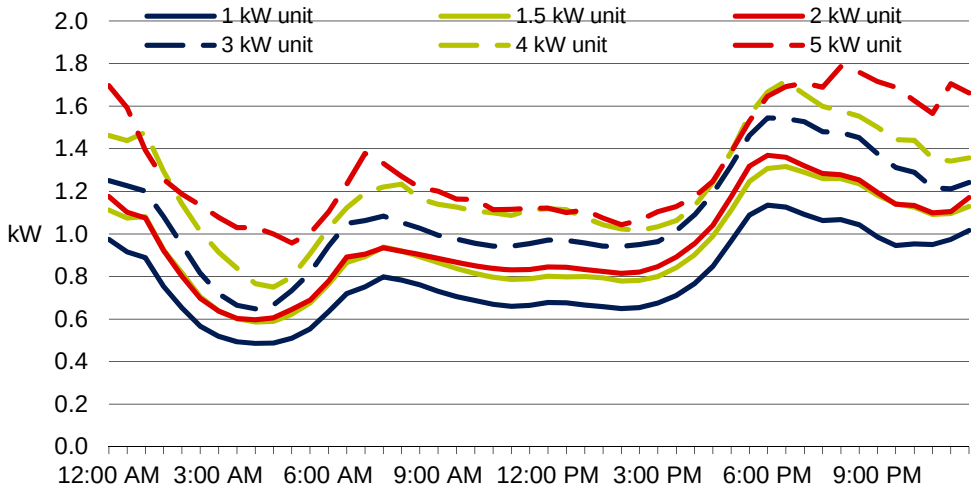
Table 4.3 Consumption by residential customers with gross metering in Ausgrid's distribution area, 2010/11

PV unit size	Median annual consumption (kWh)	Median daily consumption (kWh)
1.0 kW	5,965	16.3
1.5 kW	7,151	19.6
2.0 kW	7,380	20.2
3.0 kW	8,710	23.9
4.0 kW	9,423	25.8
5.0 kW	10,924	29.9

Note: For each category we have also included systems that are within +/-0.1 kW to provide a larger sample.
Source: Ausgrid, IPART.

Figure 4.5 shows the average consumption by customers with PV units in each half-hour of the day in 2010/11. As for most residential customers, these customers' pattern of consumption is characterised by 2 broad peaks – in the morning and in the late afternoon/early evening – with lower consumption on either side of the peaks. The evening peak is typically the highest level of daily consumption. The relatively high consumption around midnight can be attributed to controlled loads, such as off-peak hot water systems.

Figure 4.5 Average consumption by residential customers with gross metering in Ausgrid's distribution area, 2010/11 (kW)

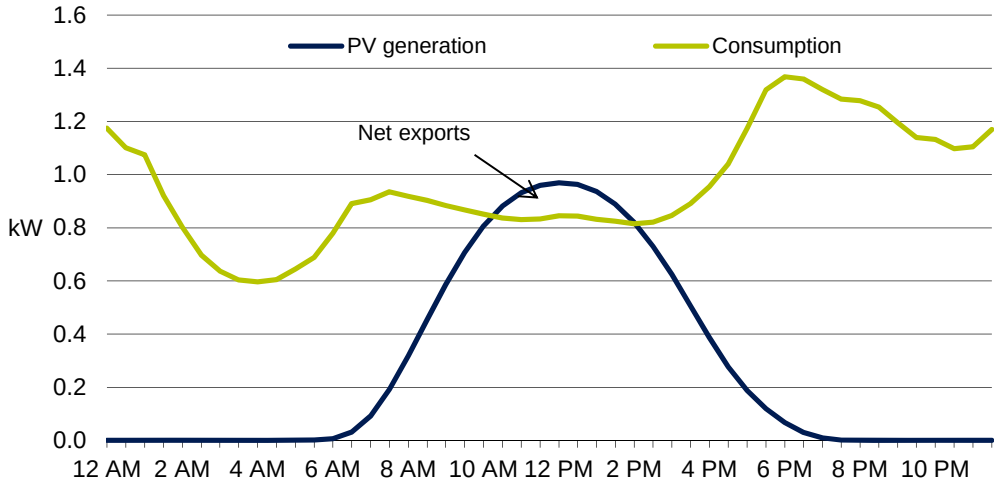


Note: Data is an annual average for each half-hour.
Source: Ausgrid, Frontier Economics, IPART.

4.3.3 What are the net electricity exports of customers with PV units?

The amount and timing (profile) of a customer's electricity generation and consumption determines the size of their net exports of electricity to the grid. To help explain the concept of net exports, Figure 4.6 provides an illustrative example of a customer's generation and consumption profiles over a day. On this particular day, the customer's generation (the blue line) is higher than their consumption (the green line) between around 10am to 2pm. During this period, the generation that is not consumed in the premises – the difference between the customer's generation and consumption at the time of generation – is exported to the grid. The size of this difference in kWh represents is their net exports on this day.

Figure 4.6 Illustrative example of a customer's generation and consumption profiles over one day



Source: IPART.

Stakeholder submissions provided contrasting views about how much of a PV unit's generation is likely to be exported. Industry documents also provide contrasting findings.

We calculated the half-hourly net exports for each of Ausgrid's residential customers on gross metering over 2010/11 (by deducting consumption from generation). Table 4.4 shows our findings on these customers' median net exports on an annual and daily basis for a range of PV units of different sizes. It also shows the median annual export ratio for this range of units, which is the ratio of the annual net exports to the total annual generation. It shows that larger units sizes tend to export more electricity, and generally have higher export ratios.

Table 4.4 Net exports in Ausgrid's distribution area 2010/11

PV unit size	Median annual net exports (kWh)	Median daily net exports (kWh)	Median annual export ratio
1.0 kW	393	1.1	32%
1.5 kW	616	1.7	35%
2.0 kW	1,007	2.8	41%
3.0 kW	1,703	4.7	49%
4.0 kW	2,378	6.5	52%
5.0 kW	2,921	8.0	50%

Note: For each category we have also included systems that are within +/-0.1kW to provide a larger sample.
Source: Ausgrid, IPART.

However, we found that net exports and net export ratios for individual customers varied significantly across all PV unit sizes. This was largely due to individual customers' different electricity consumption behaviour. For example:

- Some customers have relatively low consumption when their PV unit is generating during the day. These customers tend to export relatively large amounts of electricity and have relatively high export ratios.
- Conversely, some customers have relatively high consumption when their PV unit is generating during the day. These customers tend to export relatively small amounts of electricity and have relatively low export ratios.

5 Fair and reasonable value for a subsidy free feed-in tariff

A key outcome from our analytical process was to determine a fair and reasonable value for a feed-in tariff in NSW. The terms of reference specify that this value must not increase electricity prices or require funding from the NSW budget (that is, it must be subsidy-free). This suggests it should closely reflect the value to retailers of the electricity PV customers export to the grid (PV exports).

Therefore, to determine a fair and reasonable value, we estimated the value of PV exports to retailers using 2 methods – the direct financial gain to retailers method and the wholesale market value method. However, we also considered the potential for PV exports to create value that accrues to parties other than the retailers – such as by:

- reducing distribution and transmission network costs (potentially creating value for the network businesses)
- indirectly reducing electricity losses, or changing the pool price and load shape faced by all retailers (potentially creating value for all residential and small business customers by reducing the prices they pay for electricity).

We also considered the mechanism for implementing a fair and reasonable value feed-in tariff (the form of regulation).

The section below provides an overview of our draft recommendations on a fair and reasonable value. The subsequent sections outline the analysis and considerations that led these recommendations. Chapters 6 to 8 discuss our analysis on the value of PV exports to retailers and other parties in detail. Chapter 7, which focuses on the potential for PV exports to reduce network costs, includes our considerations on whether comprehensive system modelling is warranted to assess the impact of small-scale solar PV on distribution network costs, as specifically required by the terms of reference. Chapter 9 discusses the mechanism for implementing a fair and reasonable value feed-in tariff.

5.1 Overview of draft recommendations on a fair and reasonable value

Our draft recommendation is that a fair and reasonable value for a benchmark subsidy-free feed-in tariff in 2011/12 is in the range of 8 to 10 c/kWh. This value will increase after the introduction of a carbon pricing mechanism on 1 July 2012. However, we cannot determine the precise value until regulated retail prices have

been set. Therefore, our draft recommendation is that we set the 2012/13 value in June 2012.

Our draft recommendation on the value of PV exports to retailers in 2011/12 reflects our decisions to:

- base the value of PV exports to retailers on our estimate of the direct financial gain to retailers rather than the wholesale market value method
- not include a value for potential reductions in network costs, as PV exports are unlikely to provide system-wide benefits that materially reduce these costs
- not include a value for other potential benefits, including reductions in electricity losses and changes to the pool price and load shape, as they cannot feasibly be captured due to the practical arrangements within the electricity industry
- apply a light-handed form of regulation. This reduces the risk of regulatory error and therefore allows us to set the range based on our best estimate without distorting the competitive market.

5.2 Overview of draft findings on value of PV exports to retailers

We estimated the value of PV exports to retailers using 2 methods – the direct financial gain to retailers and the wholesale market value methods. After considering both methods and our results under each, we concluded that the direct financial gain method was more appropriate. Therefore, we based our draft finding on the value of PV exports to retailers on our results for this method (Table 5.1).

Table 5.1 Draft finding on the value of PV exports to retailers (c/kWh, $2011/12)

Method used	2011/12	2012/13
Direct financial gain to retailers	8.3 - 10.3	TBC

We estimated the direct financial gain to retailers based on the changes in the Standard Retailers' costs and revenues arising from the PV exports of customers on regulated prices. This approach is the most practical, as the size of the financial gain depends on retailers' costs to supply PV customers and the retail prices these customers pay. We only have ready access to this cost and price information for the Standard Retailers for customers on regulated prices.

We derived a value for the direct financial gain to retailers in 2011/12 in the range of 8.3 to 10.3 c/kWh. We have not yet estimated a value for 2012/13, as we will not have the necessary data until we have completed our next annual review of regulated retail tariffs and the Standard Retailers have set their regulated prices in June 2012.

We estimated the wholesale market value of PV exports to retailers based on the price the exports would receive if they were sold on the National Electricity Market (NEM) at the time they are exported. This is also the price that retailers would pay if they bought electricity on the NEM at this time. We used historical half-hourly data on PV exports and historical and forecast data on half-hourly spot prices in the NEM. We derived a wholesale market value in a range of 5.2 to 7.0 c/kWh in 2011/12 and 7.0 to 9.8 c/kWh in 2012/13.

We decided to base our draft finding on the value of PV exports to retailers on their direct financial gain as we consider this is more consistent with the terms of reference for this review. In particular, by reflecting the financial gain that retailers make from PV exports, the resulting value:

- will not interfere with competition in the market by making PV customers unattractive
- will not lead to increased retail electricity prices by making PV customers more costly to supply
- is fair for PV customers as it returns to them the benefit their PV exports deliver to retailers
- does not include a subsidy (in accordance with the terms of reference).

In addition, this method recognises the practical arrangements that currently exist within the NEM and the National Electricity Rules, including the metering and settlement arrangements, network regulation and network losses as well as other obligations (including green schemes) that retailers face.

Chapter 6 explains both methods for estimating the value of PV exports to retailers and discusses our analysis and draft findings for each method in detail.

5.3 Overview of draft findings on potential for PV exports to reduce network costs

We considered the potential for PV exports to reduce both distribution and transmission network costs, based on information provided by stakeholders and our own analysis. We found that PV exports are unlikely to provide system-wide benefits that will materially reduce either distribution network or transmission network costs in NSW. Any benefits that do arise are likely to be small, and location- and time-specific. In addition these benefits may be offset by system-wide cost increases as a result of the uptake of small-scale solar PV. Therefore, we concluded that it is not appropriate to include a value for network-related benefits in determining a fair and reasonable value for a subsidy-free feed-in tariff.

5.4 Overview of draft findings on potential for PV exports to provide other benefits

We also considered the potential for PV exports to provide other benefits, including by reducing electricity losses, and changing the pool prices and load shapes faced by retailers. We found that these potential benefits could not feasibly be captured due to the practical arrangements within the electricity industry. In addition, their inclusion in determining a future feed-in tariff could lead to increased electricity prices, and so would not be consistent with our terms of reference. Therefore, we concluded that it is appropriate to not include a value for these benefits in determining a fair and reasonable value for a subsidy-free feed-in tariff.

5.5 Overview of draft findings on the mechanism for implementing the fair and reasonable feed-in tariff

We have recommended an annual benchmark range for a fair and reasonable feed-in tariff. This benchmark would help customers understand the feed-in tariff they could potentially receive in the coming financial year, and assist them make informed decisions about installing a PV unit and assessing retailer offers. It should also increase the competitive pressure on retailers to offer a fair and reasonable feed-in tariff and reduce the risk of regulatory error.

We consider that there should be no obligation on retailers to offer a feed-in tariff within the benchmark range. However, there may be a case for obliging the Standard Retailers to offer a feed-in tariff they set themselves, so that customers can remain on a regulated price and access a feed-in tariff. We will give further consideration to this before making our final report, and welcome information from stakeholders on the costs and benefits of such an obligation.

We recommend that the annual benchmark range for a feed-in tariff should be supported by a number of actions to ensure customers have easy access to accurate information on retailers' feed-in tariff offers, and to improve their understanding of the financial benefits of installing PV units and their ability to participate in the competitive market.

5.6 IPART's considerations in making its draft recommendation on a fair and reasonable value

Based on the above analysis and conclusions, we decided to determine a fair and reasonable value for a subsidy-free feed-in tariff with reference to our draft finding on the value of PV exports to retailers. As discussed above, we derived this value by estimating the direct financial gain to the Standard Retailers from the PV exports of customers on regulated prices. This value is in the range of 8.3 to 10.3 c/kWh in 2011/12.

Our draft recommendation that this fair and reasonable value is in the range of 8 to 10 c/kWh reflects our view that it is appropriate to round down the bounds of this range. This is because:

- We recognise that the financial gain to retailers for customers supplied on **unregulated** prices may be different to the gain to Standard Retailers for customers on regulated prices. The financial gain depends on the retailers' price offerings and cost structures. Currently, retailers' unregulated prices vary, with some retailers offering discounts on regulated prices of up to 10%. While these discounts are not necessarily available to PV customers, we consider it appropriate to round down the range to reduce the likelihood that it overestimates the gain to these retailers.
- We consider rounding down the range improves its simplicity, and is consistent with the voluntary feed-in tariff offerings already available in the market (ie, retailers who offer a feed-in tariff at the moment do not offer it to a decimal point).
- We consider that the benchmark range implementation reduces the risk of regulatory error and its impact on the competitiveness of the market, particularly for PV customers.

Draft recommendations

1 A fair and reasonable value for a subsidy-free feed-in tariff in NSW is in the range of 8 to 10 c/kWh for 2011/12.

6 Value of PV exports to retailers

Retailers receive a benefit from the electricity their PV customers export to the grid (PV exports), because they avoid the costs of buying electricity from the National Electricity Market (NEM). They can also avoid some of the other costs they would normally incur if they purchased it on this market. To help us determine a fair and reasonable value for a subsidy-free feed-in tariff (discussed in Chapter 5), we estimated the value of this benefit to retailers using 2 methods:

- Estimating the direct financial gain retailers make from PV exports. To do this, we calculated the changes in the Standard Retailers' costs and revenues arising from the exports of their PV customers on regulated prices.
- Estimating the wholesale market value of PV exports. We calculated the price the exports would receive if they were sold on the NEM at the time they are exported. This is also the price that retailers would pay if they bought electricity on the NEM at this time.

The section below provides an overview of our estimates of the value of PV exports to retailers under each method. The following sections discuss our analysis and results for each method in detail, and explain the underlying reasons for the difference between the 2 estimates. Chapter 5 discusses our considerations and conclusions on which method provides the most appropriate estimate for this review.

6.1 Overview of our estimates of the value of PV exports to retailers

Our estimates of the value of PV exports to retailers using the financial gain to retailers and the wholesale market value methods are shown in Table 6.1.

Table 6.1 IPART's estimates of the value of PV exports to retailers ($2011/12 c/kWh)

Method	2011/12	2012/13[a]
Direct financial gain to retailers	8.3 – 10.3	TBC
Wholesale market value	5.2 – 7.0	7.0 – 9.8

a Includes impacts of the Carbon Pricing Mechanism.

Our estimate of the financial gain to retailers reflects the fact that, in contrast to many stakeholders' belief, retailers cannot avoid **all** their costs of supply for the electricity their customers export to the grid. Indeed, they still incur 2 of the most significant of these costs – network costs and costs of complying with green schemes – as well as other smaller costs. As a result, our estimate of the financial gain to retailers represents only approximately one-third of average regulated retail tariffs in 2011/12.

As indicated above, we estimated the financial gain to retailers using data on the Standard Retailers' costs and revenues for customers on regulated prices. However, the financial gain to retailers for customers on **unregulated** prices might be higher or lower than this estimate. This is due to the differences in the costs and revenues for customers on regulated and unregulated prices.

Our estimate of the wholesale market value of PV exports suggests that presently the value of these exports is somewhat lower than the financial gain retailers make from them. This stems from the way electricity is valued – under the financial gains approach the value of electricity is based on our energy purchase cost allowance for Standard Retailers. This currently reflects the long run marginal cost (LRMC) of generating electricity for the regulated load. The wholesale market value simply values electricity based on forecast spot prices at the time electricity is exported. This is further discussed in section 6.4.

In reaching these findings we used historical half-hourly data on PV exports and historical and forecast data on spot prices in the NEM. We engaged Frontier Economics to assist with this part of our analysis.

6.2 Estimated financial gain to retailers

During consultations for our review, many stakeholders put forward the view that retailers should pay PV customers a feed-in tariff in line with the retail price they charge these customers. This suggests they believe the direct financial gain to retailers from PV exports is equal to the retail price – or that retailers get PV exports 'for free'. However, this is not the case. Due to the arrangements in the NEM, retailers still incur a range of costs for PV exports.

Given this, our starting point for estimating the financial gain to retailers was to confirm exactly which costs retailers can and cannot avoid in relation to their customers' PV exports. We then calculated the financial gain per kWh of PV exports as the retail price paid by the PV customer **minus** the sum of the unavoidable costs.

The best and most readily available data for this calculation was for the Standard Retailers' PV customers on regulated prices in 2011/12. For these customers, we know the retail price and the estimated cost of supply on which the retail price is based. We obtained these data from the Standard Retailers and from the models we used for our 2011 annual review of regulated retail tariffs. We then estimated the financial gain by:

- Identifying the total volumes of these customers' PV exports in kWh.
- Allocating these volumes into categories according to the price the customer paid per kWh of electricity. Where this price included peak, shoulder and off-peak rates, we allocated the volume to the price that reflected the timing of the customer's PV exports.
- Calculating the financial gain to retailers per kWh of PV exports in each price category by taking the price paid by those customers, then subtracting the costs that the retailer **could not** avoid for those customers' exports.
- Calculating an overall weighted average financial gain per kWh of electricity exported for each Standard Retailer.

This approach is consistent with the proposed approach we outlined in our Issues Paper. The stakeholder submissions we received in response to this paper indicated broad support for this approach. In particular, several retailers acknowledged that they receive a financial gain from having PV customers who export to the grid.[29] Indeed, some retailers are already sharing their financial gain with their PV customers by offering voluntary feed-in tariffs. No stakeholders provided detailed information on alternative approaches for estimating the financial gain for a retailer.

Because our approach uses actual data from the Standard Retailers and the price regulation process, we were not able to estimate the financial gain to retailers in 2012/13. We will not be able to do this until June 2012, after we have completed our 2012 annual review of regulated tariffs and the Standard Retailers have set their regulated prices.

The sections below explain our findings on the costs that retailers can and cannot avoid for their PV customers' exports, and discuss our estimate of the direct financial gain to retailers from these exports. Box 6.1 and Figure 6.1 provide more information on how retailers make a financial gain from PV exports.

[29] AGL submission p 3, Origin Energy submission p 3, TRUenergy submission p 1.

Box 6.1 How would retailers make a direct financial gain if they paid no feed-in tariff?

To illustrate how a retailer makes a direct financial gain from their customers PV exports when it doesn't pay these customers a feed-in tariff, let's look at the case of a PV customer who is **not** participating in the Solar Bonus Scheme and has net metering arrangements. This customer consumes 6000 kWh and produces 2000 kWh of electricity in a year. Of the 2000 kWh they produce, they use 1500 kWh within their premises at the time of production and export 500 kWh. Therefore, they import 4500 kWh.

Under net metering arrangements with no feed-in tariff, the **custome**r:

- Pays their retailer the applicable retail price for the 4500 kWh they import.
- Receives nothing for the 500 kWh of electricity they export.
- Saves the retail price on the 1500 kWh of electricity they produce and use within their premises.

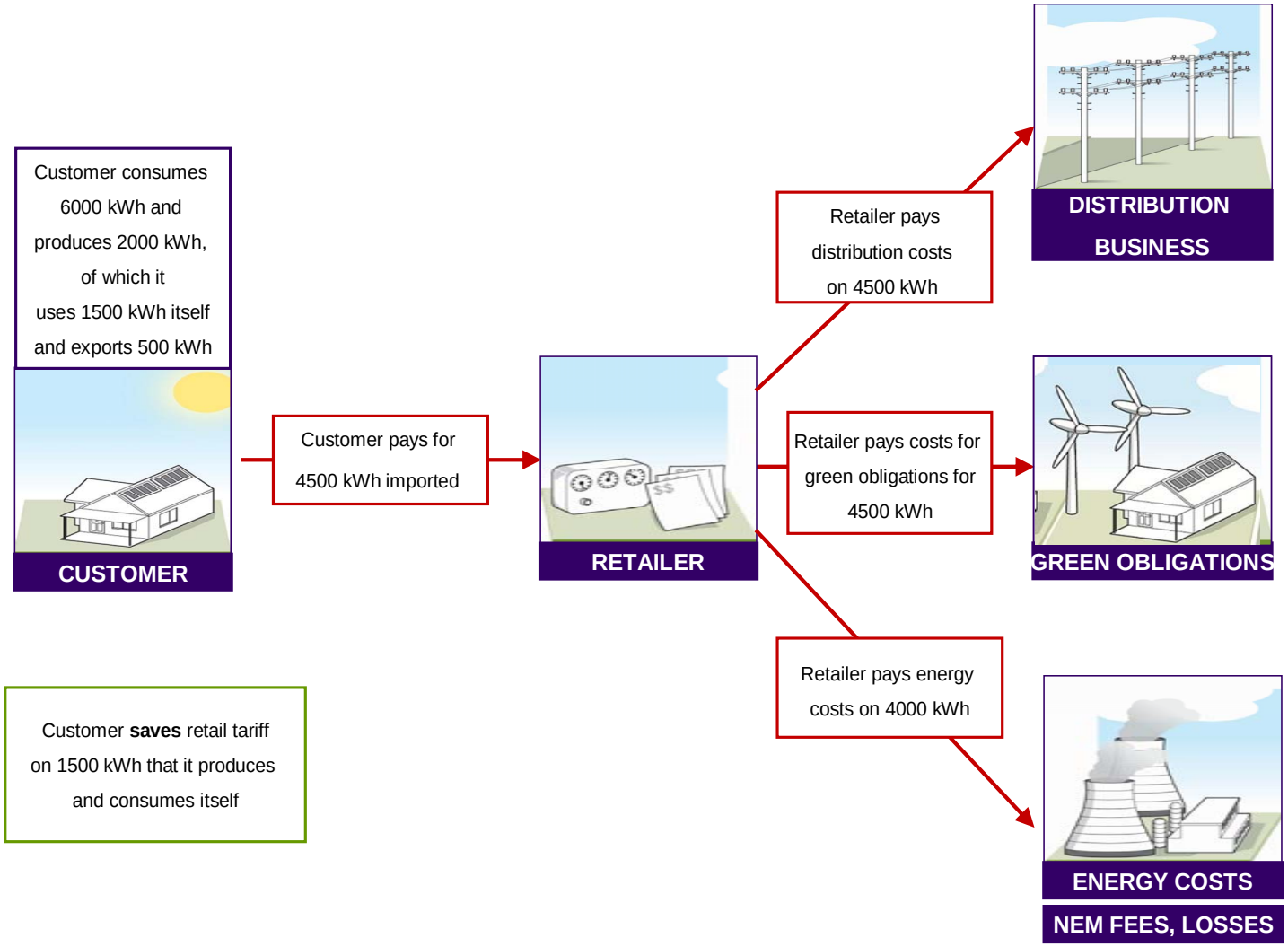
The **retailer** receives the retail price for the **4500 kWh** this customer imports. It pays the distribution network charges and the green scheme obligations for this 4500 kWh. It also incurs its usual retail costs (which generally depend largely on its number of customers). However, it would:

- Pay the Australian Energy Market Operator (AEMO) the price of purchasing **4000 kWh** of electricity (ie, the total amount the customer consumes minus the amount their PV unit produces).
- Pay the AEMO market fees and energy losses costs for only **4000 kWh** of electricity.

Thus, because of the 500 kWh of electricity the customer exports, the retailer would avoid the cost of purchasing 500 kWh of electricity from the NEM, and paying NEM fees and energy losses on 500 kWh of electricity.

Figure 6.1 shows these financial flows in diagram form.

Figure 6.1 An illustrative example of financial flows under net metering arrangements if retailers pay no feed-in tariff



6.2.1 Costs that retailers can and cannot avoid for PV exports

To ascertain which costs retailers can and cannot avoid when their customers export electricity to the grid, we considered the various costs retailers normally incur in supplying electricity to small retail customers – including all the costs we take into account in determining regulated retail tariffs. We also considered the metering and billing arrangements in the NEM, as well as the requirements on retailers under the various green schemes.

We found that for each kWh their PV customers export to the grid, retailers can avoid the electricity purchase costs, NEM fees and the costs of energy losses they would normally incur per kWh of electricity they supply. However, they cannot avoid other costs of supply, including network costs and green scheme costs (see Table 6.2). These findings are consistent with those of other recent studies that have considered the value of PV exports.[30,31,32]

Table 6.2 IPART's approach for estimating a Standard Retailer's direct financial gain

Revenue per kWh of electricity imported	–	Unavoidable costs per kWh of PV electricity exported	=	Financial gain per kWh of PV electricity exported
Retail price paid by customer		Retail costs		Avoided electricity purchase costs
		Retail margin		Avoided NEM fees
		Network costs		Avoided electricity losses
		RET, ESS & GGAS costs		

The sections below discuss in more detail our findings on each of the costs we considered. Appendix E provides more information on the metering and billing arrangements in the NEM.

Electricity purchase costs

Retailers incur electricity purchase costs in purchasing electricity in the NEM to supply their small customers. When their PV customers export to the grid, they avoid having to purchase the amount of electricity these customers export. This is because the Australian Energy Market Operator (AEMO) bills the retailer for the amount of electricity a customer imports from the distribution network *less* the amount its customers export directly to this network. Electricity purchase costs

30 ACIL Tasman, *The fair and reasonable value of exported PV output – A report for the Essential Services Commission of South Australia*, October 2011, p iii.

31 SKM MMA, *Value of Generation from Small Scale Residential PV Systems – Report to the Clean Energy Council*, July 2011, p 1-2.

32 Essential Services Commission of South Australia, *2011 Determination of Solar Feed-In Tariff Premiums Draft Price Determination*, November 2011, p vi.

generally account for around 30% of the retail price of electricity, so avoiding these costs provides a significant financial gain to retailers.[33],[34]

NEM fees

Retailers pay NEM fees, which include market fees and ancillary charges, based on the amount of electricity they purchase in the NEM. Because these charges are levied on retailers' net purchases as measured by the 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 only a small financial gain to retailers.

Electricity losses

Retailers also incur costs that reflect the electricity that is lost as it travels from the generator along the wires and through other electrical infrastructure to the end-users' premises – that is, the difference between the amount of electricity that is injected into the grid and the amount that is withdrawn from the grid as measured by meters. Like NEM fees, retailers pay for losses on the basis of net purchases as measured by the AEMO. Therefore retailers avoid incurring them for the amount of electricity their customers export to the grid. Energy losses are significant, particularly in rural areas where there are long lines, and can represent over 10% of the electricity purchase costs for some customers.

Retail costs

Retailers incur costs in running their retail business – including costs related to billing and customer inquiries, regulatory compliance and corporate overheads. These costs depend more on how many customers a retailer has than on how much electricity their customers consume. Therefore, retailers do not avoid incurring these costs when their customer exports electricity. Indeed, as several submissions from electricity retailers and other parties noted, on a per customer basis, the retail costs associated with PV customers may be higher than those for non-PV customers.[35]

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33 Based on regulated retail prices in 2011/12 (the proportion is lower for Country Energy). See IPART, *Changes in regulated electricity retail prices from 1 July 2011*, June 2011, p 70.

34 The regulated retail prices for 2011/12 are set using input assumptions on the costs of fuel, including the cost of coal, from the ACIL Tasman report for the QCA. See ACIL Tasman, *Calculating of energy costs for 2011-12 BCRI, Draft Report, Prepared for the Queensland Competition Authority*, December 2010.

35 For example, see TRUenergy submission, p2, AGL Energy submission, p4, Origin Energy submission, p4.

Retail margin

Like all businesses, retailers need to earn a profit or retail margin to be financially viable. In regulatory pricing determinations, we treat this margin as one of the costs the Standard Retailers incur in supplying electricity. We determine the appropriate margin in percentage terms, taking into account the systemic risks these retailers face in their business. We convert this percentage into an allowance by applying it to the total of the other costs incurred by a retailer. Thus, to the extent that a retailer avoids certain costs as a result of PV exports, its retail margin allowance is reduced, as the percentage is applied to a lower cost base.

However, once a retailer pays its PV customers a feed-in tariff that reflects its financial gain, the impact of avoiding those costs on its cost base is removed, and its retail margin allowance is the same as it would be if its PV customers did not export to the grid. That is, the costs it avoids paying on its PV customers' exports are offset by the feed-in tariffs it pays to these customers.

Given that our purpose in estimating the financial gain to retailers is to help us determine a fair and reasonable value for feed-in tariffs, we consider it appropriate to assume that retailers will pay these tariffs in estimating this gain. Therefore, we do not consider that part of the retail margin is an avoided cost, and did not include that part of the margin in estimating the financial gain.

If we had treated part of the retail margin as an avoided cost, we estimate that this would have added around 0.5c/kWh to our draft finding on the size of the financial gain to retailers.

Network costs

Retailers are required to pay network costs (both fixed and variable) to the network distribution businesses based on the gross amount of electricity they supply to customers. This amount is measured by the distribution businesses, using the meters installed at customer premises. This means that network charges are incurred for all electricity supplied, regardless of where and by whom it was injected into the grid. Therefore, retailers cannot avoid network costs for PV exports.

In its submission, the Australian PV Association argued that retailers shouldn't have to pay full network charges on PV electricity.[36] It argued that because the electricity exported by PV systems is often consumed in close proximity to where it is generated it uses very little of the network distribution system. However, while this may be the case, there is no way to measure how much of the distribution system electricity has been used, due to current metering and billing arrangements. In addition, as our purpose is to measure the direct financial gain to retailers, we must consider the costs retailers actually can and cannot avoid, rather than those they should be able to avoid. (Further discussion of network issues is provided in Chapter 7.)

36 Australian PV Association submission, p 6.

GGAS and ESS costs

Retailers incur costs in meeting their obligations under the NSW Greenhouse Gas Reduction Scheme (GGAS) and Energy Saving Scheme (ESS). These costs are based on the gross amount of electricity the retailer supplies to customers, including the portion that was exported by PV customers. Therefore retailers cannot avoid GGAS and ESS costs for PV exports.

RET scheme costs

Our Issues Paper raised the question of whether retailers need to pay the cost of complying with the Renewable Energy Target (RET) scheme on PV exports. The Australian PV Association stated that retailer purchases of exported electricity from PV customers were considered relevant acquisitions when calculating liability under the RET scheme. However, it also noted there was some uncertainty as to what retailers were currently reporting and paying and that this matter should be clarified.[37]

AGL Energy submitted that RET costs can be avoided due to AEMO settlements processes.[38] We wrote to the Office of the Renewable Energy Regulator (ORER) requesting clarification on whether in administering the RET scheme, ORER considered retailers to be liabile for PV exports. ORER advised:

> … retailers are liable for acquisitions from the NEM pool plus electricity acquired from non-market generators and PV systems.

Based on ORER's advice we have proceeded on the basis that RET costs cannot be avoided for PV exports and have excluded them in estimating the financial gain to retailers.

A number of stakeholders submitted that the value they receive for their PV exports should reflect the value of the **renewable** electricity.[39] In particular, stakeholders submitted that retailers may be able to avoid the costs of complying with the RET scheme given that their PV customers are exporting 'green' electricity. However, as discussed above, we have proceeded on the basis that retailers are not able to avoid the costs of complying with the RET scheme.

In addition, PV customers already receive a considerable benefit for the renewable electricity they generate. The RET scheme allows PV customers to create renewable energy certificates at the time of installation which reflects the value of the renewable energy produced by the PV unit for up to 15 years.[40] In fact, the Solar Credits Multiplier allows PV customers to create certificates in excess of the actual renewable

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37 Australian PV Association submission, p 7.

38 AGL Energy submission, p 3.

39 For example J Stone submission, p 1, T Allen & R Logan submission, p 3.

40 Department of Climate Change & Energy Efficiency, accessed on 22 November 2011 from http://www.climatechange.gov.au/government/initiatives/renewable-target/need-ret/solar-ret.aspx

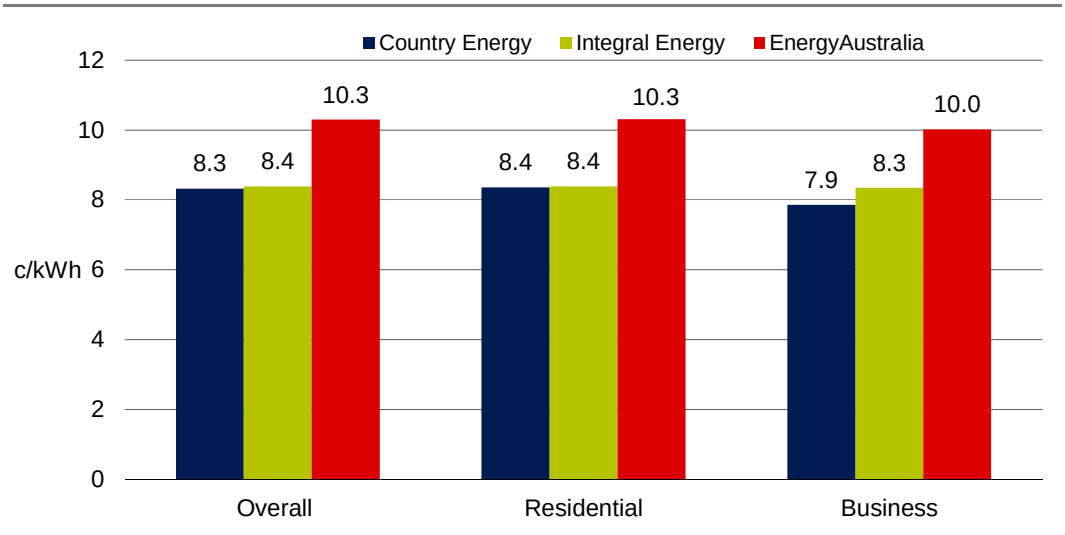
energy that is created by the PV units (this subsidy is funded by other electricity customers). These certificates typically offset the costs of installation. Given that PV customers are already more than compensated for the value of the renewable electricity that they generate, it is not appropriate that PV customers receive a further premium in the feed-in tariff for the value of this renewable electricity.

6.2.2 IPART's estimate of the financial gain to the Standard Retailers from PV exports

To estimate the direct financial gain to the Standard Retailers from PV exports, we applied the approach described in section 6.2. As that section noted, we relied on price and PV volume data for customers on regulated prices provided by the Standard Retailers and cost data extracted from the models we used in reviewing regulated retail tariffs for 2011/12.

Figure 6.2 summarises the results of our analysis for each Standard Retailer, by customer type and overall (ie, on a weighted average basis) in 2011/12. The figure shows that on a weighted average basis, the financial gain to these retailers ranges from 8.3 to 10.3 c/kWh of PV exports.

Figure 6.2 IPART's estimate of the direct financial gain to Standard Retailers from PV exports ($2011/12 c/kWh)



Data source: EnergyAustralia, Integral Energy, Country Energy, IPART.

The financial gain to both Country Energy and Integral Energy is around 8.3 c/kWh, while the gain to EnergyAustralia is around 2 c/kWh higher. This reflects the particular pricing arrangements for EnergyAustralia's PV customers, most of whom pay a time-of-use price. This means that most of their exports occur when they are paying the higher peak or shoulder price, and therefore the difference between this price and the costs EnergyAustralia can avoid is higher.

There is not a significant difference between the financial gains the Standard Retailers make from residential and business PV customers and their overall financial gain. Therefore, there is not a strong case for different feed-in tariffs for residential and business customers.

As the financial gain to the Standard Retailers reflects their particular revenues and costs for PV customers on regulated prices, the financial gain associated with PV customers on **unregulated** prices might be higher or lower than the Standard Retailers' financial gain. For example, if a retailer charges unregulated prices that are lower than average regulated prices but incurs similar costs to the Standard Retailers, its financial gain might be lower than our estimate. Alternatively, if this retailer incurs lower costs than the Standard Retailers, its financial gain might be similar or higher than our estimate. Differences may also occur if the structure of unregulated prices differs from those for regulated prices.

We considered the risk that a retailer's actual financial gain might differ from our estimate of this gain in making our recommendation on a fair and reasonable value for a subsidy-free feed-in tariff. This is discussed in Chapter 5. We also considered this risk in making our recommendation on the appropriate mechanism for implementing such a feed-in tariff. This is discussed in Chapter 9.

More information on our calculations in estimating the financial gain to retailers is provided in Appendix K.

6.3 Estimated wholesale market value

Our second method for estimating the value of PV exports to retailers calculates the wholesale market value of this electricity if it could be sold on the NEM. It assumes PV customers are like the large-scale generators who sell electricity to energy retailers on the NEM,[41] and estimates the price PV exports would sell for on this market, taking into account the time when it is exported.

The prices that generators receive (and retailers pay) in the NEM are determined by supply and demand. During periods of higher demand (or constrained supply), prices tend to rise, reflecting the relative scarcity of supply and the higher costs of meeting this demand. These higher price events occur mostly in the late afternoon or early evening, when residential demand is highest. Prices can be particularly high during extreme weather, such as very hot summer days and very cold winter evenings.

41 The NEM is a wholesale market in eastern and southern Australia through which large-scale generators sell electricity to energy retailers, who in turn bundle this electricity with network and other services for sale to customers. See Appendix D for more information.

We engaged Frontier Economics (Frontier) to assist us in applying this method. Frontier's report is available on our website.[42] In summary, this involved first calculating the historical wholesale market value using data for 2009/10 and 2010/11. Frontier:

- examined actual half-hourly data on PV customer exports provided by each of the 3 distribution network businesses in NSW, and selected the best source of data for our purpose
- obtained actual half-hourly spot prices in the NEM
- multiplied the half-hourly net PV exports by the corresponding half-hourly spot price in the NEM.

This analysis allowed us to understand the times when PV exports are most likely to occur and what spot prices are likely to be at these times. This is important for estimating the wholesale market value of PV exports. For example, if PV exports tend to occur when spot prices tend to be high, then the market value of PV exports will be high. However, if they tend to occur when spot prices tend to be low, then their market value will be low.

Next, Frontier estimated the forecast market value of PV exports in 2011/12 and 2012/13. It used actual half-hourly data on PV exports for 2010/11 and:

- the forecast spot price for 2011/12 from our most recent annual review of electricity prices
- the forecast spot price for 2012/13 modelled under 2 different demand scenarios.

It adjusted the resulting estimates of the historical and forecast wholesale market value of PV exports for electricity losses. This reflects the fact that PV exports tend to be consumed close to where they were injected into the grid, and therefore benefit from favourable loss factors.

The sections below discuss:

- the data used in estimating the historical wholesale market value of PV exports
- the estimated historical value in 2009/10 and 2010/11
- the approach used in forecasting spot prices for 2011/12 and 2012/13 and the resulting forecasts
- the forecast wholesale market value of PV exports in 2011/12 and 2012/13.

42 Frontier Economics, *Market value of solar PV exports – A draft report prepared for IPART*, November 2011.

6.3.1 Data used in estimating the historical wholesale market value

As indicated above, Frontier used 2 main pieces of data to estimate the historical wholesale market value of PV exports: historical half-hourly profiles of PV exports, and historical half-hourly spot prices in the NEM.

Historical half-hourly profiles of PV exports

We obtained half-hourly data on PV exports from each of the distribution network businesses in NSW – Ausgrid, Endeavour Energy and Essential Energy. The data sample provided by Ausgrid was the largest, as it uses time-of-use meters and records half-hourly data. It included data on PV exports from more than 1,100 customers in 2009/10 and more than 10,000 customers in 2010/11. These customers included business and residential PV customers who had a PV unit installed for the full financial year. These units had a range of generation capacity (in kW).

Neither Endeavour Energy nor Essential Energy collects half-hourly data routinely. This is either because basic accumulation meters are in use, or time-of-use meters record data less frequently than half-hourly. However, Endeavour Energy was able to provide a sample of half-hourly data for PV customers in 2009/10 and 2010/11. Essential Energy also provided a sample of half-hourly data for around 100 customers in 2010/11, although the data did not cover the whole financial year.

After examining the data, Frontier found that the Ausgrid data provided by far the most comprehensive information on PV generation and exports. Although Ausgrid provided data on both residential and business PV customers, Frontier found that the business customers mostly consumed more electricity than they generated so had no exports or very low exports. For these reasons, Frontier decided to use Ausgrid's data for residential PV customers only.

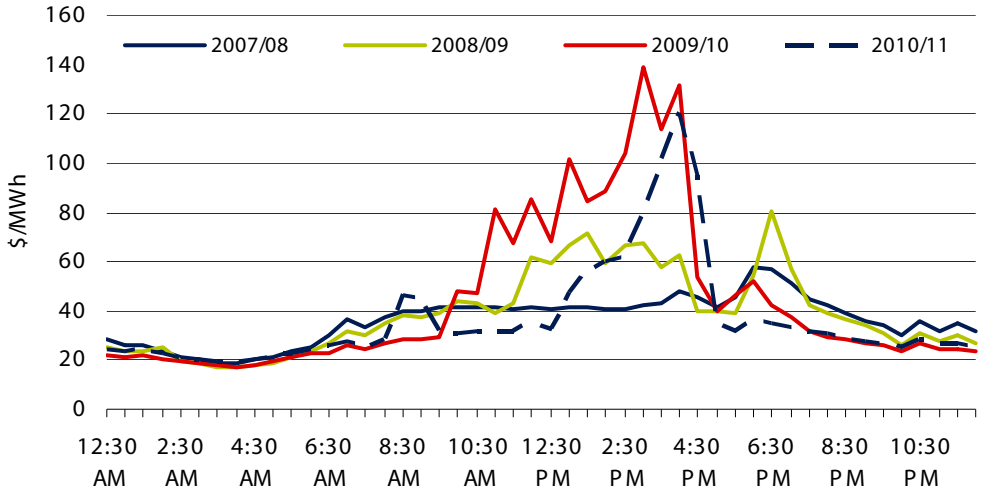
In addition, while Ausgrid provided data for residential customers on both net meters and gross meters, Frontier focused only on residential customers with gross meters. This is because there is greater information available for customers with gross meters. For customers on gross meters, data is available for both total consumption and total generation and from this it is possible to calculate total exports. For customers on net meters, data is available for total imports and total exports. However, it is not possible to calculate total consumption or total generation from this data. The majority of customers in Ausgrid's distribution area have gross meters.

Historical spot prices in the NEM

In NSW, the spot electricity price is referenced to the NSW regional reference node (RRN). Half-hourly spot prices for the NSW RRN are publicly released by AEMO. Frontier used this public information to obtain the spot price for each half-hour in the 2009/10 and 2010/11 financial years.

Figure 6.3 shows the average half-hourly spot prices for each half-hour of the day in NSW over the past 4 financial years. It indicates that spot prices were unusually high in 2009/10, particularly between around 10.30am and 4.30pm. Over the whole day, the average spot price in this year was $47.29/MWh compared to $38.06/MWh in 2010/11. Frontier noted that spot prices in 2009/10 are not representative of the longer term average.[43]

Figure 6.3 Average NSW spot prices ($/MWh)



Data source: AEMO.

Since the wholesale value method assumes PV customers are like other generators that sell on the NEM, Frontier adjusted the spot price for each half-hour in 2009/10 and 2011/12 to reflect the network losses that a generator in that location would face in the NEM. It used the transmission and distribution losses applicable to each distribution area. The effect of this was to increase the market value of PV exports to the distribution networks, reflecting the benefit of being located where load is located.

[43] Frontier Economics, *Market value of solar PV exports – A draft report prepared for IPART*, November 2011, p 5.

6.3.2 Estimated historical wholesale market value in 2009/10 and 2010/11

Frontier's estimates of the historical wholesale market value of PV exports in 2009/10 and 2010/11 are shown in Table 6.3 below.

Table 6.3 Frontier's estimated historical wholesale market value of PV exports ($2011/12)

Year	Wholesale market value (c/kWh)
2009/10	8.5 – 16.4
2010/11	5.6 – 8.9

Note: The range of values reflects the different PV system sizes.

The higher range of values in 2009/10 is largely due to the higher average daytime spot prices in that year, as shown on Figure 6.3. Because the timing of PV exports also coincided with these higher prices, this produced higher wholesale market values for PV exports. As noted above, Frontier considers that these higher spot prices during the middle of the day in 2009/10 are not representative of long-term average spot prices. Thus the estimated wholesale market value of PV exports in that year may not be representative of the long-term average value.

Frontier also estimated the wholesale market value using data from Endeavour Energy and Essential Energy. While the data from Endeavour Energy were for a much smaller sample of customers, the resulting wholesale market values were comparable to results based on Ausgrid data, shown above. The dataset from Essential Energy was too small and incomplete for Frontier to draw any firm conclusions about the wholesale market value of PV exports from it.

6.3.3 Approach used in forecasting spot prices for 2011/12 and 2012/13

To estimate the wholesale market value of PV exports for 2011/12 and 2012/13, Frontier required forecasts of both half-hourly PV exports and half-hourly electricity spot prices. It used historical correlation between half-hourly PV export data and the shape of historical half-hourly spot prices as the basis for these forecasts. It assumed that the forecast half-hourly profile (or shape) of PV exports would be the same as the historical half-hourly shape of PV exports from a base year. Similarly, it based the forecast half-hourly spot prices on the shape of spot prices in a base year.

Frontier considered that the 2010/11 financial year is the most appropriate base year because:

- There is significantly more data available on PV customers in 2010/11 than in previous years.
- Half-hourly spot prices in 2010/11 are within the range of half-hourly spot prices for other years, as shown in Figure 6.3. While these prices tended to peak significantly in the late afternoon (compared to 2007/08 and 2008/09) they were more similar to those of earlier years than the half-hourly spot prices in 2009/10.

While Frontier based the forecast half-hourly shape of spot prices on the half-hourly shape of 2010/11 spot prices, it needed to forecast an **average** spot price in 2011/12 and 2012/13. The average spot price in these years will have a scaling effect on the half-hourly shape of spot prices from 2010/11. For example, if the average spot price in 2011/12 is higher than in 2010/11, this will scale up the half-hourly shape of spot prices. Alternatively, if the average spot price in 2011/12 is lower than in 2010/11, this will scale down the half-hourly shape of spot prices.

For 2011/12, Frontier used the average spot price determined for our most recent annual review of electricity prices.[44] However, for 2012/13, it had to undertake new modelling, and take account of the impact of the national carbon pricing mechanism (due to take effect on 1 July 2012) in this modelling. These sections below outline the approaches it used.

Frontier's modelling approach

To forecast the average spot price in the NEM, Frontier used a 2-stage modelling approach and employed 2 inter-related electricity market models: *WHIRLYGIG* and *SPARK*. Frontier uses these same models in providing advice to IPART on regulated retail tariffs for Standard Retailers.

The *WHIRLYGIG* model optimises total generation cost in the electricity market, calculating the least-cost mix of existing plant and new plant options to meet load (demand). *WHIRLYGIG* provides an estimate of Long Run Marginal Cost (LRMC) of generation, including the cost of any plant required to meet modelled regulatory obligations.

The *SPARK* model uses game theoretic techniques to identify optimal and sustainable bidding behaviour by generators in the electricity market. *SPARK* determines the optimal pattern of bidding by having regard to the reactions by generators to discrete changes in bidding behaviour by other generators. The model determines profit outcomes from all possible actions (and reactions to these actions) and finds equilibrium bidding outcomes based on game theoretic techniques. An equilibrium is a point at which no generator has any incentive to deviate. The output of *SPARK* is a set of equilibrium dispatch and associated spot price outcomes.

Frontier modelled spot prices under 2 different demand scenarios in the NEM. These scenarios are based on the low and medium demand scenarios in the AEMO's 2011 Electricity Statement of Opportunities.[45]

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44 IPART, *Changes in regulated electricity retail prices from 1 July 2011*, June 2011.

45 Australian Energy Market Operator, Electricity Statement of Opportunities – For the National Electricity Market, September 2011, available at http://www.aemo.com.au/planning/ESOO2011_CD/documents/appendix_C.pdf, p C-14, accessed on 15 November 2011

Some stakeholders queried if we would use the reported subsidised price for coal from the Cobbora development.[46] The cost input assumptions that we have used, including fuel costs, were updated using an ACIL report, consistent with our approach to the 2011 Annual Review of regulated electricity prices. Regardless, the Cobbora development is not scheduled to produce coal until 2015, which is outside our modelling period.

More information on Frontier's energy models and modelling approach can be found in its report, which is available on the IPART website.[47]

Frontier's approach for incorporating the impact of a carbon pricing mechanism

On 8 November 2011, the Federal Parliament passed legislation for establishing a carbon pricing mechanism (CPM) in Australia from 1 July 2012. The CPM will place a price on carbon emissions which will push up the cost of electricity generation, and wholesale and retail electricity prices. This is intended to send price signals to electricity consumers about the environmental impact of their consumption, and thereby reduce overall consumption and the associated carbon pollution.

Frontier's approach for incorporating carbon prices in forecast spot prices is in line with the approach we used in making our 2010 electricity pricing determination.[48] For that determination, we accepted a recommendation from Frontier Economics to adopt a carbon-inclusive approach in calculating both the LRMC and the market-based electricity purchase cost. Under a carbon-inclusive approach, the costs of carbon are factored into the cost of generation and, therefore, the price of wholesale electricity. This is distinct from a carbon-exclusive approach, in which the 'black' wholesale price of electricity is calculated and the costs of carbon are added on as a separate component.

The key advantages of a carbon-inclusive approach include:

- consistency with how the CPM will affect generators' costs and the wholesale electricity market
- avoiding the need for assumptions about the extent to which generators will pass through carbon costs into the wholesale market (pass through rates)[49]
- avoiding double counting of costs, and
- facilitating internally consistent decisions.

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46 Late submission provided by Solar Business Services, 1 November 2011.

47 Frontier Economics, *Market value of solar PV exports – A draft report prepared for IPART*, November 2011, p 15.

48 IPART, *Review of regulated retail tariffs and charges for electricity 2010-2013*, March 2010, p 80.

49 Under Frontier Economics' carbon inclusive modelling of the energy purchase costs, pass through rates are an output of the modelling rather than an input assumption.

More information on Frontier's approach for incorporating carbon prices in its modelling for forecast spot prices can be found in its report, which is available on the IPART website.[50] From the perspective of estimating the market value of solar PV exports, it is the impact of the carbon price on spot electricity prices that is relevant. However, in the case of customers on the regulated retail tariff in NSW, the effect of the carbon price on retail electricity prices will reflect IPART's terms of reference that requires regulated retail tariffs to be based on the higher of the cost of hedging a load or LRMC of supplying that load. While the former will be affected by the rate of carbon pass-through in the spot market the latter will not. Rather the LRMC of supplying the retail load will reflect a much different rate of carbon pass through than would occur in the hypothetical 'greenfields' generation mix that is the basis for calculating that LRMC.

It is worth noting that because the approach for estimating the wholesale market value of PV exports includes the impact of carbon prices in 2012/13, it reflects the environmental benefit of avoided greenhouse gases associated with PV exports.

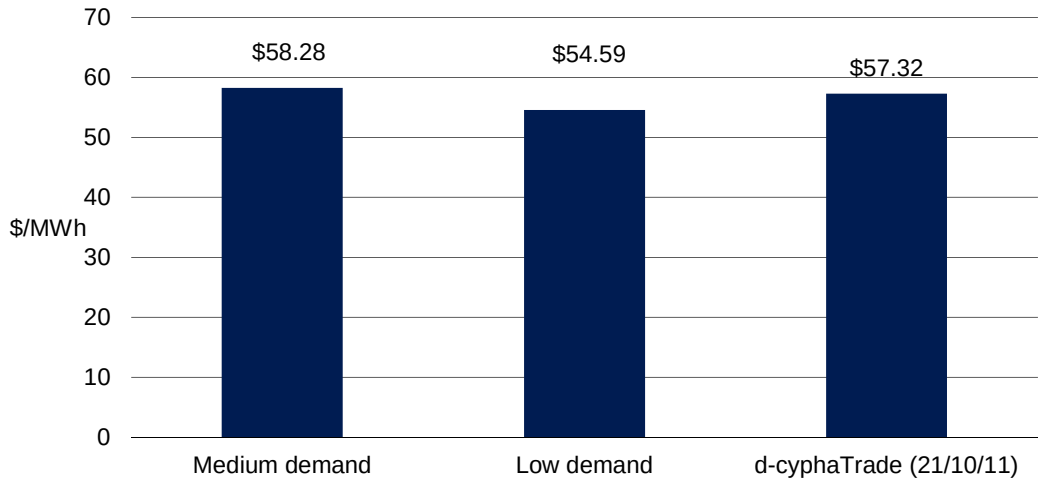
6.3.4 Forecast average spot prices for 2012/13

The results of Frontier's forecasts for 2012/13 under both demand scenarios are shown in Figure 6.4. For comparison, the d-cyphaTrade forward price for flat annual swaps in NSW (as of 21 October 2011) is also shown[51]. This price provides an indication of the market's view on future contract prices (and, by association, spot prices).

50 Frontier Economics, *Market value of solar PV exports – A draft report prepared for IPART*, November 2011, p 26.

51 Frontier Economics' spot price forecasts are close to the current d-cyphaTrade prices. After adjusting Frontier Economics' spot price forecasts for their assumption of a 5% contract premium, the medium case forecasts are around $4/MWh higher than the equivantent d-cyphaTrade price. However, Frontier Economics' spot price forecasts for the low case are almost exactly equal to the equivalent d-cyphaTrade price.

Figure 6.4 Forecasts of average NSW spot prices in 2012/13 ($2011/12)



Source: Frontier Economics.

The forecast under a medium demand assumption results in spot prices around $4/MWh higher than the low case. Frontier considers that the reason for this is that with lower demand, there is a greater likelihood that demand can be met by low-cost generation and less opportunity for strategic bidding by generators to increase prices. While demand in NSW is not materially different between the low and medium demand scenarios, there is a significant difference in Queensland.[52]

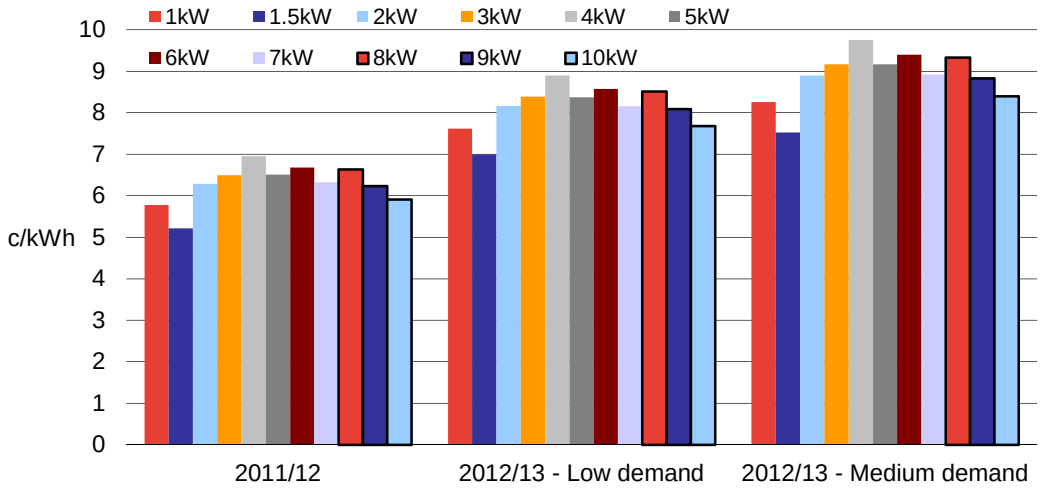
6.3.5 Frontier's estimates of the wholesale market value of PV exports in 2011/12 and 2012/13

Frontier modelled the wholesale market value of PV exports in 2011/12 using the average spot price from our 2011 annual review of regulated electricity prices (discussed in section 6.3.3 above), and for 2012/13 using the forecast spot prices for both the low and medium demand scenarios (discussed in section 6.3.4 above). For each year/demand scenario, it produced a range of values that reflect different PV system sizes (in kW).

The resulting estimates are summarised in Figure 6.5. The figure indicates that in 2011/12, the wholesale market value of PV exports ranges from around 5.0 to 7.0 c/kWh. In 2012/13, the value is higher under both the low and medium demand scenarios, ranging around 7.0 to 9.0 c/kWh under the low demand case and around 7.5 to 9.8 c/kWh under the medium demand case.

52 Frontier Economics, *Market value of solar PV exports – A draft report prepared for IPART*, October 2011, p 17.

Figure 6.5 Frontier's estimates of the wholesale market value of PV exports ($2011/12)



Data source: Frontier Economics.

The higher wholesale market values in 2012/13 reflect the higher average forecast spot prices compared to 2011/12. This is largely the result of the introduction of a carbon price. The difference between the low and medium scenarios in 2012/13 also reflects different forecasts of spot prices in 2012/13.

Figure 6.5 also shows that there is not a big difference in the wholesale market value of PV exports by PV system size. This suggests that even though different system sizes can export different volumes of electricity, the weighted average spot price for these exports is fairly consistent.

6.4 Why is the estimated value of PV exports to retailers different under the 2 methods?

For 2011/12, our estimate of the direct financial gain to retailers from PV exports is around 2 to 3c/kWh higher than our estimate of the wholesale value of these exports. Primarily, this difference stems from the difference in the way electricity is valued under the 2 methods.

The wholesale market value approach simply values the electricity based on what the forecast spot prices will be at the time the electricity is exported. Therefore the value is based on the profile (or shape) of **net exports**.

Under the financial gain to retailers approach, the value for the underlying electricity is based on the **regulated load shape**.[53] This is because the value of electricity is based on the electricity purchase cost allowance (EPCA) for Standard Retailers, as determined by IPART in our 2011 Annual Review of regulated electricity prices. The regulated load shape tends to correlate with higher prices compared to the net export shape as the regulated load captures the period of the day where demand is highest, and therefore prices are highest.

In addition, for the most recent determination, the terms of reference instructed us to set the EPCA based on either the Long Run Marginal Cost (LRMC) of generation or the wholesale market value, whichever was higher. As the LRMC was the higher, current regulated retail prices (which we used in estimating the direct financial gain) reflect this (higher) cost, rather than the (lower) market-based cost of purchasing electricity.

In the future, the value of PV exports to retailers under the 2 methods may be more similar. For example, this might arise if we used a market-based cost instead of the LRMC approach for setting the EPCA for future price determinations. Alternatively, the value under the wholesale market value method might be higher than the direct financial gain to retailers if the timing of PV exports coincides with very high price events in the spot market in the future.

[53] The regulated load shape is the average consumption over a 24-hour period for regulated customers.

7 Potential for PV exports to reduce network expenditure

In addition to having a value in their own right, PV customers' exports to the grid may have other potential benefits. One of these is reductions in the costs incurred by the distribution and transmission network businesses in NSW. These include 3 distribution network service providers (DNSPs) – Ausgrid, Endeavour Energy and Essential Energy – and one transmission network service provider – TransGrid.[54] These businesses incur considerable costs in maintaining and augmenting the networks that transport energy from generators to the end-users' premises. They have spent large amounts in recent years and are forecast to spend more in the coming years in ensuring their network infrastructure can meet the increasing levels of peak demand in NSW.

As part of our analysis for determining a fair and reasonable value for a subsidy-free feed-in tariff for NSW, we considered whether PV exports are likely to lead to significant network costs savings, and whether the value of these savings should be included in this fair and reasonable value. We also considered whether comprehensive network system modelling was warranted, as required by the terms of reference for this review.

The section below provides an overview of our draft findings and recommendations on these issues. The following sections discuss our findings in relation to distribution network cost savings and transmission network cost savings in more detail and set out our specific recommendations.

7.1 Overview of draft findings and recommendations on potential for PV exports to reduce network expenditure

We found that PV exports are unlikely to provide system-wide benefits that will materially reduce either distribution network or transmission network costs in NSW. Any benefits that arise are likely to be location- and time-specific, however at current levels of PV installation these benefits are likely to be small. In addition these benefits may be offset by system-wide cost increases as a result of the uptake of small-scale PV. Therefore, we concluded that it is not appropriate to include a network-related component in determining a fair and reasonable value for a non-

54 In addition to TransGrid, Ausgrid and the Energy Infrastructure Investments Group own some transmission assets in NSW.

subsidised feed-in tariff in NSW. We also concluded that comprehensive network system modelling is not warranted at this stage.

However, the potential for location- and time-specific benefits (and costs) may increase with further PV deployment across the NEM. We are recommending that the National Electricity Rules and the framework governing the economic regulation of electricity networks be reviewed to ensure small-scale renewable generation is appropriately incorporated into the policy and regulatory framework and that appropriate benefits (and costs) attributable to PV units can be directed to PV customers.

This review is warranted because the current provisions within the National Electricity Rules for providing PV related network savings to PV customers may not be well tailored to delivering the network related benefits (and costs) of small-scale generation such as PV units to PV customers. This form of embedded generation was relatively rare at the time that the Rules were developed, but has since become widespread across the National Electricity Market, with over 550,000 PV customers connected nationally.[55] Reviewing this framework and providing these benefits (and costs) to PV customers is likely to lead to a more efficient deployment of PV units in the community.

7.2 Potential for PV exports to result in distribution network cost savings

The distribution network is typically located near to population centres. It receives high-voltage electricity from the transmission network, converts it to low voltage, then transports it to end-users' premises.

As our Issues Paper discussed, PV customers' electricity exports to the grid via the distribution network could lead to lower distribution network expenditure in some localised areas – specifically those in which the network is nearing its capacity and would otherwise require augmentation. However, customers' installation of PV units can also impose costs on this network. For example, Ausgrid recently applied to the Australian Energy Regulator (which regulates distribution network charges in all states and territories) to pass through to customers the cost impact of implementing the Solar Bonus Scheme. It estimated that this impact was $35 million over the 2009-2014 regulatory period.[56] [57]

55 Email correspondence from the Office of the Renewable Energy Regulator, 10 November 2011.

56 AER, *Ausgrid Cost pass through application in relation to the NSW Solar Bonus Scheme*, March 2011, p 7.

57 It should be noted that the AER rejected the application on the grounds that it failed to meet the materiality threshold for a pass-through event prescribed in the National Electricity Rules. See the AER's final report, AER, *Ausgrid Cost pass through application in relation to the NSW Solar Bonus Scheme*, March 2011, p 1-2.

To assess the potential for PV exports to result in distribution network cost savings in NSW, we considered stakeholders' comments on this issue and analysed the specific information they provided.

7.2.1 Stakeholder comments

The majority of stakeholders agreed with the view we put forward in our Issues Paper that any benefits to DNSPs in terms of capital cost savings would be time- and location-specific rather than network-wide.[58] Most stakeholders also agreed with our view that the extent of any cost savings would depend on:

- The significance of the PV exports to the network, particularly whether they occur during periods of peak demand in the network and the extent to which they can be relied on to meet peak demand at all times.
- The characteristics of the network and PV generation in the localised area, with the greatest savings likely to occur where:
  - a feeder or substation is nearing capacity (and so is in need of augmentation), **and**
  - sufficient PV units are installed to reduce peak demand in that area by the amount required for this augmentation to be deferred.
- The costs of augmenting the network in the areas nearing capacity.

However, stakeholders expressed opposing views on whether PV exports are currently reducing distribution network costs. On the one hand, one stakeholder claimed that these exports could reduce DNSP's costs by around 3 cents per kilowatt a day.[59] On the other hand, the DNSPs argued PV exports have not resulted in any net benefits to date, as their costs have increased as a result of the increased popularity of small-scale PV units.[60] They submitted that the high take-up of PV has created power quality issues for their networks. In areas with high penetration of PV the networks are experiencing issues in maintaining appropriate voltage levels, and this is likely to have design and cost implications.[61]

Ausgrid also provided analysis of how PV generation affects its costs, based on the PV capacity installed in its network. It found that:

- PV exports provide no system-wide benefits in meeting winter peak demand because PV units are not exporting when winter peaks occur
- PV exports provide a very small system-wide benefit in meeting summer peak demand, as their generation capacity when this peak occurs is equivalent to only 0.3% of the total peak demand

58 For example see Australian PV Association submission, p 10 and Origin Energy submission, p 6.
59 Lake Macquarie City Council submission, p 5.
60 Essential Energy submission, p 2 and Ausgrid submission, p ii-iii.
61 Ausgrid submission, p ii, Endeavour Energy submission, p 1 and Essential Energy submission, p 2.

- for substations in areas with high PV penetration, the reduction in demand due to PV exports during the summer peak period ranged from 0.3% to 1.2%, with an average reduction of 0.6%
- for 11 kV distribution feeders in areas with high PV penetration, the reduction in demand due to PV exports during the summer peak period ranged from 0.1% to 2.9% with an average of 1.2%[62]
- the current level of PV exports would not allow investment to be deferred for 12 months in any zone substation on its network.

Based on this analysis, Ausgrid concluded that "there appears to be no case within Ausgrid's network where it is economically feasible to defer network investment due to the presence of embedded small-scale solar generation".[63] The submissions from the other DNSPs agreed with Ausgrid's view, although Essential Energy noted that in sections of the network dominated by **business** load, PV generation could reduce network peak demand.[64]

7.2.2 IPART's analysis and conclusions

Stakeholders who submitted that PV exports can reduce distribution network costs did not provide detailed evidence to support their view. Therefore, we were only able to analyse the information the DNSPs provided. We also considered data on the time and level of the monthly peak demand for electricity in NSW in 2010/11. Our analysis of this information confirmed that:

- At a network level, PV exports are not at their greatest at the times that the peaks in demand tend to occur in the distribution network, particularly for residential load.
- For those parts of the network where peak demand is in winter, this peak occurs at around 6.30pm when PV units are unlikely to be generating.
- For those parts of the network where peak demand is in summer, the time of this peak ranges from 3.00pm to 4.30pm when PV units are typically generating around 15% of their capacity. Therefore, a critical mass of PV units would be needed in those parts of the network to reduce peak demand to the extent where network augmentation can be deferred.

62 Ausgrid submission, p ii.
63 Ibid.
64 Essential Energy submission, p 3.

Overall, we concluded that as small-scale PV exports at present have relatively little impact on peak demand across the network. Thus as network expenditure is largely driven by the need to meet this peak demand, PV exports are unlikely to materially reduce system-wide distribution network costs without a significant installation of additional capacity in areas nearing capacity. Where there are net benefits for DNSPs, given the current levels of PV installation these benefits are likely to be small and location-specific. They are also likely to be available for a short-term only (ie, for the year or so that augmentation can be deferred), which means including their value in determining a fair and reasonable value feed-in tariff could lead to variability in this tariff, which is not desirable. On this basis, we found that:

- it is not appropriate to include a network-related component in determining a fair and reasonable value for a non-subsidised feed-in tariff in NSW, and
- comprehensive network system modelling is not warranted at this stage.

A recent report to the Clean Energy Council on the value of generation from small-scale solar PV systems by the consultants SKM MMA reached similar conclusions about the significance of its impact on network businesses' costs. However, the report recommended that further analysis be conducted to determine potential regional benefits from avoided infrastructure upgrades where peak PV output more closely correlates with peak demand for electricity.[65]

It may also be appropriate to provide financial incentives for the uptake of PV generation to provide network costs savings in **particular areas.** However, including a value for network costs savings in a generally-available feed-in tariff is not an effective way to do this. In our view, it would be more effective to tailor financial incentives specifically for PV customers in those areas. We also agree with the Australian PV Association that creating the right policy framework could create an incentive for the DNSPs, PV customers and the solar industry to seek out opportunities on the network where PV exports can benefit the network and be appropriately compensated.[66]

In our view, a comprehensive review of the NEM arrangements for embedded generation – particularly small-scale PV generation – is needed. When the policy and regulatory framework (including the embedded generation and economic regulation provisions within the National Electricity Rules) were developed, small-scale solar PV units were not common. Since then, there has been a rapid uptake of these units in most states and territories, with over 550,000 PV customers now connected to the grid across Australia.[67] In light of this, the arrangements related to small-scale embedded generation warrant attention from both the AEMC and AER, to ensure that the policy and regulatory framework is appropriate and that it is being applied in a nationally consistent manner.

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65 SKM/MMA, *Value of Generation from Small Scale Residential PV Systems, Final Report*, July 2011, p 22.

66 Australian PV Association submission, p 2-3.

67 Email correspondence from the Office of the Renewable Energy Regulator, 10 November 2011.

It is important to ensure that this framework provides the right incentives for all parties. If small-scale PV has the potential to reduce network costs then the policy and regulatory framework needs to reflect this. Both PV customers and DNSPs need effective financial incentive to utilise PV to reduce network expenditure where this is efficient. Providing these incentives may require changes to the way regulated revenues for DNSPs are calculated. However, in determining these changes, it will be important to assess the extent to which they will affect other network customers who do not export electricity to the grid or who do so in areas which provide no network benefits.

It is also important to consider the implications of increasing exports from small-scale PV for the regulation of DNSPs' revenues. As AGL noted in its submission, under net metering arrangements, increasing PV exports may reduce network system use which, over time, could reduce network demand and increase prices for all customers under a weighted average price cap.[68]

A variety of industry stakeholders, including the Australian PV Association and Ausgrid, support such a review.

Draft finding

1 A distribution network-related component should not be included in determining a fair and reasonable value for a non-subsidised feed-in tariff in NSW.

Draft recommendations

2 Comprehensive network system modelling is not warranted to calculate the impact of small-scale solar PV on the distribution network businesses' costs.

3 The National Electricity Rules and guidelines governing DNSPs should be reviewed to ensure they appropriately incorporate small-scale embedded PV generation into the policy and regulatory framework. This review should consider:

- the impact of PV exports on network costs
- the most appropriate way to reflect the impact of PV exports on network costs in the prices paid by those customers who install PV
- the relationship between embedded generation and the economic regulation provisions within the National Electricity Rules.

68 AGL Energy submission, p 4.

7.3 Potential for PV exports to result in transmission network cost savings

The transmission network transports high-voltage electricity from the generators to the distribution network, which typically involves long distances. When PV customers connect to the grid, their electricity exports go directly to the distribution network and so do not need to be transported along the transmission network. This suggests that PV exports can potentially reduce transmission network costs by allowing network augmentation to be deferred. To assess this potential we considered stakeholders' comments on this issue.

7.3.1 Stakeholder comments

We received few stakeholder comments and no data or other evidence directly related to the impact of PV exports on transmission network costs. As for distribution network costs, some stakeholders generally argued that PV exports reduce these costs and this benefit should be included in determining a fair and reasonable value for a subsidy-free feed-in tariff. One of the DNSP's, Essential Energy, suggested that PV customers may be entitled to avoided Transmission Use of System charges, like some other generators connected directly to the distribution network.[69]

7.3.2 IPART's analysis and conclusions

In considering Essential Energy's submission that PV customers may be entitled to avoided Transmission Use of System (TUoS) charges, we reviewed the current arrangements in relation to those charges. Transmission businesses recover their costs by levying a range of charges on transmission network users. The most significant of these charges are TUoS charges, which are applied to network customers for the use of shared transmission network assets. TUoS charges comprise 2 components, one that is location specific, and another that applies across the entire network.

The regulatory framework governing transmission and distribution businesses allows for the locational component of TUoS charges to be passed through to certain generators connected directly to the distribution system.[70] These payments were originally intended for large embedded generators, whose exports help to reduce peak demand in localised areas of the network, and are known as avoided TUoS payments to embedded generators.

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69 Essential Energy submission, p 3.

70 Clause 5.5(h) of the National Electricity Rules, available at: http://www.aemc.gov.au/Electricity/National-Electricity-Rules/Current-Rules.html, accessed on 16 November 2011

The National Electricity Rules provide that the amount of avoided TUoS payments to be passed through to embedded generators must be calculated in accordance with a "with and without test", which generally involves 3 steps:[71]

1. determining the locational TUoS charges that would have been payable by the distributor to the transmission business for the relevant financial year at the relevant connection point had the embedded generator not injected any electricity into the distribution network
2. determining the locational TUoS charges actually payable by the distribution business to the transmission company at the relevant connection point
3. calculating the excess of the first TUoS charge over the second TUoS charge (the excess is the amount of avoided TUoS payments).

TransGrid has structured its locational TUoS charges based on the maximum half-hourly monthly demand at each transmission connection point. In this case, applying the "with and without test" outlined above implies that the embedded generator must be running during the maximum half-hourly monthly demand in order to recover any avoided TUoS charges. If the generator fails to run during this half-hour period, then it will not be allowed to recover any revenue from avoided TUoS.

These arrangements are likely to present some practical difficulties in determining whether PV customers are entitled to avoided TUoS payments. This would require half hourly data on the PV customers' exports, but not all these customers have interval meters, which are necessary to provide these data. There could also be confidentially issues around disclosing peak demand at each connection point, which would make it difficult for retailers or individual PV customers to calculate avoided TUoS payments at each connection point, as required by the Rules.

In addition, based on the evidence presented in Ausgrid's submission, we would expect the contribution of small-scale PV exports towards reducing monthly peak demand at various points in the network to be small, localised and limited to summer peak periods. Therefore, the contribution of an individual PV customer and any associated avoided TUoS payments they might be entitled to could be less than the costs to the network businesses of administering the payments.

We also considered the impact of providing avoided TUoS payments to PV customers on transmission and distribution businesses. One implication of less power being withdrawn from certain parts of the transmission network (to the extent that this reduction is unanticipated) is that demand-based payments from the distribution business to the transmission business will be automatically reduced for that financial year (see Box 7.1).

71 Clause 5.5(i), Ibid.

However, since the revenue earned by the transmission operator is regulated under a revenue cap with an unders and overs account, avoided TUoS charges are simply relocated and recovered in the next financial year from distribution network operators (and therefore through higher prices for customers). This suggests that including an allowance for avoided TUoS payments in determining a fair and reasonable value for a subsidy-free feed-in tariff would not be consistent with our terms of reference, insofar as it could lead to an increase in total network tariffs (and therefore electricity prices) for all customers in the next financial year.

Given all of the above, we concluded that it is appropriate to not include a transmission network-related component in determining a fair and reasonable value for a non-subsidised feed-in tariff in NSW.

Further, if we were to include an allowance for avoided TUoS payments in the feed-in tariff, it is not clear how retailers could recover this amount from distribution network companies. Under the current regulatory framework, avoided TUoS payments to embedded generators are typically negotiated directly between the network operator and the generator as part of their connection agreement. This highlights how the current NEM arrangements for embedded generation were not designed with small scale PV units in mind, as discussed in section 7.2 above.

Draft finding

2 A transmission network-related component, including an allowance for avoided Transmission Use of System payments, should not be included in determining a fair and reasonable value for a non-subsidised feed-in tariff in NSW.

Box 7.1 Economic regulation of transmission services

The recovery of transmission network costs is regulated by the Australian Energy Regulator (AER), a national body established under the National Electricity Law. The AER regulates the transmission network business under a revenue cap with an 'unders and overs' mechanism.

The revenue cap imposes a limit on the earnings by transmission network operators during a specified regulatory period. The AER determines the maximum revenue that can be recovered by the transmission operator based on the costs of providing regulated transmission services, including:

- Operating costs.
- Capital expenditure (including allowances for a return on capital, depreciation and tax payments).

The regulatory framework includes an 'unders and overs' account that allows variations from the regulated revenue to be carried forward and adjusted in the following year.

The allocation of regulated revenue to transmission users must meet the requirements of Chapter 6A of the National Electricity Rules (the Rules), and typically involves the following steps:

1. Allocating the costs of regulated transmission system assets to each category of transmission services.
2. Calculating the cost share of each category of services in relation to the total costs of the transmission assets.
3. Allocating the regulated revenue to each category of service according to the costs share calculated in (2).
4. Allocating the regulated revenue share calculated in (3) for some transmission services to each transmission connection point.

The application of the methodology above results in a fixed lump sum dollar amount to be recovered at each transmission connection point.

8 Potential for PV exports to provide benefits to other parties

PV customers' exports can potentially provide financial benefits to parties other than their retailer and network service providers (discussed in Chapters 6 and 7), due to the arrangements in the National Electricity Market (NEM). These benefits might arise if PV exports:

- **Reduce energy loss factors.** PV exports are generally consumed close to where the electricity is generated, so the energy losses that would normally occur if the electricity was transported long distances can be avoided. We have already considered the **direct** financial benefits of this, which are captured by the PV customer's retailer (see Chapter 6). However, by avoiding these losses, PV exports might also provide **indirect** financial benefits that are captured by all retail customers. This would occur if the avoided energy losses led to a material reduction in total energy losses over the distribution networks and this resulted in the published loss factors used in setting regulated retail prices being revised downwards.
- **Change retailers' load profiles.** A retailer's load profile is the half-hourly demand for electricity from the grid from its entire customer base. PV exports may change this profile, which could make it more or less expensive per MWh for the retailer to supply electricity to its customers. In a competitive market, any benefit from a change in a retailer's load shape will contribute to lower electricity prices for all customers.
- **Reduce wholesale electricity prices as a result of the PV generation.** PV generation can contribute to a reduction in the demand for electricity across the NEM, as retailers will need to purchase less electricity from the wholesale market to meet their customers' demand. This could reduce the wholesale price of electricity (compared to what it would otherwise have been), which could benefit all customers. Several stakeholders argued that this benefit, which they called 'the merit order effect', could be substantial.

As part of our analysis for determining a fair and reasonable value for a subsidy-free feed-in tariff for NSW (discussed in Chapter 5), we considered each of these issues to determine whether benefits to other parties should be included in setting the fair and reasonable value. The sections below provide an overview of our draft findings, and then discuss our analysis and conclusions in more detail.

8.1 Overview of draft findings on whether benefits to other parties should be included in setting the fair and reasonable value

Our draft finding is that any indirect financial benefit arising from a reduction in energy losses, improvements in a retailer's load shape and the merit order effect should be excluded in setting a fair and reasonable value for an unsubsidised feed-in tariff. We based this finding on 3 key considerations:

- First, due to arrangements in the NEM, any financial benefits arising from the impact of PV exports on energy loss factors, retailer load profiles and wholesale electricity prices are not fully and directly captured by a PV customer's retailer. Rather, they are 'external benefits' that are shared by all customers (PV and non-PV customers).
- Second, it is impractical to attempt to quantify and allocate the value of these benefits to PV customers.
- Third, even if the value of these benefits could be quantified accurately, reallocating the benefit from all customers to just PV customers would increase electricity prices for non-PV customers. This would be contrary to our terms of reference for this review.

8.2 Reductions in energy loss factors

As electricity flows through the transmission and distribution networks, energy is lost due to electrical resistance and heating of conductors. This means that more electricity needs to be generated than is consumed by end users. To recover the costs of this, we include an allowance for energy losses in setting regulated retail prices. We set the allowance using the relevant distribution loss factors for the specific area and customer type, which are published by the Australian Energy Market Operator (AEMO).[72]

At a network-wide level, energy losses are significant because the large-scale generators in the NEM tend to be located long distances from the population centres where most consumption occurs. In contrast, small-scale PV units are typically located in close proximity to the point where the electricity they generate is consumed – typically in the customer's own premises or nearby premises. Therefore, the energy they export to the grid reduces network-wide energy losses.

As Chapter 6 discussed, retailers make a direct financial gain from losses due to the metering and billing arrangements in the NEM. We consider it appropriate to include this benefit in setting a fair and reasonable value for an unsubsidised feed-in tariff and our draft recommendation reflects this. (See Chapter 6 for more information.)

72 Available at: http://www.aemo.com.au/electricityops/lossfactors.html

However, all electricity customers in NSW may also derive an indirect benefit if the reduction in energy losses associated with PV exports leads to a reduction in the energy loss factors used in setting retail prices. These factors are set based on forecasts of the average energy losses in each distribution network supply area for each coming financial year (see Box 8.1) and updated each year.[73]

If PV exports lead to reductions in average energy losses, this will be reflected in lower loss factors. In turn, lower loss factors should lead to lower retail prices (all else being equal). However, it would be very difficult to restrict this benefit to PV customers only. This is because, under the current arrangements, a single loss factor applies across an entire customer class within a distribution network supply area. This means that any financial benefit associated with reduced loss factors will be equally shared among all customers within that particular tariff class.

Furthermore, the extent to which PV exports reduce network losses by any significant amount is unclear and would be practically difficult to calculate.

For these reasons, we consider it is appropriate to not include the value of any benefit to electricity customers arising from reductions in energy loss factors in setting a fair and reasonable value for feed-in tariffs. This is consistent with a recent draft determination of solar feed-in tariff premiums by the Essential Services Commission of South Australia (ESCOSA).[74]

Draft finding

3 The value of any financial benefit arising from reductions in energy loss factors associated with PV exports should not be included in setting a fair and reasonable value for an unsubsidised feed-in tariff in NSW.

[73] It is worth noting that the loss factors used in our recent annual review, particularly for Country Energy, were significantly lower than those used in our 2010 determination.

[74] Essential Services Commission of South Australia, *2011 Determination of Solar Feed-In Tariff Premium Draft Price Determination*, November 2011, p 34.

Box 8.1 How distribution loss factors are calculated

Distribution loss factors (DLFs) are calculated by distribution businesses each year in accordance with principles set out the National Electricity Rules. DLFs must be approved by the AER prior to being submitted for publication by AEMO by 1 April prior to the year in which they apply.

Prior to calculating DLFs each year, distributors are required to reconcile the previous forecast with actual losses for the last year in which data is available. Any significant discrepancies should be considered and rectified when forecasting DLFs for the next financial year.

Due to the vast number and diversity of customers connected to electricity networks, DLFs can be separated into two major groups:

1. Site-specific DLFs – these are typically applied to large customers, and represent a technical estimation of energy losses occurring between a distribution network connection point and the assigned transmission connection point.
2. Network average DLFs – these are general DLFs applied according to the type of connection points within the distribution network. The DLFs are considered in customer categories, related to the functional part of the network where those categories relate to.

Network average DLFs are principally based on the concept that distribution losses can be grouped into the major components of the distribution network, namely:

- Transmission substations.
- Sub-transmission network.
- Zone substations.
- High voltage network.
- Distribution substations.
- Low voltage network.

Customers can be directly supplied from any of the above network levels, depending on their location and connection characteristics. Customers connected to the low voltage network utilise upstream assets and therefore experience electrical energy losses in each network segment upstream of their connection points.

In some instances, network average loss factors are assigned to tariff classes (such as low voltage domestic customer class) rather than just voltage levels due to significant variation in consumption patterns and power factors.

As a result, all customers within a tariff class will be charged the same network charges regardless of their location within their distribution area.

8.3 Changes in retailers' load shapes

In our Issues Paper we identified a potential benefit that might arise from a change in a retailer's load profile. A retailer's load profile is the half-hourly electricity demand for electricity from the grid from its customer base.

The load profile is a key driver of a retailer's electricity purchase costs. The more peaky this profile is – ie, the larger the difference between peak demand and average demand across its whole customer base – the more expensive (per MWh) it is to supply. This is because higher peak demand (relative to average demand) requires the retailer to purchase relatively more electricity from the NEM at times when pool prices are typically high, or to enter into relatively more expensive contracts suited to peak period supply.[75]

The electricity that PV customers export to the grid may change a retailer's load profile by reducing the difference between peak demand and average demand (typically considered an 'improvement' in the load profile). In this case, it could reduce the electricity purchase costs the retailer incurs in supplying its customer base on a per MWh basis.[76] Thus, the retailer would receive a decrease in costs from PV customers' exports.

Conversely, the electricity PV customers export to the grid could lead to a larger difference between peak demand and average demand (typically considered a 'deterioration' in the load profile). This could increase the electricity purchase costs the retailer incurs in supplying its customer base on a per MWh basis. In this case, the retailer would incur an increase in costs.

AGL Energy submitted that there is no conclusive evidence that a retailer's load profile is improved by energy exported by PV customers. It noted that PV exports may worsen the load profile if the reduction in a retailer's load is not matched by a proportionate reduction in peak demand.[77]

TRUenergy submitted that in the competitive market, any improvement in the load shape would get passed through to customers in the form of lower retail prices. Therefore, if retailers were required to pay PV customers a feed-in tariff to reflect a benefit from a change in the load shape, electricity prices for other customers would increase.[78]

We agree with TRUenergy, that setting a value for a feed-in tariff that results in increases in electricity prices is contrary to our terms of reference.

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75 Integral Energy customers typically have relatively peaky consumption compared to EnergyAustralia and Country Energy customers. This is the result of climate, dwelling type and heating/cooling choices.

76 It is important to note that this financial gain does not result from retailers having to buy less electricity from the NEM; rather it arises as a result of them potentially having to buy **relatively** less energy from the NEM at particular times.

77 AGL Energy submission, p 4.

78 TRUenergy submission, p 2.

Further, it would be practically difficult for a third party to estimate the change in cost arising from a particular retailer's change in load shape.

Therefore, we consider it is appropriate to not include the value of any benefit to electricity customers arising from changes in retailer load shapes in setting this value. Our view is also shared by ESCOSA as outlined in their recent draft determination.[79]

Draft finding

4 The value of any financial benefit arising from changes in retailer load shapes should not be included in setting a fair and reasonable value for an unsubsidised feed-in tariff in NSW.

8.4 Changes to wholesale prices

Several stakeholders submitted that PV generation lowers the spot price for electricity, due to what they describe as 'the merit order effect'.

In the wholesale electricity market, generators offer to supply electricity at designated prices every 5 minutes of every day. AEMO stacks these bids from lowest to highest price (a merit order), with the aim of meeting prevailing demand in the market in the most cost-effective way. A dispatch price is determined every 5 minutes, with the price based on the marginal bid that meets demand. The half-hourly spot price is the average of 6 dispatch prices.

PV generation reduces the amount of electricity that retailers need to purchase from the wholesale market. If this means that demand in the market is lower than it otherwise would have been then, if all else is equal, the market could be settled at a lower bid in the merit order. This would result in a lower spot price.

However, we believe there is no economic basis to include any benefit from this merit order effect in setting a fair and reasonable value for feed-in tariffs. We accept that any new source of generation in the wholesale electricity market may contribute to a reduction in spot prices. But the generator who contributes to this reduction does not receive any payment to reflect this wider market benefit. Similarly, a customer who consumes a lot of electricity and increases electricity prices for all customers is not forced to compensate the other customers for these higher prices. Rather, these are accepted as normal outcomes of the electricity market.

79 Essential Services Commission of South Australia, *2011 Determination of Solar Feed-In Tariff Premium Draft Price Determination*, November 2011, p 27.

Furthermore, it would be very difficult to accurately quantify the value of the merit order effect for a retailer. For example, Origin Energy submitted that due to the market settlement arrangements for first and second tier retailers, the impact of a lower spot price on first tier retailers cannot be accurately captured. In addition, it noted if a financial benefit does arise, it will ultimately be shared among all electricity customers through lower prices.[80]

In our view, even if this benefit could be quantified and allocated to PV customers, it would result in an increase in electricity prices for other customers. As this would be contrary to our terms of reference, we consider it is appropriate to not include the value of any benefit arising from the merit order effect in setting this value. This view is also shared by ESCOSA as outlined in their recent draft determination of solar feed-in tariff premiums.[81]

Draft finding

5 It is not feasible or necessary to include the value of any financial benefit arising from the merit order effect in setting a fair and reasonable value for an unsubsidised feed-in tariff in NSW.

80 Origin Energy submission, pp 3 & 4.

81 Essential Services Commission of South Australia, *2011 Determination of Solar Feed-In Tariff Premium Draft Price Determination*, November 2011, p 28.

9 Mechanism for implementing a fair and reasonable value feed-in tariff in NSW

The third step in our analytical approach was to investigate and recommend a mechanism (or form of regulation) for implementing a fair and reasonable value feed-in tariff in NSW, and any necessary supporting arrangements. As our Issues Paper indicated,[82] we consider there are 3 broad options for the form of regulation (in addition to no regulation at all). These options range from heavy-handed to light-handed regulation, and include:

4. Requiring all retailers to offer a specified feed-in tariff in line with an independently determined fair and reasonable value (heavy-handed).
5. Requiring only the Standard Retailers to offer a specified feed-in tariff in line with an independently determined fair and reasonable value.
6. Publishing an independently determined benchmark value for a fair and reasonable feed-in tariff, which PV customers can refer to in assessing retailer offers and negotiating with retailers (light-handed).

To determine the most appropriate option, we developed a list of guiding principles for the form of regulation that closely reflects the terms of reference for this review, the national principles for feed-in tariff schemes established by COAG, and the principles of good regulatory practice. We also reviewed the competitiveness of the retail electricity market in NSW, as the level of competition is a key factor for determining whether regulation is required to achieve a desired outcome, and if so, how heavy-handed the regulation needs to be. Then we assessed the broad options for the form of regulation against the guiding principles to identify the option that, on balance, best satisfies these principles, taking into account our findings on the competitiveness of the market.

Once we had identified the appropriate form of regulation, we considered what supporting arrangements are required to make it operational and enhance its effectiveness in achieving the desired outcome. Finally, we considered the specific details of the form of regulation – including how the fair and reasonable value should be reviewed and updated over time, and whether any specified feed-in tariff should be available to all PV customers and should vary by customer type or location.

82 IPART, *Setting a fair and reasonable value for electricity generated by small scale solar PV units in NSW – Issues Paper*, August 2011.

The section below summarises our draft recommendations on the form of regulation. The following sections discuss our analysis, findings and recommendations on the appropriate form of regulation, supporting arrangements and other details.

Box 9.1 IPART's guiding principles for determining the appropriate form of regulation

3. Enhances the chances of PV customers receiving a fair and reasonable value feed-in tariff.
4. Supports a competitive retail electricity market in NSW, and does not deter competition or innovation in the tariff offerings available to PV customers.
5. Improves the predictability of future feed-in tariffs for customers considering installing solar PV units.
6. Is relatively simple for the Government and/or the regulator to implement, without the need for complex or costly supporting regulatory arrangements.
7. Is easy for customers to understand.
8. Is simple for retailers to administer, with low impacts on their business operations.
9. Can potentially transition to a national feed-in tariff scheme.

9.1 Overview of draft recommendations

Our draft recommendation is that the form of regulation should be a **benchmark range** for a fair and reasonable feed-in tariff, which is determined by IPART and applies for the coming financial year. We are not recommending that retailers be obliged to offer feed-in tariffs within the benchmark range to customers on market contracts. We consider the publication of the benchmark range, together with our recommended supporting arrangements and the competitiveness of the retail electricity market, will better enable PV customers to identify fair and reasonable feed-in tariff offers and empower them to seek out offers from retailers. This will increase the competitive pressure on retailers, which should be sufficient to deliver fair and reasonable feed-in tariffs.

We are still considering whether to recommend that only the Standard Retailers should be required to offer a feed-in tariff to their regulated customers. We would only make this recommendation if the benefits to customers outweigh any costs to retailers. If Standard Retailers are required to offer a feed-in tariff, then customers can access a feed-in tariff while remaining on regulated prices. Costs to retailers may include changes to their billing systems, however as some retailers currently offer feed-in tariffs (and all retailers have the capability to credit customers for Solar Bonus Scheme feed-in tariffs), we expect these costs to be small. However, if we decide that the benefits outweigh the costs and recommend that Standard Retailers should offer a feed-in tariff, we propose the Standard Retailers set the individual rates they offer themselves. We welcome stakeholder comments.

To support the benchmark range form of regulation, our draft recommendation is also that a suite of actions to improve customers' access to information and understanding of the financial benefits of PV units, including the feed-in tariffs they might receive, are required. These actions aim to better enable customers to make informed decisions about installing PV units and choosing a retailer. The actions include:

- amending the price disclosure and marketing code for retailers to make it clear that retailers are obliged to provide accurate, clear and concise information to customers on the feed-in tariffs they offer on their websites and through their call centres and door-to-door marketers
- increasing our monitoring of retailers' compliance with their disclosure obligations and, if necessary, reviewing whether they are sufficient on their own to meet their objectives
- providing information on the financial consequences for customers of installing small-scale PV units, including the arrangements for feed-in tariffs
- including information on retailers' feed-in tariff offers and the benchmark range for a fair and reasonable feed-in tariff on IPART's price comparison website.

In relation to the details of our recommended form of regulation, our draft recommendations are that:

- Initially, IPART should determine the benchmark range for a fair and reasonable tariff for 2012/13 only. If, after the AEMC's review of the competitiveness of the NSW retail electricity market, the Government decides to continue retail price regulation, we should review and update this benchmark range for 2013/14, as part of our review of regulated tariffs.
- If we decide to recommend that only the Standard Retailers should be required to offer a feed-in tariff to customers on standard contracts:
  - Eligibility for this tariff should be limited to PV customers who have generation capacity of 5kW or less on their premises, and net metering arrangements.
  - There is no need to specify different tariffs by location or customer type, given our draft recommendation is to publish a benchmark range for a fair and reasonable value feed-in tariff, rather than require retailers to offer a mandated tariff.

We consider that this package of draft recommendations best satisfies our guiding principles for the form of regulation, and therefore the terms of reference for this review. In particular, this package provides the best balance between the risk that regulatory intervention would undermine competition in the NSW market – for example, by deterring competition for PV customers, or encouraging these customers to return to regulated tariffs – against the risk that PV customers may not receive the fair and reasonable value of the electricity they export to the grid without regulatory intervention.

In addition, we expect that if these recommendations are implemented, the risk that the competitive market may not deliver fair and reasonable value to PV customers for their exports will decrease over time, as the market matures and retailer competition for PV customers' business and customer understanding and participation in the competitive market increase. The AEMC is likely to consider the market outcomes for customers, including PV customers, in its 2012 review of the competitiveness of retail electricity market in NSW. The findings of this review may assist the NSW Government in deciding whether to continue with retail price regulation. It will also provide an opportunity for Government to review the effectiveness of our recommended regulatory framework for solar feed-in tariffs.

9.2 Draft findings on competitiveness of the retail electricity market in NSW

We reviewed the current and likely future competitiveness of the retail electricity market to determine whether this competition is sufficient to deliver fair and reasonable value feed-in tariffs to customers without the need for regulatory intervention. In its response to our Issues Paper, Origin Energy submitted that our proposed approach for this review was not appropriate because the nature of the feed-in tariff 'market' is very different to the retail supply market.[83]

The ability to earn an income from a feed-in tariff or to offset a bill by exporting electricity to the grid is an additional 'service' that retailers provide PV customers under their electricity supply arrangements. In a market that is not competitive, retailers are able to provide electricity for prices that are above the efficient costs of supply, and/or provide feed-in tariffs that are below the fair and reasonable value of the PV electricity exported by customers. We consider that the competiveness of the market is an important factor in identifying the appropriate form of regulation for feed-in tariffs.

To conduct this review, we sought information from stakeholders and undertook our own research and analysis. While several stakeholders commented on the competiveness of the market, they did not provide information that strongly indicated whether or not regulatory intervention was required, and if so, how heavy or light handed this regulation should be. For example:

- Several retailers argued that the market was sufficiently competitive, based on the fact that a number of retailers are offering voluntary feed-in tariffs to PV customers.[84] AGL also argued that these voluntary tariffs are fair, as they reflect "the market's assessment of the value of solar PV generation."[85]

[83] Origin Energy submitted that this is as a result of retailers being the consumers of the electricity exported by solar PV customers. (See Origin Energy submission, p 8.)
[84] Origin Energy submission, p 2; TRUenergy submission, p 3.
[85] AGL submission, p 2.

- Other stakeholders submitted that competition may not provide sufficient protection to customers, including PV customers. For example, PIAC stated that customers in regional areas of NSW may be less aware of their choices in relation to the supply of electricity (and presumably their options in relation to feed-in tariffs).[86]

For our own analysis, we sought information on the structure of the market, the conduct of the market participants and the financial outcomes for customers. We also considered the extent to which the market was providing sufficient information in relation to feed-in tariffs, in particular, information provided by retailers' call centres.[87] We found there have been several positive developments in relation to the competitiveness of the market over the last financial year (2010/11). In particular:

- While the concentration of the market increased following the sale of the 3 Standard Retailers to TRUenergy and Origin Energy, there has been an increase in market activity in the last 6 months (from March 2011). In addition, non-incumbent retailers such as AGL continued to increase their customer base at the expense of the Standard Retailers over the year, continuing the long-term trend.[88] Smaller new entrants and niche retailers also increased their customers, almost doubling their market share over the year, albeit from a relatively small base.
- The discounts on regulated retail tariffs being offered by some retailers have increased, delivering larger savings to customers who take-up retailers' offers.
- The market information available to customers on retail electricity tariffs has improved, and the number of customers accessing IPART's price comparison website, www.myenergyoffers.nsw.gov.au, increased significantly over the past 6 months.

Given the available evidence, we consider that there are no material barriers to entry in the overall retail electricity market. Retailers' offers and customers' behaviour suggest the competitive market is developing and is delivering benefits to many customers.

However, we also found that some retailers are not offering feed-in tariffs even though they receive financial gains. Only some retailers were offering voluntary feed-in tariffs at the time of our review. For example, two of the Standard Retailers (Integral Energy and Country Energy) are not offering feed-in tariffs to customers on regulated electricity prices. AGL's offer of 8 c/kWh is the only feed-in tariff offer

86 PIAC submission, p 1.

87 We made a series of calls to retailers' call centres over a period of 8 weeks which involved seeking information from all retailers in relation to feed-in tariff offers. This includes information about eligibility for the Solar Bonus Scheme, what voluntary feed-in tariffs they offer to PV customers in NSW, and the reasons why they offer these tariffs or not.

88 AGL increased its customer base by over 80,000 electricity customers in NSW over the past year. IPART's calculation based on individual energy licensees' reported operating statistics for 2010/11.

that is consistent with our estimate of a fair and reasonable value for the electricity PV customers export to the grid (discussed in Chapter 5).[89] In addition:

- Although customers' awareness of full retail contestability is generally high across NSW,[90] their understanding of PV customers' options and the implications of metering arrangements is low.[91] As a result, PV customers' expectations are often unmet.[92] This may be the result of several factors.[93] We consider that one of the major causes is poor or limited understanding of the arrangements for PV customers outside the Solar Bonus Scheme. Unless this is addressed, it may result in customers making ill-informed decisions about installing solar PV units, and may inhibit the development of effective competition in the retail market.
- Some retailers are not providing accurate information to customers about eligibility for the Solar Bonus Scheme, whether the retailer offers a voluntary feed-in tariff to customers outside this scheme, and their reasons for making (or not making) this offer.[94]
- There has been a sharp increase in the number of customer complaints to (or about) their retailer, primarily in relation to the Solar Bonus Scheme but also in relation to billing and affordability issues.

Overall, we concluded that the operation of the competitive market can be improved by better information disclosure. Customers need better information to help them

89 Except for Standard Retailers' obligations to supply regulated customers, retailers have the choice to supply electricity to PV customers. That is, retailers are not obliged to supply PV customers on market contracts. However, a number of retailers are offering to supply electricity to PV customers but without a feed-in tariff.

90 However, this awareness may be higher in metropolitan areas than it is in certain rural and regional areas. See Public Interest Advocacy Centre, *Choice? What Choice? A study of consumer awareness and market behaviour in the electricity market in five regions of New South Wales: Cooma, Lismore, Bourke, Wagga Wagga and Orange,* June 2011, p 2.

91 For example, many customers do not understand that now that the Solar Bonus Scheme has closed to new participants, or that customers installing solar PV units can choose whether (i) to remain on/return to a standard contract with their Standard Retailer and pay regulated retail electricity prices and possibly receive a voluntary feed-in tariff, or (ii) enter into a contract with a 2nd tier retailer for market retail electricity prices and feed-in tariffs (alongside other terms and conditions). Further, some don't understand that under net metering arrangements, PV customers are required to purchase electricity from the grid at any time when the electricity generated by their PV units is insufficient to meet their demand. Nor do some understand that the electricity supplied by a customer's PV unit cannot be stored on the grid during the day for use in their premises in the evening.

92 Origin Energy submitted that customers' awareness of solar issues are high, but they often make decisions based on incomplete or misleading information, and as a result their expectations (such as not having to pay another bill once a PV system has been installed) are not met (see Origin Energy submission, p 4). Similarly, the Sustainable Energy Association of Australia submitted that customer understanding of energy pricing, in terms of the different costs incurred and who incurs them, is a significant barrier to customer's perception of a 'fair and reasonable' feed-in tariff (Sustainable Energy Association of Australia submission, p 3).

93 Customer understanding has not been assisted by frequent changes in NSW Government and Federal Government policy in relation to subsidised feed-in tariffs and other financial incentives, differences in policies across jurisdictions and a lack of clear and concise information from retailers, the solar industry and Government.

94 This is based on the calls that we made to retailers' call centres (see footnote 87).

assess the financial consequences of installing PV units, assess retailer feed-in tariff offers, and shop around for a better feed-in tariff offer. Better informed customers who participate effectively in the market will also increase the competitive pressure on retailers, making it more likely that they will deliver fair and reasonable value feed-in tariffs without heavy-handed regulation.

Our analysis and draft findings on the competitiveness of the market are discussed in more detail in Appendix G.

9.3 Draft findings and recommendations on the appropriate form of regulation

As outlined above, to determine the appropriate form of regulation for implementing a fair and reasonable value feed-in tariff, we developed a list of guiding principles (Box 9.1). These principles represent the qualities or characteristics that the form of regulation needs in order to be consistent with the terms of reference for this review, COAG's national principles for feed-in tariff schemes, and the principles of good regulatory practice. Essentially, this form of regulation needs to improve PV customers' chances of receiving a fair and reasonable feed-in tariff for the electricity they export to the grid **without** undermining competition in the retail electricity market, and **without** involving undue expense or complexity.

We assessed the 3 broad options for the form of regulation (outlined above) against these guiding principles to identify the option that, on balance, best satisfies those principles. In making this assessment, we took into account our findings on the competitiveness of the market and what changes are needed to improve market outcomes for PV customers (discussed above).

We found that the form of regulation that best satisfies the guiding principles is publishing a benchmark range of values for a feed-in tariff for the coming financial year. This is particularly the case when the benchmark range is accompanied by supporting actions to improve the information available to customers about the financial consequences of solar PV generation and retailers' feed-in tariff offers. For example, this approach:

- provides guidance for retailers on a fair and reasonable feed-in tariff rate, but allows them to design their own feed-tariff offers after considering the individual characteristics of PV customers (such as location, PV unit size, consumption patterns and metering arrangements) and the inherent risks and value in providing a fixed feed-in tariff
- provides guidance for customers on the potential feed-in tariff rate they could receive in the year ahead, making it easier for them to assess retailers' feed-in tariff offers and seek out an offer that best suits their circumstances.

In our view, this light-handed form of regulation is the most appropriate response given the risks of regulatory intervention compared to the risks of no regulatory

intervention, and the relative seriousness of these risks for customers, retailers and competition.

We have not yet reached a view as to whether only the Standard Retailers should be required to offer a feed-in tariff (without a mandated rate) to PV customers who are on standard contracts. We would only make this recommendation if the benefits to customers out-weigh any costs to retailers. We will consider this issue further before making our final recommendations, and welcome stakeholder comments.

If the Government decides to implement our recommendations, or make alternative changes to retailers' obligations in relation to feed-in tariffs, it will need to consider how the obligations can be implemented when retailers transition to the national framework for the sale and supply of energy under the National Energy Consumer Framework.

Recommendations

4 The appropriate mechanism for implementing a fair and reasonable value feed-in tariff in NSW is the publication of benchmark range for this tariff. This benchmark range will:
   - inform PV customers of the potential fair and reasonable value of their electricity exports in the coming financial year
   - better enable PV customers to assess retailers' feed-in tariff offers
   - encourage retailers to voluntarily offer competitive feed-in tariffs that reflect the fair and reasonable value of the electricity exported by PV customers.

5 If the NSW Government decides to introduce new obligations for retailers' in relation to feed-in tariffs, it will need to consider how these new obligations can be implemented when retailers transition to the national framework for the sale and supply of energy under the National Energy Consumer Framework.

IPART seeks comment

1 Should only the Standard Retailers be required to offer a feed-in tariff to PV customers supplied on standard contracts at a rate which they set themselves? What would be the costs and benefits of this requirement?

Table 9.1 provides an overview of our assessment of the 3 broad options for the form of regulation against our guiding principles. The sections following summarise the draft findings of our assessment against each guiding principle. Our recommended supporting actions are discussed in section 9.4 below.

Table 9.1 Overview of our assessment of the broad options for the form of regulation for feed-in tariffs against our guiding principles

Guiding principle	Option 1: Requiring all retailers to pay a mandated feed-in tariff	Option 2: Requiring only Standard Retailers to pay a mandated feed-in tariff	Option 3: Setting a benchmark feed-in tariff
1. Enhances the chances of PV customers receiving a fair and reasonable value feed-in tariff	Medium	Medium/High	Medium
2. Supports a competitive retail electricity market in NSW	Low	Low/Medium	High
▼ Minimises the potential for forecasting error			
▼ Facilitates competition for PV customers			
▼ Supports product diversification			
3. Improves predictability of feed-in tariffs for customers	Medium/High	Medium/High	Medium
4. Can potentially transition to a national scheme	Low	Low/Medium	High
5. Is relatively simple for government/regulator to implement	Low	Low/Medium	High
6. Is easy for customers to understand	High	Medium/High	Medium
7. Is simple for retailers to administer	Medium	Medium/High	High

9.3.1 Enhances chances of customers receiving a fair and reasonable value feed-in tariff

We consider that publishing an independently determined benchmark range for a fair and reasonable value tariff will make PV customers more aware of the value of their electricity exports. However we recognise that this approach would seem to provide less certainty for customers than the other broad options we considered. For example, requiring all retailers to pay a mandated feed-in tariff would ensure that all customers receive this mandated rate. Requiring only the Standard Retailers to pay a mandated rate to regulated customers would ensure that all customers have access to least this mandated rate, and can shop around in the competitive market for a better rate.

However, based on our assessment of the competitiveness of the market (discussed in section 9.2 above) we consider that when our recommended option for light-handed regulation is combined with supporting actions to improve the information available to customers about the financial consequences of PV generation and retailers' feed-in tariff offers, this light-handed form of regulation is sufficient. For example, it will enable customers to participate more effectively in the market than at present, which will improve their chances of receiving a fair and reasonable value feed-in tariff. It will also help them make better informed decisions about installing PV units, based on realistic expectations of the potential feed-in tariff they could receive, which should improve their satisfaction with their outcomes.

In addition, the analysis we did on the financial consequences of PV generation for customers under net metering arrangements suggests the likely revenue from an unsubsidised feed-in tariff is likely to be relatively small for a typical PV customer.[95] The majority of this benefit comes from the upfront subsidies provided under the RET scheme and ongoing reductions in retail electricity bills.[96] The potential for changes in government policy in relation to green schemes is also likely to present a greater risk to PV customers and the financial benefits they receive.

Further, in contrast to the supply of electricity, access to a feed-in tariff is not an essential service. That is, customers have a choice about installing PV units and should consider the feed-in tariffs available[97] prior to deciding to do so. While there may be a number of important reasons why PV customers should receive the fair and reasonable value for the electricity they export,[98] the potential for imperfect

95 See our fact sheet *Customers with solar PV units in NSW- producing and consuming electricity*.

96 This is because typically, under net metering arrangements, a significant proportion of the electricity generated by a customer's PV panels is likely to be consumed by the customer at the time of generation. Only electricity in excess of the customer's demand at the time of generation is exported (and thus potentially attracts a feed-in tariff). However, the amount exported will vary, depending on the customer's characteristics and the size of their PV unit.

97 Alongside a range of other considerations including the costs of the PV units, their likely asset life and the potential movements in electricity prices.

98 For example, the optimal deployment of solar generation in the community and the resulting environmental and economic benefits.

competition does not necessarily justify regulatory intervention beyond the various existing safeguards for consumers, for example, the prohibitions against misleading or deceptive and unconscionable conduct and the regulation of unfair contracts in the Australian Consumer Law.

9.3.2 Supports a competitive retail electricity market in NSW and does not deter competition for PV customers' business or innovation in tariff offerings for these customers

To assess the 3 broad options for the form of regulation against this guiding principle, we assessed the extent to which they involved the risk of regulatory error, and the implications of this for the competitive retail electricity market. The risk of regulatory error is the risk that the regulator will set prices too high or too low compared to retailers' efficient costs of supply (due to the forecasts or other inputs used in the price setting process). This can have significant implications for competition – for example, it can affect the relative attractiveness of serving some customers.

In general, the risk of regulatory error in setting prices in the retail electricity market in NSW is significant due to high levels of uncertainty about the costs of supplying electricity. IPART manages this risk in setting regulated retail tariffs for the Standard Retailers through a number of mechanisms, including:

- Annual reviews of the energy cost allowance, which includes the costs of purchasing wholesale energy and the costs of complying with green scheme obligations.
- Automatic pass through of network charges, because these are difficult to forecast (beyond the current regulatory period) and are beyond the retailers' control.
- A cost pass through mechanism that allows the retailers to pass through material incremental costs associated with eligible regulatory or taxation change events.
- The use of a weighted average price cap (WAPC) approach, which allows the retailers to set their individual regulated tariffs, provided the average increase in these tariffs does not exceed a specified percentage.

We consider that the risk of regulatory error in setting a mandated feed-in tariff is also significant. As several stakeholders noted,[99] it will be difficult get the price "exactly right", given that the value of the electricity exported by PV customers will vary over time, location and by customer type. In addition, our analysis of this value shows that it has been volatile over recent years (see Chapter 6).

We consider that our recommended form of regulation, setting a benchmark range for the feed-in tariff, best supports the competitive market as it best manages the risk of regulatory error and minimises its implications for competition. By setting a range for a fair and reasonable value feed-in tariff, we can provide guidance to both

[99] For example, see AGL submission, p 2; Australian PV Association submission, p 17.

retailers and customers that accounts for the variation and volatility in the value of PV exports. If all retailers, including the Standard Retailers, are not required to offer a feed-in tariff within this range, they should be able to correct for any regulatory error in setting their own tariffs.

In our view, requiring all retailers to pay a mandated feed-in tariff poses the highest risk of regulatory error, and has the greatest potential implications for the competitive market because:

- If the mandated feed-in tariff were set too high relative to the value of the electricity that PV customers export,[100] supplying these customers may impose costs on retailers. As noted at the Australian Solar Round Table, this may reduce PV customers' attractiveness to retailers. As a result, retailers may either try to avoid entering into market contracts with these customers, or offer them higher retail electricity rates than other customers.[101] The Standard Retailers would not have these options for PV customers on standard contracts,[102] so the costs of serving these customers would reduce their profitability, and could potentially reduce their long-term financial viability.
- If the mandated feed-in tariff were set too low relative to the value of the electricity exported by PV customers, they would have limited ability to negotiate a feed-in tariff that better reflected this value.

Requiring only the Standard Retailers to pay a mandated tariff would pose a similar risk with similar implications for these retailers. If the mandated feed-in tariff were set too high, it would encourage PV customers to return to their Standard Retailer on a standard contract, which would discourage competition. It may also impact on their financial viability given that Standard Retailers cannot increase regulated tariffs to offset any 'incorrect' feed-in tariff. If it were set too low, it would prevent regulated retail customers from receiving the fair and reasonable value for the electricity they export to the grid.

We could try to manage the risk of regulatory error associated with requiring retailers to pay a mandated feed-in tariff through similar mechanisms to those used in retail price regulation (listed above). However, we consider that this would be inconsistent with other guiding principles. For example, the administrative costs for retailers and IPART would be large in proportion to the risk to PV customers of not receiving the 'fair and reasonable' value for the PV exports. It would also reduce the predictability of feed-in tariffs and make them harder for customers to understand.

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100 For example, higher than the wholesale market value of the electricity exported by PV customers or the financial gain retailers make as a result of their PV customers' exports.

101 Australian Solar Round Table submission, p 7.

102 All customers have a right to be supplied with electricity by standard retailers, and standard retailers cannot discriminate against customers on the basis that customers use alternative forms of energy or energy from alternative sources, or use products or services that reduce energy demand: *Electricity Supply Act 1995* (NSW), ss34 and 35.

9.3.3 Improves predictability of feed-in tariffs for customers considering installing PV units

In our view, none of the options for the form of regulation will improve the predictability of feed-in tariffs for customers, except in the short term. Our recommended option of setting a benchmark range will give customers an indication of the feed-in tariff they could potentially receive in the coming financial year. The other options will allow them to know the minimum feed-in tariff they will receive for the coming year.

However, none of the options provides predictability in the longer term, as we are only likely to be able to determine the value of the electricity PV customers export for the coming financial year, due to the high levels of uncertainty about the costs of supplying electricity and volatility of this value (as discussed in section 9.3.2 above). In considering the benefits of installing PV units customers will ultimately need to form a longer term view of likely feed-in tariffs and electricity prices.

In addition, the AEMC's review of the NSW retail electricity market is scheduled for 2012, and the Government is likely to make a decision about whether or not it will continue electricity price regulation once it considers the findings of this review. This means even if we set a mandated feed-in tariff, it would only be predictable for 2012/13.

9.3.4 Is relatively simple for the NSW Government and IPART to implement

We also considered the extent to which the options for the form of regulation would be simple for the NSW Government and IPART to implement.

We are of the view that our recommended form of regulation is the most simple of all the options for the Government and IPART to implement given that:

- The Government would need to formally request IPART to review and determine a benchmark range for a fair and reasonable value feed-in tariff for the coming financial year, which IPART would then publish.
- While price regulation remains, IPART could conduct a review and recommend a benchmark range at the same time as our annual review of regulated retail tariffs.
- If our final recommendation were to include requiring only the Standard Retailers to offer a feed-in tariff to customers on standard contracts (with no mandated rate), the Government would also need to impose a licence condition on these retailers to this effect.[103]

[103] The Minister grants licences to rretail suppliers, including Standard Retailers, under the *Electricity Supply Act 1995* (NSW). These licences are subject to conditions imposed under that Act, as well as other conditions imposed by the Minister from time to time: *Electricity Supply Act 1995* (NSW), s33; Schedule 2, clause 6.

In addition, implementing our recommended supporting actions (discussed below) would require only small changes to the current regulatory framework to improve retailers' price disclosure in relation to feed-in tariffs.

Implementing the other broad options would be more complex, as they would involve more significant changes to the regulatory framework to require either all retailers or only the Standard Retailers to offer a mandated feed-in tariff. IPART's review to determine the mandated tariff rate would also be more complex as we would need to consider how to balance the need for the mandated tariffs to be cost reflective (which is likely to require multiple feed-in tariffs) with the risk of regulatory error in setting these feed-in tariffs.

9.3.5 Is easy for customers to understand and simple for retailers to administer

We consider that a relatively light-handed form of regulation, such as publishing a benchmark range and potentially requiring Standard Retailers to offer a feed-in tariff is relatively easy for customers to understand. Customers are likely to be familiar with shopping around for the most attractive offers, particularly those customers who have previously entered into a market contract. This will be made easier with our recommended supporting arrangements. We consider this light-handed form of regulation is also simple for retailers to administer.

While mandating a feed-in tariff is likely to be the easiest option for customers to understand (although they would need to identify the rate that is relevant to them), it is also likely to be the most difficult for retailers to administer.

9.3.6 Can potentially transition to a national scheme

We consider that a relatively light-handed form of regulation, such as publishing a benchmark range and potentially requiring Standard Retailers to offer a feed-in tariff to regulated customers is conducive to transitioning to any future subsidy-free national scheme. A transition would be more difficult if we were to adopt a more heavy-handed form of regulation. We consider there to be considerable benefits to PV customers, retailers and the solar industry of moving towards a national scheme and have discussed this with other jurisdictions. Stakeholders similarly provided strong support for a national scheme.[104]

The Federal Government has announced a review of state-based green schemes in light of the introduction of the Clean Energy Future package. By avoiding a further proliferation of mandatory transitional feed-in tariff schemes, or imposing a regulated minimum feed-in tariff we believe we are facilitating a transition to a national scheme.

[104] For example, Origin Energy submission, p 1.

9.4 Supporting arrangements

As discussed in section 9.2 above, we assessed the competitiveness of the market. We consider that to ensure its effectiveness, our recommended form of regulation needs to be supported by actions to improve the quality and accessibility of information available to customers about the financial consequences of installing PV generation and retailers' voluntary feed-in tariff offers. This will better enable customers to make informed decisions about whether to install a PV unit. Further, if customers decide to install a PV unit, it will help customers to participate more effectively in the competitive market – for example, by assessing retailers' feed-in tariff and price offers and actively seeking the best offer for their circumstances. In turn, this should increase the competitive pressure on retailers, and so support and enhance the competitive retail market in NSW.

We recognise that retailers in NSW currently have obligations to provide feed-in tariff information. In particular:

- the Retail Price Disclosure Guideline[105] requires retailers to provide a description of any feed-in tariff credits or payments available on their websites, to any person on request, and to IPART (for our myenergyoffers price comparison website)[106]
- the NSW Marketing Code of Conduct[107] requires retailers (including through their call centres and door-to-door marketers) to provide specified information to customers before or at the time customers enter into supply contracts with retailers, including any information reasonably necessary for customers to make an informed decision about whether to enter into the supply contract.[108] This should include information about available feed-in tariffs.
- the *Electricity Supply (General) Regulation 2001* requires retailers to provide information in customers' electricity bills about the amount of PV electricity supplied by the customer[109] in PV customers' electricity bills and the amount credited for that electricity (ie. amount of feed-in tariff paid).

105 http://www.ipart.nsw.gov.au/files/Electricity%20and%20gas%20retail%20price%20disclosure%20and%20comparison%20guidelines%20-%20Final%20Report%20-%20June%202010%20-%20WEBSITE%20DOCUMENT.PDF

106 Compliance with the retail price disclosure guideline is a condition of a retail supplier's licence: *Electricity Supply Act* 1995 (NSW), s181A.

107 http://www.trade.nsw.gov.au/__data/assets/pdf_file/0010/369298/marketing-code-of-conduct-electricity-gas.pdf

108 NSW Marketing Code of Conduct, clause 7.1 Licensed retail suppliers and their agents or intermediaries (ie, third party marketers) must not contravene the NSW Marketing Code of Conduct: *Electricity Supply Act 1995* (NSW), s63H. It is also a condition of a retail supplier's licence that it complies with the code, and that it is satisfied that their marketers have complied with the code before entering into a supply contract with customers (s63I).

109 *Electricity Supply (General) Regulation 2001*, clause 24(2A); see also clause 24(2)(h).

However, in our view, the obligations in the Retail Price Disclosure Guideline and NSW Marketing Code of Conduct are not sufficiently clear or detailed with respect to feed-in tariffs. We consider these instruments should be amended to clarify that retailers (and their marketers) must specify the amount of the feed-in tariff rate, even when the rate is equal to zero (ie, when they do not offer a feed-in tariff). We also consider that the NSW Marketing Code of Conduct should require the information about feed-in tariff rates to be disclosed to customers *before* customers enter into supply contracts with retailers, but not allow disclosure at the time of entry into the contracts

In addition, we are concerned that the current practices of retailers in disclosing the key features of their offers are not assisting customers to assess these offers and make well informed decisions. We consider that in complying with their price disclosure and marketing obligations, retailers should ensure all the information provided to customers is accurate, particularly information provided through call centres and door-to-door marketers. They should also ensure this information is presented clearly and concisely and in a way that allows customers to easily compare and assess retailers' offers. The challenges faced by customers in navigating information provided by retailers, and ultimately making informed decisions, is well documented across a range of industries.[110]

We will increase our monitoring of retailers' compliance with these disclosure obligations, and if necessary, we will consider whether these obligations are sufficient to meet their objectives. We will also publish retailers' feed-in tariff offers on our myenergyoffers price comparison website.[111]

In addition, given the recent changes in eligibility for subsidised feed-in tariffs and the varying voluntary tariffs offered by retailers, there is also a role for Government and the solar industry (including retailers who are increasing involved in the installation market) to play in improving customers' understanding.[112] In our view, key information to customers is necessary to improve customers' participation in the competitive market and ultimately to achieve the NSW Government's objectives under the Solar Bonus Scheme such as promoting the uptake of small-scale solar. This could build on the information that the NSW Government currently provides.[113]

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110 For a recent study into consumer decision making in the Australian telecommunications industry see: Deakin University and Australian Communications Consumer Action Network (2011), Seeking Straight Answers: Consumer Decision-Making in Telecommunication, September 2011.

111 http://www.myenergyoffers.nsw.gov.au/

112 For example, the NSW Government (Trade and Investment NSW) has prepared a short number of frequently asked questions (FAQs) on its website. http://www.trade.nsw.gov.au/energy/sustainable/renewable/solar/solar-scheme/questions

113 For example, clear and accessible information in relation to PV customers' rights and obligations (such as the need to purchase electricity when generation is insufficient to meet demand), the subsidies available and the relative financial benefit they provide, types of metering arrangements and the impact this can have on electricity bills, and general information about small scale solar PV and the issues to consider when installing solar PV (eg, how it works, how generation from the panels can be maximised, what happens to excess energy generated etc).

We consider that these supporting changes are relatively small in terms of the administrative costs to Government and retailers, but will have important impacts in empowering customers and improving information disclosure in relation to retailers' offers. Ultimately, these arrangements should improve customer understanding and the functioning of the competitive market.

Recommendations

6 To enhance the effectiveness of publishing a benchmark range for a fair and reasonable value feed-in tariff, the following action should be taken to improve the quality and accessibility of information available to customers on feed-in tariffs:

- The Retail Price Disclosure Guideline and NSW Marketing Code of Conduct should be amended to clarify that retailers (and their marketers) must specify the amount of the feed-in tariff rate they offer (even when this rate is equal to zero). The NSW Marketing Code of Conduct should also be amended to require the amount of the feed-in tariff rate to be disclosed to customers before they enter into a contract with retailers. IPART will publish these rates on our price comparison website.
- In complying with obligations under the price disclosure guidelines and NSW Marketing Code of Conduct, retailers should ensure that the information provided to customers, is accurate and presented in a clear and concise manner. This includes information provided via call centres and door to door marketers.
- The NSW Government and the solar industry provide clear information to customers about small-scale solar PV, including the potential financial consequences to households and small business customers who choose to install PV units.

9.5 How the feed-in tariff should be updated over time

While we consider that the benchmark range should be set annually, we are recommending that IPART determine the range in June 2012 for the upcoming financial year (2012/13) only.[114] The significant volatility in the value of the electricity exported by PV customers would make it difficult to set this range for a period longer than one year while still maintaining reasonable confidence in its accuracy. In addition, as Chapter 2 discussed, 2012/13 is the last year of the current regulated retail tariff determination period, and there is no certainty that price regulation will continue beyond this period. It would be difficult and costly to continue setting a benchmark range for a fair and reasonable value feed-in tariff in the absence of price regulation, as we would no longer have ready access to much of the information required.

[114] We are unable to set this range until June 2012 once regulated retail electricity tariffs have been approved.

If, after the AEMC's review into the competitiveness of the NSW electricity retail market, the NSW Government decides to continue retail price regulation beyond 2012/13, we can update our benchmark range for 2013/14 as part of a future review of regulated retail tariffs.

We recognise that this would not provide customers with certainty in terms of the likely revenue that a feed-in tariff will provide over the life of a PV unit. However, for typical customers who are not participants in the Solar Bonus Scheme and are on net metering arrangements, this revenue is likely to represent only a small component of the overall financial benefit they derive from installing a PV unit. This is because they are likely to consume most of the electricity that they produce at the time of production and therefore reduce the electricity that is bought from the grid. This 'saving' is likely to be significantly larger than any revenue from electricity exported to the grid. (See Chapter 4 for more detail.) In addition, any uncertainty associated with future feed-in tariffs is likely to be of much less significance than the uncertainty surrounding likely movements in retail electricity prices.[115]

Lake Macquarie City Council[116] proposed linking the value of the feed-in tariff to the regulated retail electricity tariff as a way of providing certainty about the ongoing reduction in retail electricity bills that installing a solar PV unit is likely to provide. As Chapter 6 discusses, the value of the regulated tariff is driven by the range of costs retailers incur in supplying electricity to customers on standard contracts. While the estimated fair and reasonable value is related to the retail tariff (as retailers avoid certain costs that make up the retail price), these costs will vary over time and as such will represent a varying proportion of the regulated retail tariff. In our view it is not cost-reflective or consistent with the terms of reference to set the feed-in tariff as a fixed proportion of the regulated retail tariff.

Recommendation

7 IPART should set the benchmark range for a fair and reasonable value feed-in tariff for 2012/13 in June 2012.

8 If the NSW Government decides to continue price regulation beyond 2013, IPART should review and update the benchmark for 2013/14 as part of our review of regulated retail tariffs for the next determination period.

115 This stems from the uncertainty in the underlying costs of supplying electricity including the potential for changes in green scheme obligations, fuel prices such as coal and gas as a result of international and domestic factors, carbon obligations as a result of political uncertainty and international certificate prices, and network prices as a result of the AEMC considering amendments to the National Electricity Rules.

116 Lake Macquarie City Council submission, p 7.

9.6 Which PV customers should be eligible for a feed-in tariff

Under our draft recommendations, the question of which PV customers should be eligible for a feed-in tariff does not arise. As we are not recommending that retailers be required to offer feed-in tariffs, retailers can decide whether and which customers they will offer them to, and customers can select the offers that are most attractive to them.

If, in making our final recommendations, we decide that only the Standard Retailers should be required to offer a feed-in tariff to customers on standard contracts, we consider that eligibility should be limited to those customers who have:

- installed solar PV units of 5kW of less on their premises
- net metering arrangements.

We consider that only customers with PV units of 5 kW or less should be eligible because:

- This is broadly consistent with limits on eligibility in other States and Territories, and we consider that setting a limit in line with other jurisdictions is most likely to facilitate a move to a national scheme. A number of stakeholder submissions supported this approach.[117]
- This will cover the vast majority of PV customers. Currently, only a few of the small retail customers who have installed PV units larger than 5kW. Those with larger units outside the Solar Bonus Scheme are more likely to be small business customers with large demand during the day, and these customers are more likely to be participating in the competitive market than to be on regulated contracts with Standard Retailers.[118]

We consider that only net metered customers should be eligible because:

- This is likely to ensure that customers install net metering which, in the absence of a subsidy, will be of more financial benefit to them. This is particularly the case as retail electricity prices increase.
- There are very few customers with gross metering arrangements who are not participants in the Solar Bonus Scheme.[119]

[117] For example, see Origin Energy submission, p 10; Essential Energy submission, p 8.

[118] With an unsubsidised feed-in tariff customers are less likely to install large units unless they have a large demand for electricity during the day (that is, a load shape that is better matched with generation from the units).

[119] For example, customers that had solar PV units installed with gross metering with the intention of receiving a subsidised feed-in tariff (or have moved into a house with gross metering) but for whatever reason are not eligible for the Solar Bonus Scheme.

- There was no clear stakeholder view on this issue. Some stakeholders broadly supported any arrangements applying to both gross and net metered customers,[120] while others supported the arrangements applying to net metered customers only,[121] or gross metering only.[122]

Recommendation

9 If only Standard Retailers are required to offer a feed-in tariff to customers on standard contracts, eligibility for this tariff should be limited to who have:
   - installed solar PV units of 5kW or less on their premises, and
   - net metering arrangements.

9.7 How the feed-in tariff should vary by tariff component, location or customer type

The terms of reference ask us to consider whether a single feed-in tariff should be applied across NSW, or whether it should vary by location or by customer type. Under our draft recommendations this question does not really arise as our draft recommendations does not include requiring retailers to offer a feed-in tariff at a mandated rate.

As discussed above, we are recommending that we set a benchmark range for a fair and reasonable value feed-in tariff, and this range should reflect the estimated value of the electricity PV customers export to the grid. As Chapter 6 discussed, our analysis indicates that this value does differ according to a variety of factors, including:

- whether the customer is a residential or business customer
- whether the customers has a time of use or accumulation meter
- where the customer is located in NSW.

We consider that these differences can be accounted in determining the upper and lower bounds of the benchmark range, and therefore will cover all customer types and locations.

120 For example, see Australian PV Association submission, p 19-20.
121 Origin Energy submission, p 11.
122 Essential Energy submission, p 10.

10 Retailer contributions to the costs of the Solar Bonus Scheme

In addition to investigating an unsubsidised feed-in tariff for customers who **are not** part of the Solar Bonus Scheme (PV customers), the NSW Government asked us to recommend the contribution retailers could make to the costs of the subsidised feed-in tariffs paid to customers who **are** in this scheme (SBS customers). As Chapter 1 discussed, the number of customers who installed PV units under the Solar Bonus Scheme was much higher than anticipated. Therefore, costs associated with these subsidised feed-in tariffs are also higher than anticipated.

To control these costs, the former Government reduced the feed-in tariff available to new participants from 60 c/kWh to 20 c/kWh in October 2010, then closed the scheme to new participants in July 2011.[123] Nevertheless, the scheme is expected to accrue costs of $1.05 – $1.83 billion[124] over its 7-year life. A significant portion of these costs will be recovered through electricity prices over the coming years.[125] In other words, the prices paid by all customers in NSW will increase to subsidise the feed-in tariffs paid to SBS customers.

As part of our 2011 annual review of regulated retail tariffs, we recommended that the Government consider requiring retailers to make a contribution to these costs, to reduce the pressure on electricity prices.[126] We argued that retailers make a financial benefit from their customers' participation in the Solar Bonus Scheme, which arises from the arrangements in the National Electricity Market (NEM). Therefore, they could return some or all of this financial benefit without affecting their financial viability. The Government responded by asking us to recommend a contribution in line with the financial benefit.

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123 The scheme was suspended on 28 April 2011 and subsequently closed on 1 July 2011.

124 There have been several recent estimates of the costs of the Solar Bonus Scheme. In May 2011 the Department of Trade & Investment estimated the scheme costs at $1.83 billion (Mark Duffy presentation to the Solar Summit 1). In June 2011, the Premier estimated the scheme costs at $1.44 billion (http://premier.nsw.gov.au/sites/default/files/110608-SBS.pdf) and in September 2011 the NSW budget included a cost estimate of $1.75 billion (NSW Budget Papers 2, pp 5-3 and 5-6). In November 2011, the Audit Office determined a probable range of $1.25 to $1.44 billion, with a possible range of $1.05 to $1.75 billion (Audit Office of NSW, New South Wales Auditor-General's Report, Special Report, Solar Bonus Scheme, 7 November, p 19).

125 For example, the Government has announced it will increase the Climate Change Fund levy recovered by increased electricity prices by NSW distribution network businesses by $100 million in 2012/13 (bringing these businesses total annual contribution to $250 million), and by a further $150 million (to $400 million) per annum from 2013/14 – 2016/17 (when the scheme will end). These higher levies will be passed on to customers through higher prices. (NSW Budget 2011/12 – Budget Paper 2, chapter 5, p 3.)

126 IPART, *Changes in regulated electricity retail prices from 1 July 2011, June 2011*, pp 108-109.

To reach our recommendation on this contribution, we considered that all retailers would be required to make the contribution at the same rate, as this is the only feasible approach in a competitive market.[127] We then took the following steps to determine the appropriate rate:

1. Estimated the direct financial gain to retailers per kWh of electricity generated by their SBS customers that is eligible subsidised feed-in tariff.
2. Considered the impacts of requiring retailers to make a contribution that reflects this estimated gain, including the impacts of setting the contribution rate either too high or too low relative to retailers' actual financial gain.
3. Determined the contribution rate for the period from implementation to 30 June 2012 and arrangements for updating it in future years, taking into account our findings at steps 1 and 2.

The section below summarises our recommendations. The subsequent sections explain how retailers make a financial benefit from the Solar Bonus Scheme, and discuss our analysis and consideration on each of the above steps.

10.1 Summary of draft recommendations on retailer contributions

Our draft recommendation is that the NSW Government should place a statutory obligation on all retailers supplying SBS customers to make a contribution towards the costs of the Solar Bonus Scheme. Our recommended rate for this contribution is 7.5 c/kWh of eligible electricity from implementation until 30 June 2012. We cannot recommend a rate for 2012/13 as the necessary data are not yet available. The Government should set this rate in June 2012 with advice from IPART, and then update the contribution rate annually until the Solar Bonus Scheme ceases in 2016.

We recognise that if these recommendations are implemented, retailers currently voluntarily offering their SBS customers a 6 to 8 c/kWh premium on top of the statutory feed-in tariff rate are unlikely to continue.

We consider that retailers should make a contribution towards the costs of the Solar Bonus Scheme. This will reduce future electricity price increases by reducing the amount of the costs of the scheme that need to be recovered from electricity customers.[128]

This contribution will ensure that customers and taxpayers do not have to fund the entire costs of the Solar Bonus Scheme. It will ensure that retailers who do not pay a voluntary premium to customers of the Solar Bonus Scheme do not benefit financially.

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[127] If the contribution was not mandatory, retailers would not be inclined to contribute to the Government, but to potentially share benefits with their customers through voluntary feed-in tariffs, which could give that retailer a marketing advantage.

[128] The NSW Government has announced that it will increase the Climate Change Fund levy to recover the costs of the Solar Bonus Scheme. This will further increase electricity prices.

Solar Bonus Scheme customers will continue to receive their existing statutory feed-in tariffs, which are subsidised.

We recommend that the Government, retailers and IPART work together to ensure that SBS customers understand why these voluntary premiums reduce or are eliminated.

10.2 How do retailers make a financial benefit from Solar Bonus Scheme participants?

In Chapter 6, we discussed how retailers make a direct financial gain for the electricity their PV customers generate and export to the grid. They make this same gain for the electricity their SBS customers generate and receive the subsidised feed-in tariff,[129] for essentially the same reason. For example, if the SBS customer has gross metering arrangements:[130]

- The customer pays the retailer the retail price on their gross electricity consumption and receives at least the statutory feed-in tariff for their gross generation.
- The retailer incurs the distribution network charges and the green scheme obligations on this gross consumption.[131] However, it pays:
  - energy costs for the customer's gross consumption minus gross generation at the spot price
  - the market fees and energy losses costs on this **netted amount**.

Thus, for the electricity the SBS customer generates, the retailer avoids electricity purchase costs, NEM fees and energy losses – the same costs it avoids for the electricity its PV customers export to the grid. Therefore, it makes a direct financial gain equivalent to the difference between the retail price it charges and the costs it still incurs for the electricity.

Retailers make the same gain per kWh, regardless of whether the SBS customer is on the 60c/kWh or 20 c/kWh rate. Some retailers also voluntarily share this gain with their SBS customers by paying a 6 to 8 c/kWh premium on top of the statutory feed-in tariff.

For further explanation of how retailers make a financial gain from SBS customers, see Appendix H.

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[129] If the SBS customer has gross metering arrangements, this electricity is equal to the customer's gross generation; if they have net metering, it is equal to their net exports.

[130] Around 90% of SBS customers have gross metering arrangements. With net metering arrangements, the retailer would make the gain on the SBS customer's net exports to grid. However, the gain per kWh would be the same.

[131] It also incurs its usual retail costs and earns it usual retail margin (which do not vary significantly with the customer's consumption).

10.3 Estimated financial gain to retailers from SBS customers

Our draft finding is that the financial gain to retailers from SBS customers is 8.3 to 10.3 c/kWh of electricity eligible for the statutory feed-in tariff. This is the same as our draft finding on the financial gain to retailers on PV customers' exports.

As noted above, retailers make a financial gain from their SBS customers and their PV customers for essentially the same reason: that is, when they supply the electricity generated by these customers to other customers, they avoid electricity purchase costs, NEM fees and energy losses. Therefore, the financial gain they make for these customers is the same on a per kWh basis.

However, as Chapter 6 discussed, we estimated this gain using data on the Standard Retailers' costs and revenues for customers on regulated prices, as this was the best available data. The financial gain to retailers for customers on unregulated prices could be higher or lower than this estimate (due to differences in the costs and revenues for customers on regulated and unregulated prices).

Because our approach for estimating the financial gain to retailers relies on actual data from the Standard Retailers and the price regulation process, we cannot estimate the gain for 2012/13 until June 2012. For more information on this approach, see Chapter 6, section 6.2.

10.4 Impacts of requiring retailers to make a contribution in line with their estimated gain

We have considered the impacts of requiring retailers to make a contribution to the costs of the Solar Bonus Scheme in line with their estimated financial gain from SBS customers – including the impact of setting the contribution rate either too high or too low relative to retailers actual financial gain. In particular, we considered the impacts on competition, SBS customers, electricity prices and retailers.

10.4.1 Impact on competition

Retailers raised a range of concerns about the impact of setting the retail tariff too high on competition, including that it would undermine industry confidence and discourage new entrants.[132]

[132] Alinta Energy submission, p 4.

However, our main concern is that this would deter competition for SBS customers. If the rate is set too high relative to retailers' actual gain, supplying these customers may impose costs on retailers. Clearly, this will reduce SBS customers' attractiveness to retailers, and they may either try to avoid entering into market contracts with these customers, or offer them higher rates than other customers.[133] This could impact on the overall competitiveness of the market.

10.4.2 Impact on SBS customers

The impacts of setting the retailer contribution too high on competition would also have implications for SBS customers themselves. As noted above, this could make it more difficult for them to benefit from the competitive market, or lead them to return to their Standard Retailer.

In addition, requiring retailers to make the contribution would have impacts for SBS customers who currently receive voluntary premiums on top of the statutory feed-in tariff. We assume these voluntary premiums reflect a sharing of the relevant retailer's estimate of the financial gain it makes from these customers. Therefore, when this retailer is required to make a contribution that reflects this financial gain, it will reduce or eliminate the voluntary premium.[134]

We are not concerned about the impact of this for customers who are eligible for 60 c/kWh feed-in tariff, as in our view they will still receive an overly generous subsidy. The pay back periods these customers are substantially lower than those of customers receiving 20 c/kWh feed-in tariff.

However, for customers on the 20c/kWh feed-in tariff, the impacts may be more significant. In particularly, we consider that if these customers have gross metering arrangements, the loss of voluntary premiums may mean they would be financially better off with net metering (although there are relatively few of these customers). In general:

- If the feed-in tariff is higher than the retail price of electricity (which currently around 25 to 30 c/kWh and expected to increase in the coming years), the customer is better off with gross metering, as they earn this (higher) tariff on their total generation.

[133] All customers have a right to be supplied with electricity by standard retailers, and standard retailers cannot discriminate against customers on the basis that customers use alternative forms of energy or energy from alternative sources, or use products or services that reduce energy demand. *Electricity Supply Act 1995*, ss34 and 35.

[134] As these premiums are discretionary they can be changed provided the retailer notifies the customer in accordance with the Electricity Supply (General) Regulation 2001 (regs 21 and 22) and the terms of the contract.

- But if the feed-in tariff is lower than the retail price, they are better off with net metering. This is because most customers consume the bulk of the electricity they generate in their premises, and under net metering they save the (higher) retail price on this consumption, and earn the (lower) feed-in tariff on the smaller portion they export to the grid.

Given this, setting a mandatory retailer contribution is likely to affect the incentive for SBS customers who receive the 20c/kWh feed-in tariff to switch from gross to net metering, particularly if they currently receive a voluntary premium on this tariff. This has implications for both these customers and their distribution, as the customer will incur meter installation costs, and the distributor will incur the costs of the new meter and inspecting the installation. The Government could consider not requiring retailers to make the contribution in respect of these customers.

In its submission, Origin Energy more broadly opposed a retailer contribution to reduce the costs of the Solar Bonus Scheme. While it acknowledged that retailers make a financial gain from the scheme, it expressed concern about the impact on customers.[135]

AGL raised concerns about the regulatory risk associated with retrospectively altering contracts to reduce or eliminate voluntary premiums.[136] IPART is not suggesting a retrospective change to contracts. We consider it appropriate for the Government to set a future date for implementing our recommendations that will allow retailers to give notice to customers of any change in voluntary premium arrangements. Further, as voluntary premiums for part of the retailer's market offer, they can be changed provided the retailer notifies the customer in accordance in accordance with the *Electricity Supply (General) Regulation 2001*.

10.4.3 Impact on electricity prices

We consider that requiring retailers to make a contribution to the costs of the Solar Bonus Scheme will have a beneficial impact on electricity price increases. In particular, it will reduce the amount these prices need to increase to recover the costs of this scheme from 2012/13 to 2016/17 (when the scheme will cease).

Under the Solar Bonus Scheme, the feed-in tariffs are paid by the distributors. The distributors recover the costs they incur in this from the NSW Government's Climate Change Fund. These funds are raised through a levy on electricity prices. The Government's 2011/12 budget specified that due to the higher than anticipated costs of feed-in tariffs under the scheme, the Climate Change Fund will increase from its current rate of around $150 million to $250 million in 2012/13, and then to $400 million from 2013/14 to 2016/17. Therefore, the Climate Change Fund levy on electricity prices will have to increase. We estimate that on average, this levy will

[135] Origin Energy submission, pp 11-12.
[136] AGL Energy submission, p 5.

recover around $30 a year from each small retail customer over the period from 2013/14 to 2016/17.[137]

The Government has provided a range of projected costs of the Solar Bonus Scheme. In May 2011, the NSW Office of Resources and Energy estimated that the costs of the scheme would be $1.83 billion.[138] In June 2011, the Premier estimated the costs of the scheme would be $1.44 billion.[139] In September 2011, the NSW Budget included an estimate of $1.75 billion.[140] In November 2011, the Audit Office estimated that the possible range of costs of the scheme would be $1.05 to $1.75 billion, with a probable range of $1.25 to $1.44 billion.[141]

We consider that the costs of the Solar Bonus Scheme is likely to be at the lower end of the Auditor-General's range, predominately due to lower output from PV units than is assumed by the Government and the distribution businesses (see Chapter 3 for information on actual output from installed PV in Sydney). If scheme costs are below the NSW Treasury estimate of $1.75 billion, then the Government could lower the budgeted contributions to the Climate Change Fund, thereby ameliorating the impact of further electricity price increases.

This different cost estimates reflects uncertainties about a range of factors, including:

- The output characteristics of units related to its installation. Average output tends to be lower than the rating of the units, reflecting that some units might be obstructed by shade for parts of the day, may not have the most desirable orientation or may not function at all possible times (due to outages, voltage fluctuations, etc).
- Weather variations, which could see higher or lower than average sunlight hours per day.
- The total amount of capacity that will be installed under the Solar Bonus Scheme and the timing of any installation – some customers have lodged applications and are eligible for the scheme, but are yet to install the units or may have installed smaller sized units. For some customers, it has been more than a year since they applied for connection.
- A proportion of customers who are on the 60 c/kWh payment who will move house, leaving the new occupants eligible for the 20 c/kWh payment only.

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137 This calculation assumes that 25% of the Climate Change Fund Levy is recovered from small retail customers and there are around 3.2 million small retail customers in NSW. The remaining 75% of the Climate Change Fund Levy is recovered from large customers.

138 Mark Duffy presentation to Solar Summit, 6 May 2011 http://www.trade.nsw.gov.au/__data/assets/pdf_file/0008/388718/NSW-Solar-summit_Duffy-presentation_6-May-2011.pdf

139 Premier's Press release, 7 June 2011, http://premier.nsw.gov.au/sites/default/files/110608-SBS.pdf

140 NSW Government Budget Paper 2, 6 September 2011, pp 5-3 and 5-6.

141 Audit Office of NSW, *New South Wales Auditor-General's Report, Special Report, Solar Bonus Scheme*, 7 November 2011, p 19.

If retailers are required to contribute towards the cost of the Solar Bonus Scheme then electricity prices will need to increase by a lesser amount. Given the recent and forecast large increases in electricity prices, we think that it is appropriate to take measures to limit price increases, particularly for low-income households.

For the purposes of analysing the impact of requiring retailers to make a contribution to the costs of the Solar Bonus Scheme, we have estimated that the costs of the scheme are around $208 million in 2011/12. If our recommended contribution of 7.5 c/kWh had been that entire financial year, the retailer contribution would have saved around $29 million, or 14% of the scheme costs.

10.4.4 Impact on retailers

If the contribution towards the costs of the Solar Bonus Scheme is set too low, then retailers can continue to offer voluntarily premiums (albeit smaller) in the market. Of the Standard Retailers, Country Energy and Integral Energy do not currently offer a voluntary premium, while EnergyAustralia offers a 6 c/kWh premium to regulated and market PV customers. AGL, TRUenergy and Origin Energy offer 6 to 8 c/kWh premiums to market customers.

However, if the contribution rate is set too high, then second tier retailers will either tailor products with higher costs to SBS customers to (for example, not offer or offer lower discounts in the market) or will avoid serving these customers.

The consequences of setting the contribution rate too high are significant for the Standard Retailers because they are restricted in their ability to set the regulated tariff higher in order to recover these costs. Therefore, it is important to ensure that we are setting a rate that reflects no more than the financial benefit to retailers.

Some retailers submitted that if the Government requires a contribution towards the costs of the feed in tariff, then IPART or the Government should assist in explaining to customers why the premium rate is being removed. Our clear reason for recommending that retailers make a contribution towards the cost of the Solar Bonus Scheme is to lower the overall scheme costs, which will lead to lower electricity price increases for all customers. If our recommendation is implemented, IPART will provide a Fact Sheet explaining the rational for our recommendation that retailers will be able to use in communicating with customers.

10.5 Recommended contribution for 2011/12 and arrangements for updating the contribution in future years

To balance the impacts on the competitive market and future electricity prices, we consider that it is appropriate to require retailers to make a contribution to the costs of the Solar Bonus Scheme at a specified rate that is slightly below our estimated range for the financial gain to retailers. The risk of regulatory error is greater given our recommended mandatory contribution. This view also reflects the fact that this estimated range is based on the costs and revenues of the Standard Retailers for customers on regulated prices, and the costs and revenues of retailers for customers on market contracts may be a little lower (or higher).

In addition, for simplicity, we consider that the all retailers should be required to contribute the specified rate for every kWh generated by their SBS customers that is eligible for a statutory feed-in tariff Solar Bonus Scheme. This requirement should continue until the scheme ceases in 2016.

Based on our estimated range for the financial gain to retailers in 2011/12 of 8.3 to 10.3 c/kWh, we consider that the appropriate contribution rate for this year would be 7.5 c/kWh. We cannot determine the appropriate contribution rate for 2012/13 until June 2012, when we have the necessary data to update our estimate of the financial gain to retailers. The financial gain will change from year-to-year as retail prices and the underlying costs change.

Further, we consider that information should be provided to SBS customers to explain that the requirement on retailers to make this contribution will lessen electricity price increases but will lessen or remove voluntary premium contributions.

Unless IPART receives a terms of reference for a future review of retail price regulation, regulated prices will cease on 30 June 2013. If we continue to regulate retail prices beyond this point, then we can review and recommend the mandatory retailer contribution rate in conjunction with our price setting process. Alternatively, if the Government chooses not to continue with retail price regulation, then it should consider the how best to update this rate in determining the transitional arrangements.

Recommendation

10 The NSW Government should impose a statutory obligation on all retailers to contribute to the costs of the Solar Bonus Scheme until the scheme ceases in 2016. This contribution should be a specified rate for every kWh generated by their customers that is eligible for a statutory feed-in tariff Solar Bonus Scheme.

11 The appropriate rate for such a mandatory retailer contribution is 7.5 c/kWh from implementation until 30 June 2012.

12 The NSW Government should set the rate for the mandatory retailer contribution for 2012/13 following advice from IPART in June 2012.

13 The NSW Government should update the contribution rate annually until 2016. If price regulation continues beyond 2013, IPART should provide advice on the updated rate. If price regulation ceases in 2013, the Government should consider how this rate will be setting in determining its transitional arrangements.

14 The NSW Government, retailers and IPART should work together to ensure that customers understand why the voluntary premiums paid by some retailers reduce or are eliminated once retailers are required to contribute to the costs of the Solar Bonus Scheme.

Appendices

A Terms of Reference

Reference to IPART under s9 of the IPART Act

I, Barry O'Farrell, Premier of New South Wales, approve the provision of services by the Independent Pricing and Regulatory Tribunal (IPART) under section 9 of the *Independent Pricing and Regulatory Tribunal Act* 1992, jointly to the Office of Environment and Heritage (Department of Premier and Cabinet) and the NSW Department of Trade, Investment, Regional Infrastructure and Services, by conducting a review in accordance with the following terms of reference.

IPART is to independently investigate and report on a fair and reasonable value for electricity generated from small-scale solar PV consistent with the COAG National Principles for Feed-in-Tariffs.

In investigating and reporting on a "fair and reasonable" value for small-scale solar PV, IPART is to consider the following key parameters:

- there should be no resulting increase in electricity prices in NSW;
- a fair and reasonable value will not be funded from the NSW Government budget;
- any price should be administratively simple and must take into account the impact on business operations of administering such pricing; and
- a fair and reasonable price benchmark should operate in such a way as to support a competitive electricity market in NSW.

As part of its investigation and report, IPART is also to consider:

- the benefit gained by customers and retailers from electricity produced from small-scale solar PV;
- whether a fair value should be linked to particular metering arrangements;
- whether the facilitation of retailer competition would require any supporting arrangements;
- whether a fair value should be limited in application to generators of a particular size or in a particular location; and

- the impact of small-scale solar PV, if any, on the costs of network distribution businesses, including capital and operating costs. IPART is requested to investigate this issue to the extent necessary to make recommendations as to whether comprehensive network system modelling is warranted.

IPART is also to report on the mechanism(s) by which a fair and reasonable value could be implemented in NSW and which can potentially transition to a national scheme if one is established. In reporting on an implementation mechanism IPART is to consider:

- The need for predictability for customers wanting to install small-scale solar PV;
- Arrangements for reviewing the fair and reasonable value at appropriate intervals;
- The place of an independently derived fair and reasonable value within a competitive market with a mixture of regulated and market-determined price offerings.

  A key question for consideration is how a fair and reasonable value should apply within NSW, for example:
  - as a mandated floor price;
  - as a mandated price range (with, or without an upper limit);
  - at the discretion of the competitive market; and/or
  - as an advisory benchmark.
- Similar pricing and mechanisms in other jurisdictions.

As a related task, IPART is to investigate the contribution that could be made by retailers to the cost of the Solar Bonus Scheme. This contribution would reflect the benefit to retailers of the energy produced by small scale solar PV generators.

Public consultation

IPART should consult with stakeholders by issuing an Issues Paper and Draft Report and calling for submissions. It may also hold a public hearing. IPART must make its Issues Paper and Draft and Final reports available to the public.

Timing

IPART is to complete this investigation within 8 months of receiving the terms of reference, and release its Draft Report by the end of November 2011.

Background

Renewable energy is a critical part of Australia's energy future and the NSW Government is committed to building a prosperous sector in NSW that will contribute to meeting Australia's 20 per cent renewable energy target by 2020.

The NSW Government recently held a Solar and Renewable Energy Summit that brought together industry, energy experts, government, environment and community groups to discuss actions to ensure further development of solar and other renewable energy in NSW. A draft Solar and Renewable Energy Plan will be prepared for public consultation, informed by discussions at the Summit, with oversight from a Joint Industry-Government Taskforce.

Electricity retailers gain a benefit for the net electricity exported from small-scale solar PV to the grid.

In this context the NSW Government is committed to there being a fair and reasonable value for energy generated from small-scale solar PV following the closure of the Solar Bonus Scheme. Such a value should operate to support a sustainable solar PV industry, avoiding "boom/bust" cycles.

The NSW Government's preference is for a national renewable energy buy-back framework, consistent with the COAG National Principles for Feed-in Tariffs. In the absence of a national framework, however, the NSW Government supports the introduction of a state-based fair value framework for small-scale solar PV electricity buy-back.

An independently determined value will provide customers with a level of assurance that the price they are receiving is fair and reasonable and also a point of comparison to enable customers to better consider and negotiate offers.

The potential benefits and costs to network distribution businesses from small-scale solar PV will also be considered, including impacts (such as costs or avoided costs) which may be attributable to specific small-scale solar PV systems.

This component of IPART's investigation will be completed in light of a number of reviews planned or underway, including by the Australian Energy Regulator and the Australian Energy Market Commission, examining network pricing rules and policies.

B IPART's role in setting regulated electricity prices

IPART is responsible for setting the regulated electricity prices for around two-thirds of residential and small business customers in NSW. These are the prices that the Standard Retailers – EnergyAustralia (now owned by TRUenergy) and Country Energy and Integral Energy (now owned by Origin Energy) – charge customers who have not signed a market contract with either with them or another retailer.

IPART sets prices to enable Standard Retailers to recover the costs they incur in supplying electricity to small retail customers.

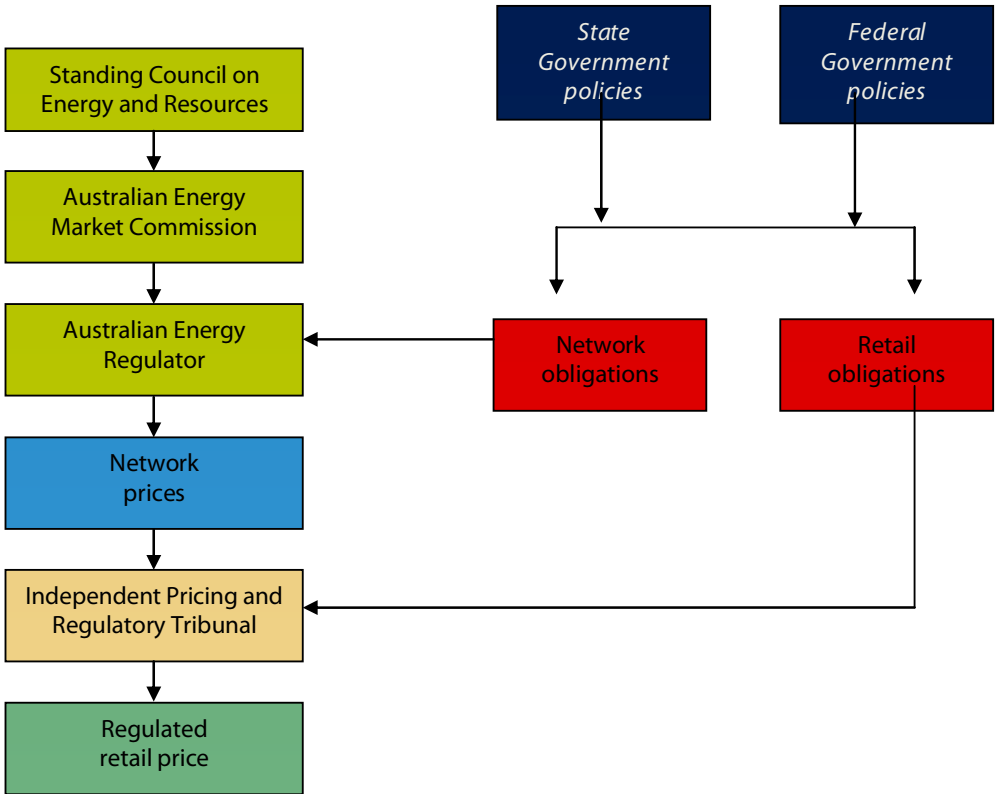
The largest cost component of electricity prices is network charges, which are the costs of transporting electricity from generators to homes and businesses across the wires. These costs, which are more than half the end price, are set by the Australian Energy Regulator, who regulates networks under the National Electricity Rules (the Rules). These Rules are set by the Australian Energy Market Commission. In turn, the Australian Energy Market Commission provides advice to the Standing Council on Energy and Resources (formerly the Ministerial Council on Energy) and operates under the National Electricity Law.

The next largest cost component is energy costs. The wholesale energy market is not subject to economic regulation, but is operated by the Australian Energy Market Operator under the National Electricity Rules.

State, Territory and Federal Governments have imposed statutory obligations on network and retail businesses. An example is the Federal Government's Renewable Energy Target scheme, which imposes obligations on retailers under the *Renewable Energy (Electricity) Act 2000* (Cth) and accompanying regulations. Another example is the reliability standard imposed on the network businesses by the NSW Government.

After considering the costs of running the business, buying and transporting electricity and meeting all relevant statutory obligations, we set the final retail price that is paid by regulated customers.

Figure B.1 IPART's role in setting regulated prices



C Components of the retail price

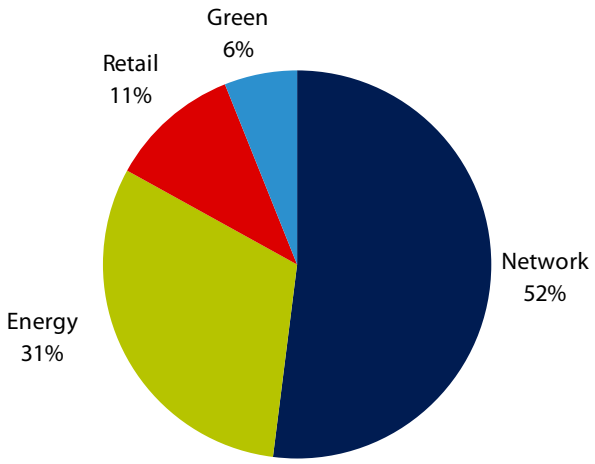
The retail price for electricity has 4 main components:

- Network costs, which are the costs of transporting electricity from the generators to customers via the transmission and distribution networks. These charges are regulated by the Australian Energy Regulator and have increased significantly in recent years.
- Energy costs, which include the costs of
  - purchasing electricity from generators on the wholesale electricity market, including managing the risks of the volatile spot market through hedging products
  - paying for National Electricity Market (NEM) fees and for electricity losses, which is electricity that is lost in the distribution system due to electricity resistance and heating of conductors.
- Green scheme costs, which represent the costs of complying with several green (or climate change mitigation) schemes, as required by the Federal and NSW Governments.
- Retail costs and margin, which includes the costs of running the retail business (including call centre costs, billing costs, etc) and making an appropriate return.

Figure C.1 illustrates the components of a regulated retail price.[142] The largest component is network costs, comprising more than half the retail price. The energy costs component is the second largest component. While green costs represent only 6% of the final price, it is the fastest growing cost driver.

[142] IPART, *Changes in regulated electricity retail prices from 1 July 2011 - Final Report and Determination*, June 2011, p 70.

Figure C.1 Components of a retail price, 2011/12



C.1 Network costs

Network costs reflect the charges that retailers must pay to transport electricity from the generator to the customer using the transmission and distribution networks.

These charges are regulated by the Australian Energy Regulator (AER) and have increased significantly in NSW in recent years. On 1 July 2011, they increased by:

- 20% for AusGrid (formerly EnergyAustralia) and Essential Energy (formerly Country Energy)
- 15% for Endeavour Energy (formerly Integral Energy).[143]

The increases in network costs are driven by the major capital investment programs the network businesses are undertaking to:

- Cope with growing loads and meet rising peak demand as population grows and patterns of electricity use change.
- Replace aging assets.
- Meet more rigorous licensing conditions intended to improve network security and reliability.

The AER has made a price determination for the NSW network businesses that applies until 30 June 2014.

143 IPART, *Changes in regulated electricity retail prices from 1 July 2011 - Final Report and Determination*, June 2011, p 67.

C.2 Energy costs

Energy costs are the second largest component of the final retail price. It represents the costs of purchasing electricity in the NEM, which reflects the spot price of the mandatory electricity pool and the hedging arrangements that retailers enter into to manage their risk. Energy costs also include NEM fees and ancillary charges and the recovery of costs associated with technical electricity losses.

C.2.1 Electricity and hedging costs

Electricity retailers buy energy in a wholesale market characterised by volatile spot prices, currently ranging from -$1,000 to $12,500/MWh, but sell energy to customers at prices that tend to be fixed. In this environment, retailers' margins can be quickly eroded by a short period of high spot prices if retailers are not adequately hedged. In order to manage the price risk associated with buying at variable prices and selling at fixed prices, retailers enter into a range of hedging contracts.

In our June 2011 electricity price determination, we estimated the market based energy costs (inclusive of hedging) at $46 to $50/MWh for 2011/12 (varying by supply area).[144]

C.2.2 Loss factors

As electricity flows through the transmission and distribution networks, energy is lost due to electrical resistance and the heating of conductors. Around 10% of electricity generated is lost in its transport to customers, meaning that more electricity must be generated than is used by customers.[145]

The impact of network losses on spot prices is represented as transmission and distribution loss factors. Transmission loss factors and high-voltage distribution loss factors are calculated using engineering analysis. However, distribution loss factors for the low voltage network are calculated by deducting metered electricity (as read by the distributors from each premises) from the amount of electricity that is delivered to the low voltage network. The distributors calculate the distribution loss factors, which the AER approves and AEMO publish.

In setting the retail price, the energy allowance is 'scaled up' to account for the energy losses so that the retailer can recover the costs that it faces.

Historically there has not been a large amount of generation exported to the grid from small scale PV units. Because the first tier retailer is responsible for the net electricity delivered to the transmission connection point (see Figure D.1), the loss factors calculation needs to specifically account for the increasing PV generation.

144 IPART, *Changes in regulated electricity retail prices from 1 July 2011 - Final Report and Determination*, June 2011, p 34.

145 AEMO, *An introduction to Australia's National Electricity Market*, July 2010, p 16.

C.2.3 NEM fees

AEMO imposes fees on retailers to recover the costs of operating the market. NEM fees are levied on retailers on a per MWh basis according to their net electricity purchases (imported electricity minus exported electricity, as recorded by AEMO). NEM fees represent less than $1/MWh and less than half a percent of the retail bill.

Currently, AEMO bill the retailers based on its own data. The amount billed is the amount taken from the grid less the amount generated (for gross metering) and exported (for net metering).

C.3 Green scheme obligations

Both the NSW and Federal Governments impose green scheme obligations on retailers.[146] While historically these obligations have not significantly increased retailers' costs, small-scale solar obligations have materially added to costs more recently. On 1 July 2011 changes to the Federal Government's RET scheme added 6% to retail bills. The vast majority of that increase arose from the small scale component of the RET scheme. The costs of the Solar Bonus Scheme were not factored into the 1 July 2011 price increases but will further increase electricity prices from 1 July 2012.

C.3.1 RET scheme

The Federal Government's Renewable Energy Target scheme (RET scheme) is designed to generate 20% of Australia's annual electricity consumption from renewable sources by 2020. On 1 January 2011 the scheme was split into 2 parts:

- the Large-scale Renewable Energy Target (LRET), and
- the Small-scale Renewable Energy Scheme (SRES).

The LRET has annual targets set by the legislation that transition to at least 41,000 GWh of generation by 2020. Under the LRET, electricity retailers are obliged to purchase and surrender a certain number of Large Scale Certificates (LGCs) per year, each representing 1 MWh of renewable energy generation from large-scale technology. The price of certificates is determined by the market.

The SRES is a new obligation that commenced on 1 January 2011. Under this scheme, retailers are obliged to surrender Small-scale Technology Certificates (STCs) from households and small businesses that take up small-scale technologies like PV panels and solar hot water heaters. Each STC represents 1 MWh of renewable energy from small-scale PV generation, except for the Solar Credits multiplier effect, which allows more STCs to be created than MWh of renewable energy generated. The number of STCs that retailers must surrender each year is not capped – rather it depends on the

[146] Under the *Electricity Supply Act 1995* (NSW) and *Renewable Energy (Electricity) Act 2000* (Cth).

extent to which customers take up small-scale technologies. While the price of each certificate is determined by the market, certificates can be sold through a clearing house for a set price of $40.

Currently, meeting the obligations under the RET scheme adds around $9/MWh or 6% to electricity bills.

C.3.2 ESS and GGAS

The NSW Greenhouse Gas Reduction Scheme (GGAS) is designed to reduce the greenhouse gas emissions associated with the production and use of electricity. The scheme establishes emissions benchmarks for the scheme participants (which includes electricity retailers). Participants must meet these benchmarks by obtaining and surrendering NSW Greenhouse Gas Abatement Certificates based on their size and their share of the NSW electricity market.

The NSW Energy Savings Scheme (ESS) was introduced on 1 July 2009. This scheme establishes legislated annual energy savings targets for electricity retailers (and other participants). To meet their obligations, retailers must surrender an appropriate number of Energy Savings Certificates (ESCs). ESCs may be created from recognised energy savings activities that either reduce electricity consumption or improve the efficiency of energy use.

The retailers' liabilities under both GGAS and ESS is dependent on the amount of electricity that they purchase. This calculation will be made by taking the AEMO net consumption data and adding electricity exported by solar PV units.

Currently ESS and GGAS collectively add about $1.10/MWh to the electricity price, which is less than 1% of the total energy price.

C.4 Retail costs and margin

In supplying their customers, electricity retailers perform a range of retail functions including billing, marketing, providing advisory services, promoting and advertising their services, and handling customer inquiries.

Retailers also face a range of risks, including systematic (or market) risks and non-systematic (or industry-specific) risks. In setting the regulated prices, we factored in allowances for these risks through the retail margin.

D The National Electricity Market

The National Electricity Market (NEM) operates as a wholesale market for the supply of electricity to end-users (usually through retailers) in Queensland, NSW, the ACT, Victoria, South Australia and Tasmania. It is the world's longest interconnected power system – 5000 kilometers from Port Douglas to Port Lincoln.

Exchange between electricity producers and consumers is facilitated through a pool where output from generators is aggregated and scheduled to meet demand. Electricity lends itself to pool trading because it is used instantaneously and is a homogenous product – one unit of electricity cannot be distinguished from another unit and it is impossible to tell which generator produced a particular unit.

The Australian Energy Market Operator (AEMO) is responsible for the operation of the power system and market. It also performs a data management function.

D.1 The spot market

Wholesale trading in electricity is conducted as a spot market where supply and demand are instantaneously matched. Generators offer to supply the market with specific amounts of electricity at particular prices. Offers are submitted every 5 minutes of every day. AEMO issues instructions to each generator to produce the required quantity of electricity that will meet demand at all times in the most cost efficient way, while maintaining the technical security of the power system.[147]

A dispatch price is determined every 5 minutes and 6 dispatch prices are averaged to determine half-hourly spot prices in each region (which is usually close to state boundaries). These spot prices are then used to settle financial transactions for energy traded in the NEM.

The National Electricity Rules set a maximum spot price (called the Market Price Cap) of $12,500/MWh and a price floor (called the Market Floor Price), which is -$1,000/MWh. Generators might offer electricity at a negative price if it will cost more to shut down than it does to continue running and pay to put electricity onto the grid.

[147] AEMO stacks the offer bids of all generators in ascending price order for each 5 minute dispatch period. It dispatches the cheapest generator bids first, then progressively more expensive offers until enough electricity is dispatched to satisfy demand. This results in demand being met at the lowest possible cost. *AER, State of the Energy Market 2009*, p 74-5.

In our recent electricity price determination we estimated that the average spot price of electricity in NSW for 2011/12 will be around $37/MWh.[148]

D.2 AEMO settlements arrangements

Customers are required to install meters to record their electricity consumption. This data is used for the retailer to bill the customers, but is also used for the distributor and AEMO to bill the retailer for the network and spot price costs, respectively.

The distributor reads the meter and sends the metering data to AEMO for financial settlements. Electricity customers in NSW have the right to choose to be supplied by a licenced retailer. AEMO facilitates the transfer of metering information from the distributors (who read the meters for small customers) and the respective retailers.

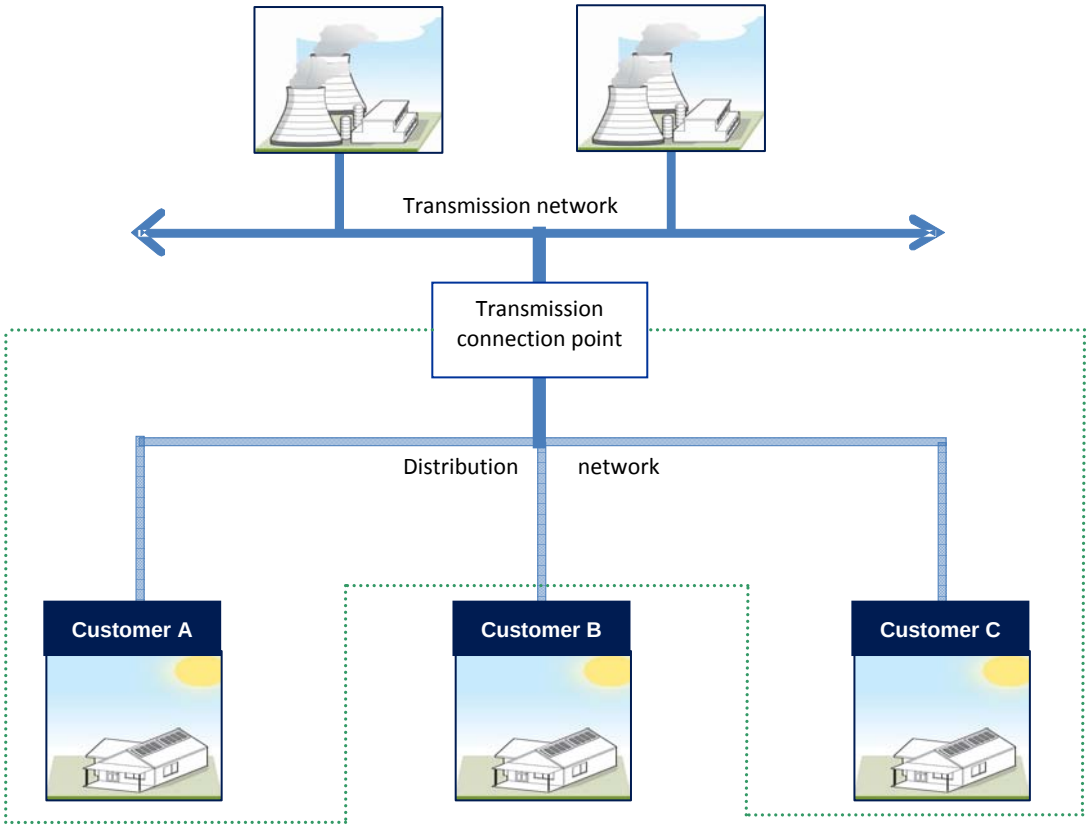
AEMO settles the NEM weekly. This involves AEMO collecting money due from the retailers (and large customers) and paying the generators. The spot price is the basis for these financial transactions.

AEMO settles the market by charging first tier retailers (known as the host, local or default retailer) for all electricity supplied to the distribution network, measured at the transmission connection points, less energy supplied to any customers within the distribution network that are supplied by alternative retailers.

This is illustrated in Figure D.1 below, where Retailer 1 is the first tier retailer and has customers A and C. Retailer 2 has customer B. Retailer 1 will be billed for all energy delivered to the transmission connection point less the amount of energy read from the meter of customer B (adjusted for losses) – therefore it will responsible for the energy inside the dashed green area.

[148] Frontier Economics, *Energy costs – annual review for 2011/12 and 2012/13, a final report prepared for IPART*, June 2011, p 28.

Figure D.1 AEMO's settlement of the market



E Gross and net metering arrangements for solar PV

Customers have meters on their premises to measure their electricity consumption. Some older-style 'accumulation' meters for small customers measure the total amount of electricity consumed, but not the time of day when it was consumed. There are also 'interval' or 'time of use' meters, which measure the band in which the electricity was consumed (peak, off peak and shoulder) or usage by half hour.

Customers with PV units usually have interval or time of use meters. There are different types of interval or time of use meters. While Ausgrid collects data on a 30 minute basis, Essential Energy collects the data only in the time-bands that it uses for billing (peak, off-peak and shoulder). Endeavour Energy does not collect information from its PV customers on the time of day when electricity is generated or consumed.

As set out in Appendix D, the distributor is responsible for reading the meters and providing the data to AEMO.

There are 2 types of metering arrangements for customers with PV units:

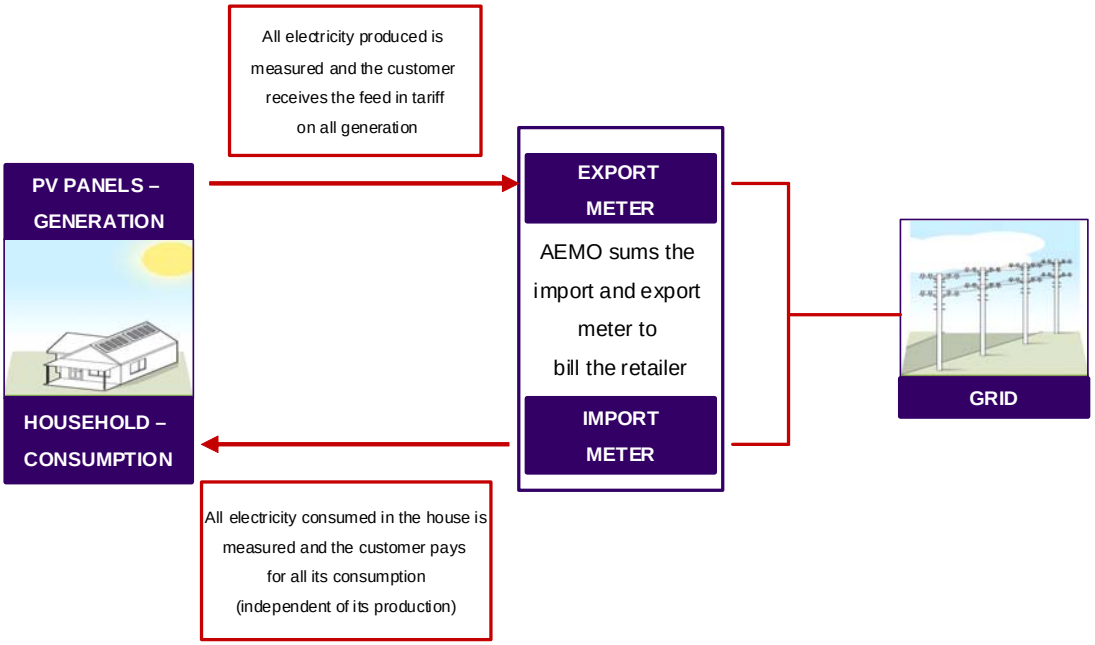
- gross metering arrangements – where **all** electricity produced by the PV unit is measured on one meter and **all** consumption in the premises is separately measured on a different meter, and
- net metering arrangements – where electricity exported to the grid is measured on the export meter and electricity imported from the grid is measured on an import meter.

E.1 Gross metering arrangements

Figure E.1 illustrates gross metering arrangements. It shows that the electricity flows from the panels through a meter that registers all generation. Energy from the grid or the PV units flows through the consumption meter. Therefore, all generation and all consumption are measured separately.

When AEMO settles the market it sums together the generation and consumption meters.

Figure E.1 Gross metering arrangements



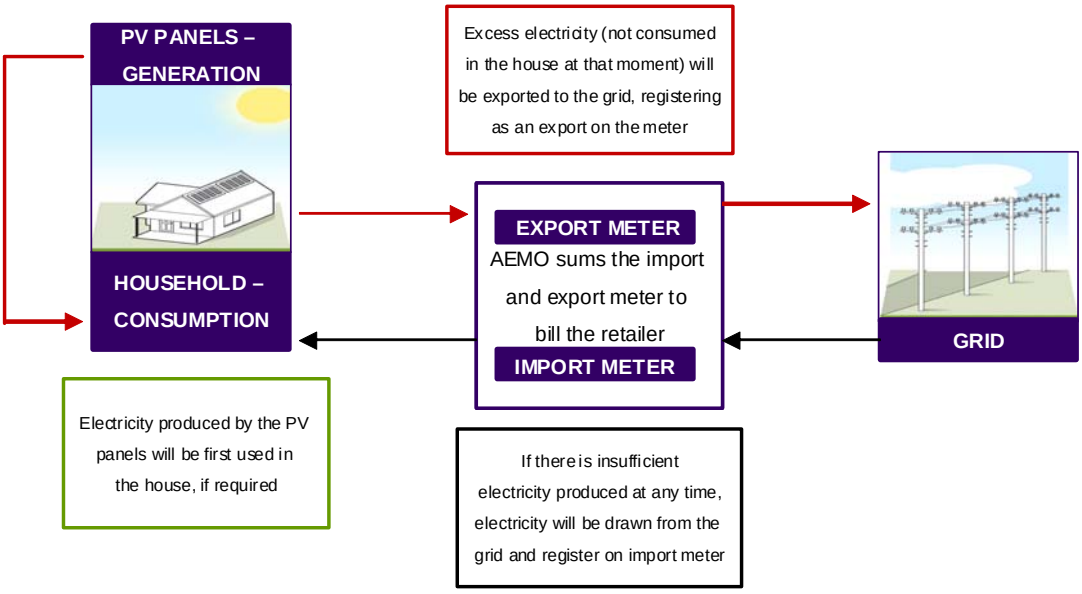
E.2 Net metering arrangements

Figure E.2 illustrates net metering arrangements. It shows that electricity that is generated by PV units is first used in the house, if required. If there is excess electricity generation at any point in time, it will be exported to the grid, registering on the export meter. If at any time there is not sufficient electricity being generated for use in the premises, electricity will be imported from the grid, registering on the import meter. For example, this would occur at night, when the PV panels are not generating electricity. The customer pays the retail price for this imported electricity.

Therefore, the metering will not measure electricity produced that is consumed within the premises, but rather the amounts of electricity imported and exported.

When AEMO settles the market it sums together the import and export meters.

Figure E.2 Net metering arrangements



The distributor uses the metering information to bill the retailer for network charges for each customer. For customers participating in the Solar Bonus Scheme with a gross metering arrangement, the distributor will bill the retailer for all energy used in the house. For customers with solar PV units on a net metering arrangement, the distributor will bill the retailer for imported electricity. This means that the distributor will not levy network charges on electricity that is produced by the PV units that is consumed within the house for net metered customers.

Therefore, the usage that the distributor bills the retailer for is greater under gross metering arrangements than it is under net arrangements.

In the absence of a subsidy, customers installing PV units will be better off with net metering arrangements because they will save the entire retail price for electricity that it produces and consumes itself but will only earn a proportion of that retail price for electricity that it exports.

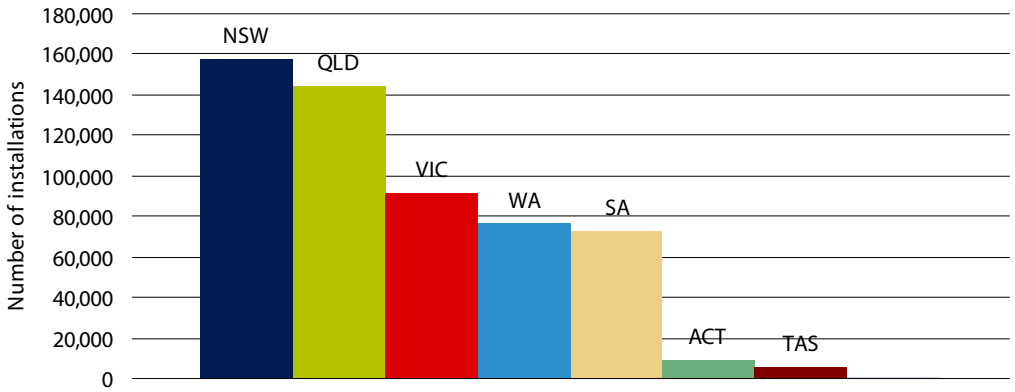
F Feed-in tariffs and retailer contributions in other jurisdictions

State, Territory and Federal governments have offered financial subsidies to customers installing PV units.

The schemes in each jurisdiction have differed in the scheme length, the rate paid, the metering arrangements, eligibility requirements and the funding of the scheme.

As illustrated in Figure F.1, there has been a substantial uptake of PV units across Australia, but particularly in NSW, Queensland, Victoria, Western Australia and South Australia, reflecting the generous subsidies offered to customers.

Figure F.1 Number of PV installations under the Renewable Energy Target scheme as at 30 October 2011

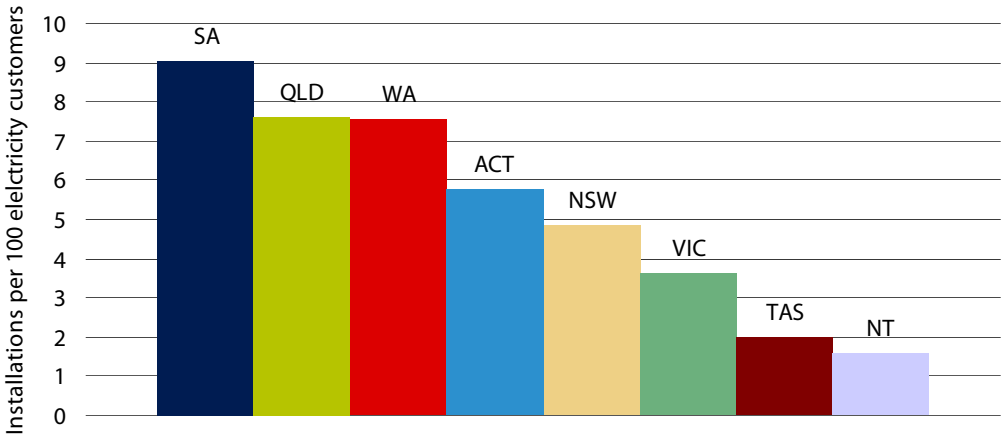


Note: Number of units installed to 30 October 2011 that resulted in the creation of at least 1 renewable energy certificate under the Federal Government's Renewable Energy Target scheme.

Data source: ORER.

The number of PV installations for each jurisdiction on a per electricity customer basis is shown in Figure F.2.

Figure F.2 Number of PV installations per 100 electricity customers as at 30 October 2011



Note: Number of units installed to 30 October 2011 that resulted in the creation of at least 1 renewable energy certificate under the Federal Government's Renewable Energy Target scheme.

Data source: ORER, AER.

Both State, Territory and Federal Governments have adjusted their subsidies in response to this rapid uptake. This has led to uncertainty for customers looking to install PV units and for the industry itself.

NSW was the first jurisdiction to cease its subsidised feed-in tariff. In August 2011, the Western Australian Government suspended its scheme. Without a subsidy, the feed-in tariff policy should be more stable as the Government does not seek to make changes to the level of the feed-in tariffs in order to manage the costs of the scheme.

F.1 Feed-in tariffs in other Australian jurisdictions

Most Australian jurisdictions offer subsidised feed-in tariff schemes, although some of these schemes are now closed for new applicants.

Table F.1 summarises the arrangements currently in place. While NSW and the ACT previously had gross feed-in tariff schemes, most jurisdictions now have net feed-in schemes.

Table F.1 Mandatory feed-in tariffs across all jurisdictions

Jurisdiction	Type	Scheme name	Closed to new applications	FiT (c/kWh)	Commencement date	Closing application date	Program duration
QLD	net	QLD Solar Bonus Scheme	No	44	1-Jul-08	N/A	2028
NSW	gross	NSW Solar Bonus Scheme	Yes	60	1-Jan-10	18-Nov-10	31 December 2016
NSW	gross	NSW Solar Bonus Scheme	Yes	20	18-Nov-10	28-Apr-11	31 December 2016
VIC	net	Premium FiT	Yes	60	1-Nov-09	30-Sep-11	until 2024
VIC	net	Transitional Feed-in Tariff	No	25	1-Jan-12	N/A	Until end of 2016
VIC	net	Standard FiT	No	Full retail price		N/A	no end date
WA	net	FiT	Yes	40	1-Aug-10	30-Jun-11	10 years
WA	net	FiT	Yes	20	1-Jul-11	1-Aug-11	10 years
WA	net	Renewable Energy Buyback Scheme	No	from 7 to full retail price		N/A	10 years
ACT	gross	ACT FiT	Yes	50.05	1-Mar-09	30-Jun-10	20 years
ACT	gross	ACT FiT	Yes	40.04	1-Mar-09	30-Jun-10	20 years
ACT	gross	Micro-generator FiT	Yes	45.7	1-Jul-10	30-June-11	20 years
ACT	gross	Medium generator FiT	Yes	34.27	17-Feb-11	13-Jul-11	20 years
ACT	gross	Medium and Small FiT	Yes	30.16	12-Jul-11	13-Jul-11	20 years
SA	net	Solar feed-in scheme	Yes	44 + retailer voluntary contribution	1-Jul-08	30-Sep-11	2028
SA	net	Solar feed-in scheme	No	16 + retailer voluntary contribution	1-Oct-11	30-Sep-13	up to 30 September 2016

F.2 Retailer contributions to feed-in tariff schemes

Some feed-in tariff schemes require retailers to make a contribution towards the cost of the scheme.

Electricity retailers in South Australia will be required to make a prescribed contribution determined by the Essential Services Commission of South Australia. The amount is intended to reflect the "fair and reasonable value" to a retailer of electricity fed back into the grid.

While now closed to new connections, the ACT electricity feed-in tariff scheme requires retailers to make a contribution of 6 c/kWh. According to the Independent Competition and Regulatory Commission, this is approximately the saving that retailers are able to make by avoiding the purchase of electricity from the NEM.[149] Although the mandatory feed-in tariff scheme has now closed, ActewAGL is currently offering a Solar Buyback Scheme where it voluntarily purchases the net energy exported at the customer's energy tariff rate.[150]

In Western Australia, electricity retailers are required to purchase renewable energy exported to the grid under "fair and reasonable" terms and conditions as part of their license conditions. Synergy is currently offering 7 c/kWh for residential customers.[151]

Despite the absence of any legislated feed-in tariff scheme in Tasmania, Aurora currently offers a one-for-one tariff for all electricity fed back into the grid.[152]

In the Northern Territory, Power and Water Corporation is offering its residential customers a voluntary feed-in tariff of 19.77 c/kWh for all the electricity they produce and export into the network.[153] In this case, customers are also required sign a Purchase Power Agreement with the retailer setting out the terms under which the electricity from PV systems will be purchased.

149 Independent Competition and Regulatory Commission, *Electricity Feed-in Renewable Energy Premium: Determination of Premium Rate,* March 2010, p 4.

150 http://www.actewagl.com.au/Product-and-services/Green-energy/Connecting-green-energy-systems/ActewAGL-Solar-buyback-scheme.aspx

151 http://www.synergy.net.au/at_home/renewable_energy_buyback_schema.xhtml

152 http://www.auroraenergy.com.au/your-home/electricity/renewable-energy/faqs-about-solar-installation/

153 http://www.powerwater.com.au/environment/renewable_energy/solar_buyback_program

G Competition in the retail electricity market

If competition is effective, retailers are less likely to be able to provide payments to customers for the energy produced by small scale PV significantly below fair value. This means that the form of regulation can be more light-handed, as competition will provide customers with choices and provide payments to customers at efficient levels.

Therefore, one of the key issues we considered is whether competition in the retail electricity market in NSW is sufficiently effective to deliver the fair and reasonable value to customers without the need for regulatory intervention. The purpose of reviewing competition in the retail electricity market is **not** to determine whether it is sufficiently effective for regulation to be phased out. The responsibility for this rests with the NSW Government, after considering analysis from the Australian Energy Market Commission (AEMC), which is scheduled to conduct a review of the NSW retail electricity market in 2012.[154] The NSW Government has committed to maintaining retail price regulation at least until 2013.

G.1 Our approach to assessing the competitiveness of the retail electricity market

Our Issues Paper outlined our proposed approach for analysing the effectiveness of retail market competition. This approach is consistent with that used for previous assessments of retail competition and involves considering the structure of the market, the conduct of market participants and the outcomes for customers.

In general stakeholders did not provide comment on our proposed approach. However Origin Energy noted that our proposed approach was not appropriate on the basis that the nature of the feed-in tariff 'market' is very different from energy supply to a small customer as a result of retailers being the consumers of the energy exported by PV customers.[155] We do not accept this view given that customers purchase both 'services'[156] from retailers, and that a market that is not competitive

[154] Under the Australian Energy Market Agreement, the AEMC is responsible for reviewing and publicly reporting on the effectiveness of retail competition in all jurisdictions participating in the NEM, for the purpose of removing retail price regulation where competition is effective.

[155] Origin Energy submission, p 8.

[156] The services being the retail supply of electricity and the provision of feed-in tariffs for electricity exported to the grid.

will either supply electricity at prices that exceed the efficient costs, and/or provide feed-in tariffs at levels below the fair and reasonable value of the energy exported.

We are of the view that considering the current and likely future state of competition in the retail market is an important step in establishing an appropriate form of regulation.

G.2 Our 2010 analysis of the competitiveness of the retail electricity market

As part of our 2010 review, IPART considered the level of retail market competition in the three standard supply regions and found that competitiveness of the market had not changed significantly since 2007.[157] This supported a relatively light-handed approach to regulation where there is significant discretion for retailers to set individual tariffs within an overall price cap.

G.2.1 Market structure

Several structural features of a market are likely to promote competitive pressure. These include the number of retailers and the market concentration (or relative market share of the retailers), as well as barriers to new retailers entering the market.

The more concentrated the market, the greater the potential for businesses to exercise market power. Therefore, a market with a considerable number of businesses may still not exhibit effective competition if it is concentrated in the hands of a small number of businesses. In our 2010 review we found that Standard Retailers had continued to lose market share to second-tier retailers, however Country Energy had retained a more substantial market share in its standard supply area than the other Standard Retailers.

Barriers to entry are the characteristics of a market that may make it difficult or less attractive for businesses to enter or exit (excluding obstacles that are part of the normal process of entering a market). Generally, a competitive market does not have significant barriers to entry. We found there were relatively low barriers to entry to entering this market.

[157] IPART, *Review of regulated retail tariff and charges for electricity 2010-2013*, March 2010, p 32.

G.2.2 Market conduct and customer outcomes

In an effectively competitive market, the market information available and the retailers' behaviour should be conducive to customers negotiating deals that are in the customer's best interest. In March 2010, we found there had been an increase in marketing activity from 1 July 2009 and customer switching rates had increased over the second half of 2009. The proportion of customers on regulated prices in each of the standard areas was declining.

However, the retail market was found to be less transparent over the 2007 to 2010 determination period. This made it difficult for customers to access tariff information for comparison purposes. In addition, some retailers had moved away from the practice of marketing retail offerings based on a discount relative to regulated tariffs. This was likely to have increased the search costs for customers looking for more competitive offers in the market place. The lack of transparency also affected the accuracy of pricing comparator services offered by private businesses.

G.3 Recent market developments

There have been a number of changes in the retail electricity market since our 2010 review. In some cases, the full implications for retail electricity competition have yet to be seen.

In their submissions on our Issues Paper retailers submitted that the market was sufficiently competitive as evidenced by the fact that a number of retailers are offering voluntary feed-in tariffs to customers.[158] For example, AGL submitted that retailers are already offering fair tariffs reflecting "the market's assessment of the value of solar PV generation."[159]

However this does not indicate whether:

- A substantial proportion of PV customers have taken up these offers, and whether there are any particular groups of customers that may be more or less active in the market, or more or less attractive to retailers.
- The offers that are being made to PV customers reflect the fair and reasonable value of the energy being exported to the grid. In making offers to PV customers, retailers are likely to consider a range of factors including an assessment of the value of the energy exported, as a well as the price sensitivity (or 'stickiness') of customers.
- Whether there are any barriers that may prevent existing (and potential) retailers from competing for PV customers (or preventing PV customers from participating in the competitive market) and whether these barriers can be addressed through the regulatory framework.

[158] Origin Energy submission, p 2; TRUenergy submission, p 3.
[159] AGL submission, p 2.

Conversely other stakeholders submitted that competition may not provide sufficient protection to customers:

- PIAC submitted that customers in regional areas of NSW may be less aware of their choices in relation to the supply of electricity (and presumably feed-in tariff offers).[160]
- EWON submits that there has been a large number of customer complaints, primarily around the Solar Bonus Scheme and more general concerns around billing and affordability.[161]
- Australian PV Association submitted that competitive concerns in the PV installation market (as a result of retailers being involved in the installation of solar PV units) may impact competition in the retail electricity market.[162] It also submits that retailers may not have an accurate understanding of the value of electricity exported by PV customers.[163]

Likewise this does not indicate whether:

- A substantial proportion of PV customers in rural and regional parts of NSW are taking up these offers, particularly given that retailers have increasingly been active in regional parts of NSW.[164]
- The offers that are being made to PV customers reflect the fair and reasonable value of the energy being exported to the grid.
- The primary source of customer complaints stems from changes in Government policy and lack of information provided to customers rather than retailer behaviour.

The following sections outline our draft findings on recent retail market developments in NSW.

G.3.1 Market structure

Earlier this year, the NSW Government sold the three State-owned retailers to TRUenergy and Origin Energy as part of its energy reform strategy. Origin Energy bought Integral Energy and Country Energy's retail business and TRUenergy bought EnergyAustralia's retail business. As a result, the market concentration in NSW has increased. The market shares of these retailers within their individual supply areas would have also increased.

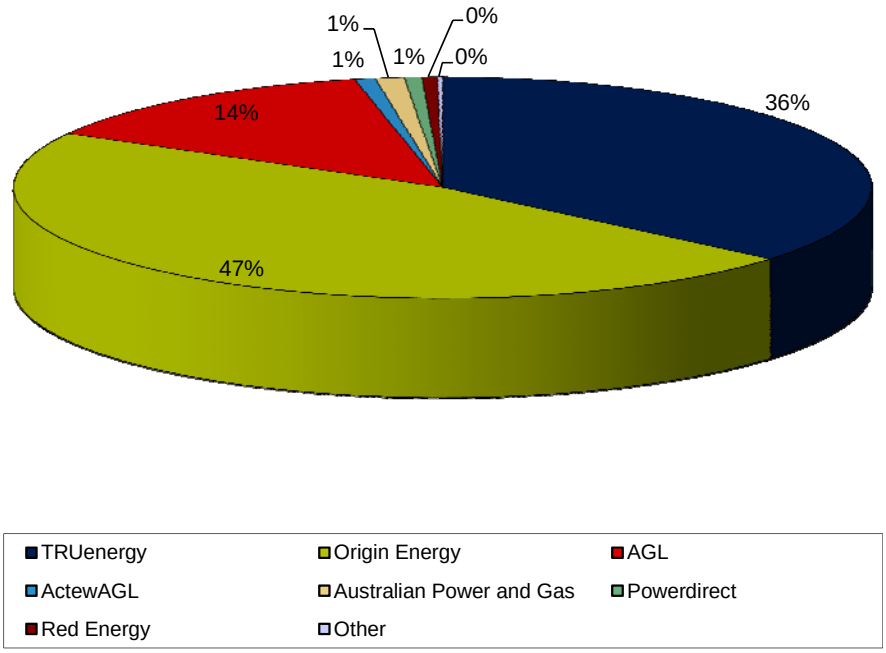
160 PIAC submission, pp 1-2.
161 EWON submission, pp 1-2.
162 Australian PV Association submission, p 17.
163 Australian PV Association submission, p 18.
164 For example, Lake Macquarie City Council submits that take-up of PV has occurred in many of the lower socio-economic areas of Lake Macquarie City. Lake Macquarie City Council submission, p 7.

However, while the concentration of the NSW retail market increased following the sale of the 3 Standard Retailers to TRUenergy and Origin Energy, since March 2011 there has been considerable activity in the retail market. Continuing the long term trend, non-incumbent retailers such as AGL have increased their customer numbers at the expense of the Standard Retailers over the past financial year.[165] Smaller new entrants and niche retailers are also competing for customers in NSW.

Figure G.1 shows the retail market shares of small customers in NSW as at the end of the 30 June 2011. It shows that non-incumbent retailers have around 17% of the retail market in NSW. This market share is likely to be higher in the Ausgrid and Endeavour Energy supply areas, but lower in the Essential Energy supply area.

It is also worth noting that the incumbent retailers (Origin Energy and TRUenergy) are likely to have a smaller proportion of the customers on retail market contracts (that is, customers that are not on the regulated retail tariff).

Figure G.1 Retail market shares of small customers in NSW (customer numbers as at 30 June 2011)



Data source: IPART's calculation based on individual energy licensees' reported operating statistics for 2010/11.

[165] That is, while TRUenergy and Origin Energy have increased their market share following the acquisition of the Standard Retailers (EnergyAustralia, Integral Energy and Country Energy), AGL has also increased its market share by winning over some of the customers 'purchased' by TRUenergy and Origin Energy.

Importantly, by itself the concentration of the market does not necessarily tell us that the market is any more or less competitive. A concentrated market can be competitive if it has sufficient competitors or low barriers to entry.

We have not seen any evidence to suggest that there are any material barriers to retailer entry in the NSW retail market. As highlighted above there are a number of smaller retailers that have entered the market in recent years and have been steadily acquiring customers. However we do consider that there may be barriers to effective PV customer participation in the market (see section G.3.2).

G.3.2 Market conduct

We made recommendations in our 2010 review to impose conditions on retailers to make it easier for customers to gain access to information about retail tariffs. We also made a recommendation that the NSW Government provide a price comparison service to make it easier for customers to determine if they were getting the most appropriate deal. Both these recommendations were implemented and we believe they have improved market information.[166]

There has been a large increase in the number of customers accessing the *myenergyoffers* website over the previous 6 months[167] and that the information provided by retailers in relation to retail electricity tariffs available to customers has also improved.

We have also found that the discounts on regulated retail tariffs being offered by some retailers have increased over the past year, delivering larger savings to customers that take-up these offers.[168] While we cannot say whether all customers across NSW (such as those in regional areas[169]) are accessing these market offers, in general this is a positive development in the retail market.

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166 For further information see IPART, *Electricity and gas retail price disclosure and comparison guidelines*, June 2010.

167 Observed from internal IPART website statistics.

168 For example, some retail offers include discounts of up to 10% off the regulated retail usage tariff as well as upfront rebates.

169 For example, PIAC expressed concern that the NSW electricity market is not a single market, and found no clear evidence that the 5 regions examined were effectively participating in the electricity market. Public Interest Advocacy Centre, *Choice? What Choice? A study of consumer awareness and market behaviour in the electricity market in five regions of New South Wales: Cooma, Lismore, Bourke, Wagga Wagga and Orange,* June 2011, p 4.

Only some retailers are offering voluntary feed-in tariffs.

Our analysis found that while some retailers are offering a voluntary feed-in tariff to PV customers other retailers are not.[170]

Table G.1 shows the feed-in tariff offers being made by retailers in NSW. It shows that Integral Energy and Country Energy (owned by Origin Energy) do not offer a feed-in tariff to regulated retail customers. Rather, customers can receive a feed-in tariff if they sign a market contract with Origin Energy. In addition, many of the smaller retailers do not offer a feed-in tariff to PV customers.

Table G.1 Retailers offering voluntary feed-in tariffs in NSW

Retailer	Offering voluntary FiT	Value of FiT (c/kWh)
AGL	yes	8
ActewAGL	no	n/a
Australian Power and Gas	no	n/a
Country Energy	no	n/a
DODO Power and Gas	no	n/a
EnergyAustralia	yes	6
Integral Energy	no	n/a
Lumo Energy	no	n/a
Origin Energy	yes	6
Powerdirect	yes	6
Red Energy	yes	5.5
TRUenergy	no	n/a

Note: Offers as at October 2011.

We are unable to comment on which customers are likely to attract offers from retailers (such as whether regional customers are likely to receive these offers), and whether certain customers may be more or less attractive to retailers (and therefore attracting higher or lower feed-in tariff offers).

[170] Retailers have the choice to supply electricity to PV customers that do not remain on the regulated tariff. That is, retailers are not obliged to supply PV customers. However, a number of retailers are offering to supply electricity to PV customers but without a feed-in tariff.

Concerns in relation to customer understanding of PV

In addition, while customer awareness of full retail contestability is generally high across NSW (although PIAC's study suggests it maybe higher in metropolitan areas than in certain rural and regional areas[171]), customer understanding of their rights[172] and obligations[173] in terms of the PV industry is low and as a result customer's expectations are often unmet.[174] This may be the result of several factors including:

- frequent changes in NSW Government and Federal Government policy in relation to subsidised feed-in tariffs and other financial incentives
- differences in policies across jurisdictions and
- a lack of clear and easy to understand information from the PV industry and Government and retailers.

Importantly, we consider incomplete understanding to be a major cause of customers' dissatisfaction. This has the potential for customers to make ill-informed decisions about the installation of PV units, and may inhibit the development of effective competition in the retail market. It may also have contributed to the sharp increase in the number of complaints, primarily around the Solar Bonus Scheme.[175]

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171 PIAC recently completed a study of consumer awareness and market behaviour in the electricity market in 5 regions of rural and regional NSW. Results from the study indicated that the majority of respondents were aware of the ability to choose electricity retailer. However, in each region the proportion of respondents who indicated such awareness was lower than in regions previously surveyed by IPART. Public Interest Advocacy Centre, *Choice? What Choice? A study of consumer awareness and market behaviour in the electricity market in five regions of New South Wales: Cooma, Lismore, Bourke, Wagga Wagga and Orange,* June 2011, p 4.

172 For example, they are able to choose whether they would prefer to pay regulated retail electricity prices and receive a voluntary feed-in tariff from Standard Retailers, or enter into a market contract with a 2nd tier retailer which may include a feed-in tariffs (alongside other terms and conditions).

173 For example, customers under net metering are obligated to purchase energy from the grid at any time when the generation supplied by their solar PV units is insufficient to meet demand. This means that electricity supplied by a customer's solar PV units cannot be stored on the grid during the day for use on the customer's premises in the evening.

174 Origin Energy submits that customer awareness of solar issues are high but often decisions are made based on incomplete or misleading information resulting in expectations (such as not having to receive another bill once a PV system has been installed) that do not materialise. Origin Energy submission, p 4. Similarly the Sustainable Energy Association of Australia notes that customer understanding of energy pricing, in terms of the different costs incurred and who incurs them, is a significant barrier to customer's perception of a 'fair and reasonable' feed-in tariff. Sustainable Energy Association of Australia submission, p 3.

175 EWON submission, p 1.

Provision of accurate information in relation to feed-in tariffs

Lastly, some retailers do not offer accurate information in relation to feed-in tariffs including:

- eligibility for the Solar Bonus Scheme
- whether retailers are offering a voluntary feed-in tariff to customers
- why they are (or aren't) providing a feed-in tariff
- likely revenue from any feed-in tariff.

We reached this draft finding after seeking this information from retailers' call centres over a period of 8 weeks.

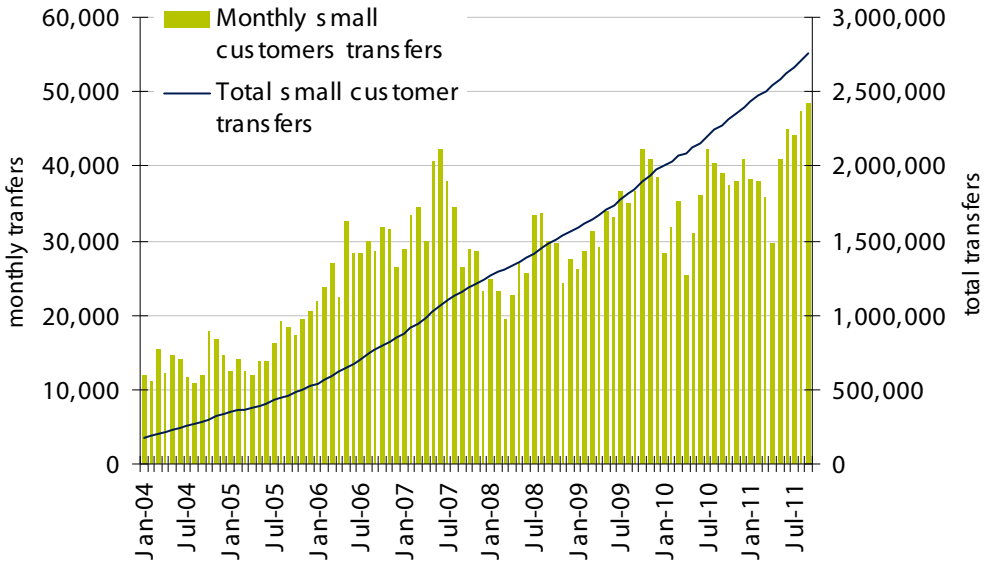
G.3.3 Customer outcomes

When we considered this issue in 2010, we cautioned against over-emphasis on customer switching rates. While switching rates may provide a good indicator of whether customers are active in the market, they are not necessarily a good measure of whether they are exercising choice effectively.

Figure G.2 shows the number of small customers in NSW who have switched retailers since the end of 2003. It shows that customer switching continues to grow steadily, consistent with the increasing market share of non-incumbents. Customer switching has reached an annualised rate of 17% in September 2011 (around 50, 000 small customers per month) indicating that there is strong customer activity at present.[176]

[176] http://www.aemo.com.au/data/ret_transfer_datafiles/0330-0256.pdf

Figure G.2 Number of transfers for small customers in NSW, January 2004 to September 2011



Data source: Collated from AEMO, Retail Transfer Statistics - http://www.aemo.com.au/data/retail_transfers.html

The need for improved information on PV and feed-in tariffs

For a market to be effectively competitive, customers need to participate in it and this participation must lead to positive outcomes for them. Improved information provision and market conduct are key elements in delivering positive outcomes for PV customers in the retail market. For this reason we have made a number of recommendations to improve information disclosed by retailers (for example through websites, door to door marketers and call centres) and for Government to consider an education campaign that explains key information to customers.[177]

We note the recent moves in the United Kingdom by Ofgem to improve customer engagement with the energy market primarily by facilitating greater price comparability, improving the information available on bills and reducing price complexity.[178] We are of the view that our draft recommendations are consistent with Ofgem's objectives and proposals.

[177] For example, clear and accessible information in relation to PV customers' rights and obligations, the subsidies available, types of metering arrangements, and general information about small scale solar PV (eg, how it works, what happens to excess energy generated).

[178] Ofgem's 2008 review of the UK energy market found that there was a need to improve the quality and accessibility of the information available to consumers to empower them to engage effectively in the market. Subsequently Ofgem implemented a package of new licence conditions and marketing and communication guidelines. However Ofgem's 2010 review found that the market was still not providing appropriate information to customers and Ofgem is currently consulting on a number of proposed policy changes. For a summary see Oxera, *Agenda – Consumer decision-making in complex markets: Ofgem's Retail Market Review*, May 2011.

H Solar Bonus Scheme

This appendix describes the implementation of the Solar Bonus Scheme and how retailers make a financial gain from their Solar Bonus Scheme customers (which some retailers share with their customers through voluntary premiums in addition to the statutory subsidised feed-in tariff).

The implementation of the Solar Bonus Scheme

In November 2009, the NSW Government announced that it would provide a subsidised feed-in tariff that applied to the output from eligible small-scale solar PV units and wind turbines from 1 January 2010 to 31 December 2016 under the Solar Bonus Scheme. The goals of this scheme were established by the NSW Government and aimed to:

- provide an additional means of support to PV customers in NSW who wish to generate renewable energy locally
- build the State's green collar jobs sector (eg, service, manufacturing or research and development) by helping solar technology compete with non-renewable energy sources, and
- expand the visibility of renewable energy technologies to help motivate the whole community in responding to climate change.[179]

The Solar Bonus Scheme was open to small retail electricity customers[180] who were connected to the grid, and who produced electricity through solar PV and wind turbines with up to 10 kW capacity. PV customers who are participants in the scheme are paid a specified feed-in tariff by their electricity distributor (normally through their electricity retailer) for the electricity produced by their PV unit until the scheme ceases on 31 December 2016.

The scheme operates predominately on a **gross metering basis**.[181] This means that the electricity produced by participating customers is independently metered, and they are paid the relevant feed-in tariff for **all** the electricity they produce.

[179] Industry & Investment NSW, *NSW Solar Bonus Scheme, Statutory Review, Report to Minister for Energy*, October 2010, p 6.

[180] Small retail customers are households and small businesses consuming less than 160 MWh of electricity a year.

[181] While customers could connect with gross or net metering arrangements under the Solar Bonus Scheme, the vast majority of customers were installed under gross metering arrangements.

Participating customers' consumption is also independently metered, and they are billed for **all** the electricity they use (their **gross** consumption).

Initially, the feed-in tariff was set at 60 c/kWh. However, the legislation that established the scheme provided for the former Minister for Energy to review the scheme when the generation capacity of participating customers reached 50 MW or after 1 July 2012, whichever came first.[182] The Minister reviewed the scheme in mid-2010 when the generation capacity reached 50 MW, approximately 6 months after the scheme opened.[183]

As a result of the Minister's review, the Government announced changes to the scheme on 27 October 2010, including a reduced feed-in tariff of 20 c/kWh for new participants. However, transitional arrangements applied so that new participants were still eligible for the original 60 c/kWh tariff provided that:

- they had purchased or leased an eligible system on or before 27 October 2010, and
- they (or their representative) had lodged an application to apply to connect this system to the grid on or before 18 November 2010.

After the announced reduction from 60c to 20c on 27 October 2010, some 37,000 customers met these conditions, making them eligible for the 60 c/kWh feed-in tariff.[184]

The Minister for Resources and Energy announced a 2-month hold on new applications to the Solar Bonus Scheme on 29 April 2011,[185] and closed the scheme to new participants on 1 July 2011.[186]

Figure H.1 illustrates the rapid growth in eligible capacity installed under the Solar Bonus Scheme, including the large increase in installations resulting from the announcement to reduce the feed-in tariff from 60 to 20 c/kWh. It also shows the back-log of customers that are eligible for the Solar Bonus Scheme and are yet to have their PV units installed (the gap between the green and blue lines).

Based on information recently provided there was 322 MW of generator capacity installed (342 MW of inverter capacity), with an additional 46 MW of outstanding applications for generator capacity (47 MW of inverter capacity). If all the eligible outstanding applications are installed, there would be 368 MW of generator capacity (388 MW of inverter capacity) installed under the Solar Bonus Scheme.[187]

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182 *Electricity Supply Act 1995*.

183 Industry & Investment NSW, *NSW Solar Bonus Scheme, Statutory Review, Report to the Minister for Energy*, October 2010, p 4.

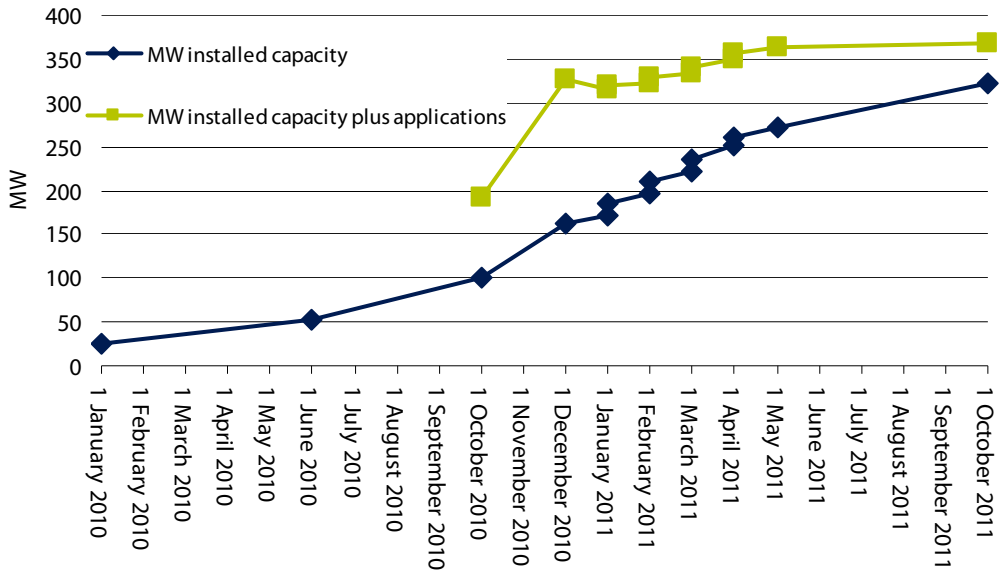
184 Mark Duffy, *Solar Summit Stage One: Opportunities for containing Solar Bonus Scheme costs*, Presentation to Solar Summit, 6 May 2011.

185 http://www.dtiris.nsw.gov.au/__data/assets/pdf_file/0007/386926/nsw-govt-places-hold-on-solar-bonus-scheme.pdf

186 Government Gazette of the State of NSW, No. 67, 1 July 2011, p 4801.

187 Advice provided by Department of Trade & Investment, Regional Infrastructure & Services for the period ending 9 September 2011 (Endeavour Energy), 7 October 2011 (Ausgrid) and 9 October 2011 (Essential Energy).

Figure H.1 Installations and applications for connection under the Solar Bonus Scheme (MW)



Note: MW applications for connection includes the MW installed capacity.

Data source: Industry & Investment NSW, *NSW Solar Bonus Scheme, Statutory Review, Report to the Minister for Energy*, October 2010, p 10, http://www.dtiris.nsw.gov.au/energy/sustainable/renewable/solar/solar-scheme/applications, and information provided by DNSPs as at 9 September (Endeavour Energy), 7 October (Ausgrid), and 9 October 2011 (Essential Energy) .

The NSW Government has provided a range of projected costs of the Solar Bonus Scheme. In May 2011 the NSW Office of Resources and Energy estimated that the costs of the scheme would be $1.83 billion.[188] In June 2011 the Premier estimated the costs of the scheme would be $1.44 billion.[189] The NSW Treasury included an estimate of $1.75 billion in the NSW Budget 2011/12, based on estimates supplied by the three DNSPs.[190] In November 2011 the Audit Office estimated that the possible range of costs of the scheme would be $1.05 to $1.75 billion, with a probable range of $1.25 to $1.44 billion.[191]

[188] Mark Duffy presentation to Solar Summit, 6 May 2011 http://www.trade.nsw.gov.au/__data/assets/pdf_file/0008/388718/NSW-Solar-summit_Duffy-presentation_6-May-2011.pdf

[189] Premier's Media release, 7 June 2011, http://premier.nsw.gov.au/sites/default/files/110608-SBS.pdf

[190] Audit Office of NSW, *New South Wales Auditor-General's Report, Special Report, Solar Bonus Scheme*, 7 November 2011, p 19.

[191] Audit Office of NSW, *New South Wales Auditor-General's Report, Special Report, Solar Bonus Scheme*, 7 November 2011, p 19.

We consider that the costs of the Solar Bonus Scheme are likely to be at the lower end of the Auditor-General's range, predominately due to lower output from PV units than is assumed by the Government and the distribution businesses (see Chapter 4 for information on actual output from installed PV units in Sydney). If scheme costs are below the NSW Treasury estimate of $1.75 billion, then the Government could lower the budgeted contributions required from the Climate Change Fund levy, thereby ameliorating the impact of further electricity price increases.

How retailers make a financial gain from Solar Bonus Scheme customers

Chapters 6 and 10 describe how retailers make a financial gain from their PV customers, including Solar Bonus Scheme participants. Box H.1 and Figure H.2 provide an illustrative example of the benefits that retailers make from their Solar Bonus Scheme customers if they did not pay them a voluntary feed-in tariff or make a contribution to the costs of the Solar Bonus Scheme.

Box H.1 Further explanation of how retailers made a financial gain from the Solar Bonus Scheme

For illustrative purposes, let's assume that a household participating in the Solar Bonus Scheme consumes 6000 kWh and generates 2000 kWh in a year. The financial flows are described below, and are also represented in Figure H.1.

The **customer**:

- **Pays** their retailer the applicable retail price for their gross consumption of 6000 kWh.
- **Receives** the statutory feed-in tariff for their gross generation of 2000 kWh.
- **Receives** any premium rates on the feed-in tariff that their retailer offers (eg, an additional 6c/kWh) for their gross generation of 2000 kWh. This is a market offering that can be changed subject to the retailer notifying the customer in accordance with the Electricity Supply (General) Regulation 2001 (reg 21 and 22)) and the terms of the contract.

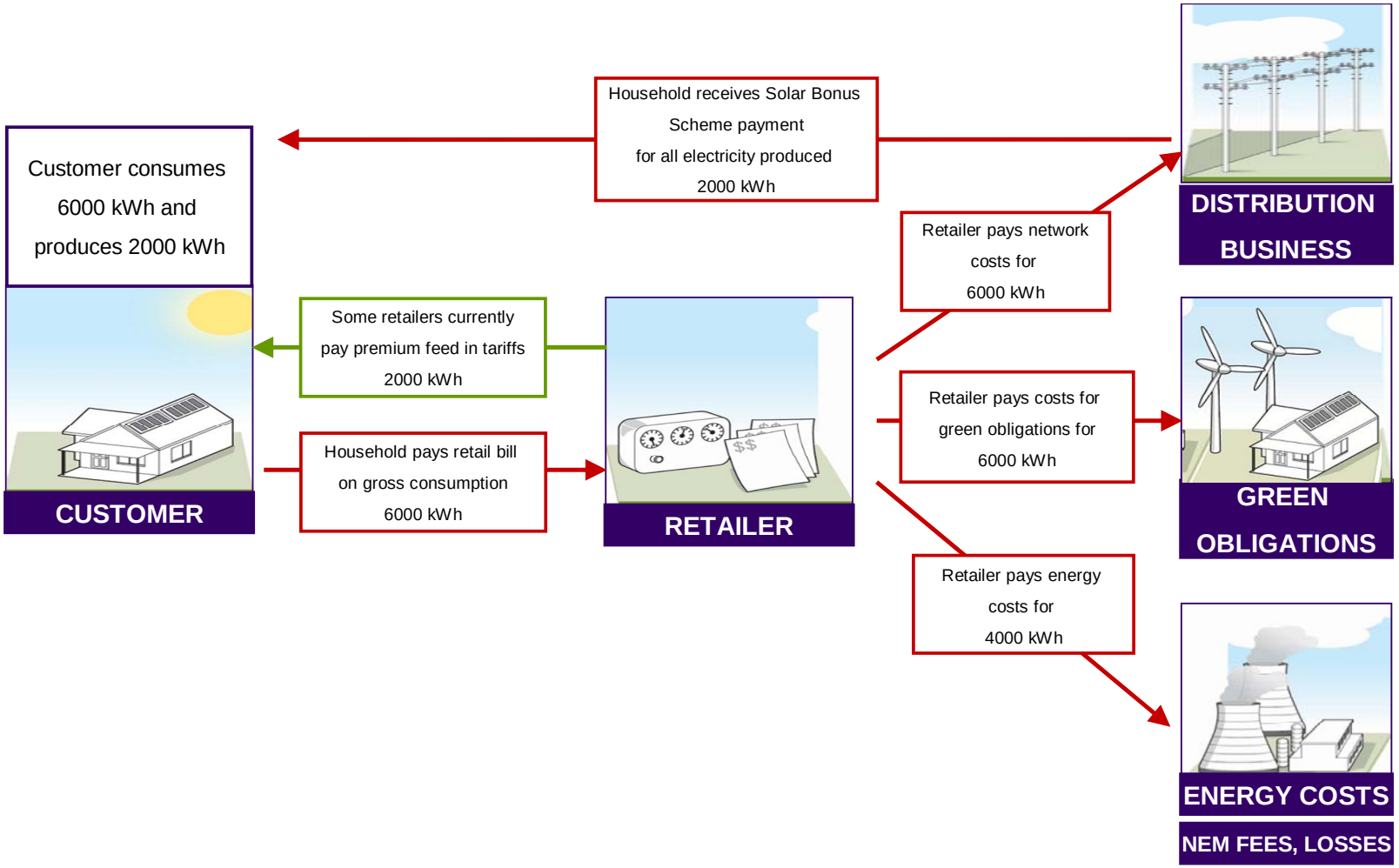
The **distributor:**

- **Pays** the customer the statutory feed-in tariff for their gross generation of 2000 kWh. (In practice the distributor pays the retailer who passes it through to the customer, but Figure H.2 shows the distributor paying the customer for simplicity.)
- **Recovers** the costs of this over time through a levy applied to all electricity customers.
- **Receives** the network tariff from the retailer for the customer's gross consumption of 6000 kWh.

The **retailer:**

- **Receives** the retail price for the customer's **gross consumption** of 6000 kWh, and pays the network charges and green scheme costs on this gross consumption.
- **Pays** the AEMO the pool price for customer's **net consumption** of 4000 kWh (there may be additional financial flows for financial hedges), including the energy losses incurred in supplying that electricity. (AEMO deducts the electricity produced from the PV system from the energy consumed by that household and bills the retailer for the net amount of energy consumed.)
- **Pays** AEMO market fees for the customer's net consumption of 4000 kWh of electricity, including the energy losses incurred in supplying that electricity.

Figure H.2 An illustrative example of financial flows under Solar Bonus Scheme with gross metering arrangements



I List of submissions

This appendix provides a list of submissions to our Issues Paper released in August 2011.

Table I.1 List of submissions to our Issues Paper – Solar feed-in tariffs – Setting a fair and reasonable value for electricity generated by small-scale solar PV units in NSW

Submitter	Date received
AGL	12 September 2011
Alinta Energy	12 September 2011
Ausgrid	11 October 2011
Australian PV Association	12 September 2011
Australian Solar Round Table	12 September 2011
Beyond Zero Emissions	12 September 2011
Clean Energy Council	12 September 2011
Combined Pensioners & Superannuants Association	13 September 2011
Endeavour Energy	12 September 2011
Energy Retailers Association of Australia Ltd	12 September 2011
Energy Supply Association of Australia	16 September 2011
Essential Energy	16 September 2011
EWON	8 September 2011
Individual - (Brian Lederer)**	7 September 2011
Individual - (Craig Blanch)	17 August 2011
Individual - (Derek Bolton)	11 September 2011
Individual - (Donald Ross Hamilton)	7 November 2011
Individual - (Gary Bulley)	19 September 2011
Individual - (Graham Warburton)	23 August 2011
Individual - (J Ferrelle)	30 August 2011
Individual - (Jeremy Cooper)	22 August 2011
Individual - (Jon Stone)	12 September 2011
Individual - (Monty Lang)	12 September 2011
Individual - (Pat Collinson)	26 September 2011
Individual - (Peter Bretschneider)**	9 September 2011
Individual - (Peter Snepvangers)	20 September 2011
Individual - (Phil Sefton)	18 August 2011

Submitter	Date received
Individual - (Tim Allen and Ron Logan)	12 September 2011
Lake Macquarie City Council	12 September 2011
Melbourne Energy Institute**	13 September 2011
Nickel Energy**	12 September 2011
Origin Energy	12 September 2011
Public Interest Advocacy Centre Ltd (PIAC)	9 September 2011
Self Sufficiency Supplies Pty Ltd	11 September 2011
SolarBusinessServices	1 November 2011
Suntech Power Australia Pty Ltd	15 September 2011
Sustainable Energy Association of Australia	12 September 2011
TRUenergy	12 September 2011
Union Fenosa Wind Australia	26 September 2011

Note: ** Submissions not published due to confidentiality and/or legal reasons.

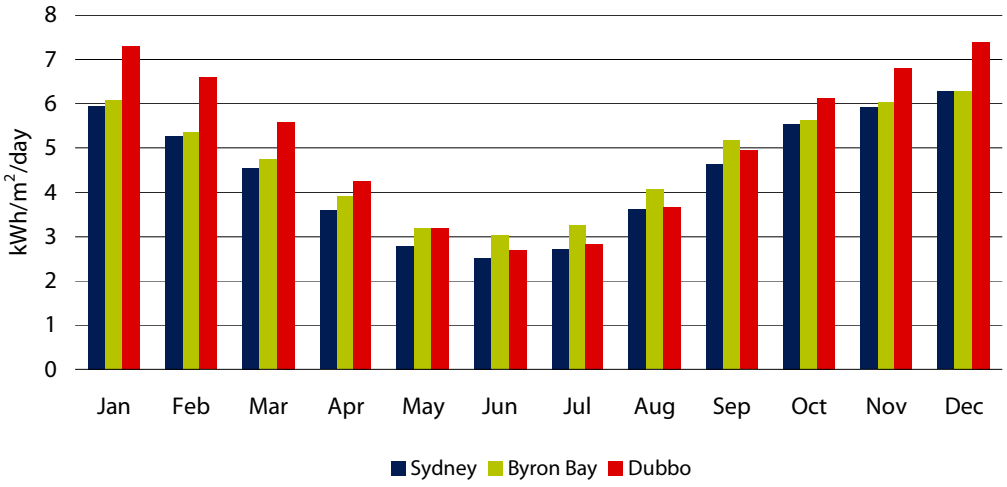
J Solar Radiation

An important factor affecting the output of PV systems is the amount of exposure to energy from the sun.

The quantity of solar radiation reaching a PV panel depends on a number of factors, including the location of the PV unit, cloud cover and the time of the year.

Figure J.1 shows monthly average solar radiation for selected locations in New South Wales over the period from July 1983 to June 2005.

Figure J.1 Monthly average solar radiation incident on a horizontal surface



Data source: NASA Atmospheric Science Data Center.

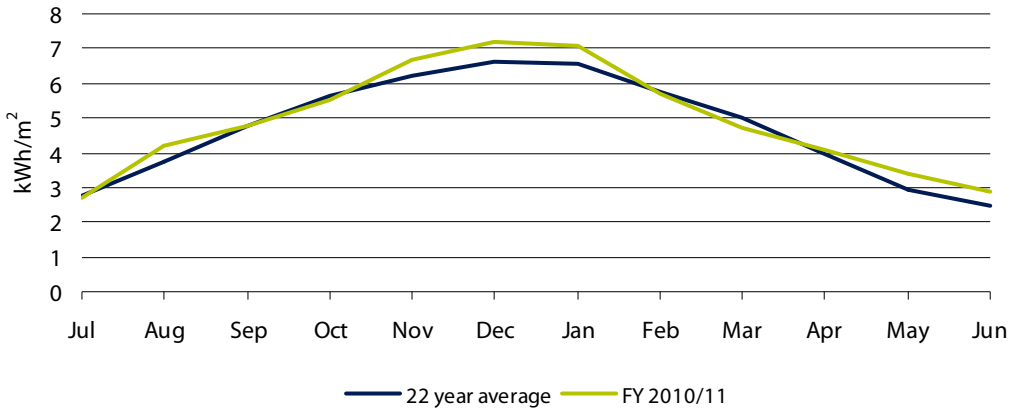
A PV unit in Byron Bay, located in the north-eastern corner of New South Wales, will receive on average 6% more solar radiation each year than a similar unit located in Sydney. Dubbo receives on average 15% more solar radiation each year than Sydney.

In addition to geographical differences, the quantity of solar radiation reaching a site is also affected by the season of the year and the length of the days. For example, the average solar radiation reaching Sydney is only 2.5 kWh/m² /day in June, when the days are shorter and the sun is on a greater angle. This figure more than doubles to 6.3 kWh/m²/day in December, when the days are longer and the sun is more direct.

J.1 Solar exposure over time

The total solar energy for a day falling on a horizontal surface also varies across the years. Figure J.2 shows the monthly average of all available daily exposure for the 2010/11 financial year compared to the 22-year average.

Figure J.2 Monthly mean daily global solar exposure in Sydney Observatory Hill



Data source: Bureau of Meteorology.

The graph shows that for the 2010/11 financial year, the total energy from the sun reaching Sydney was higher than the long term average. Therefore, we would expect, all else being equal, the output from PV systems generating during that year also to be greater than the average.

K More detail on our analysis of direct financial gains for Standard Retailers

We estimated the direct financial gains that PV exports provide to Standard Retailers in Chapter 6. This appendix provides more information supporting our analysis.

Our analysis is based on 2 key sources of data:

- volumes of consumption, generation and net exports for PV customers on regulated prices in 2010/11, based on information provided by each Standard Retailer, and
- price and cost data, including energy purchase costs, green scheme costs, and retail costs and margin, from our determinations of regulated retail prices in 2011/12.

The PV volume data for each Standard Retailer is the sum of total PV generation (for gross metered customers) and net exports (for net metered customers) for customers on regulated tariffs in 2010/11. For time-of-use tariffs, these PV volumes have been allocated into the price category that corresponds to the time of export (peak, shoulder or offpeak). For volume-based tariffs (ie, where prices are based on the volume of electricity consumption) PV volumes were allocated based on consumption.

The workings that support our estimates of direct financial gains for Standard Retailers in 2011/12 are provided on the following pages. As PV volume data is commercially sensitive information, we have excluded this from our workings.

Table K.1 Direct financial gain for Country Energy 2011/12 ($2011/12)

Country Energy 2011/12	Full retail tariff (c/kWh)	Unavoidable network tariffs (c/kWh)	Unavoidable green costs (c/kWh)	Unavoidable retail costs (c/kWh)	Financial gain (c/Kwh)	Financial gain residential/ business (c/kWh)	Overall financial gain (c/kWh)
	Note 2	Note 2	Note 3	Note 4			
RESIDENTIAL TARIFFS							
Residential Continuous						Residential	Total
All kWh	26.23	14.76	1.40	1.69	**8.38**	**8.4**	**8.3**
Residential TOU							
Peak	28.25	17.01	1.40	1.69	**8.15**		
Shoulder	28.25	17.01	1.40	1.69	**8.15**		
Off Peak	14.14	5.59	1.40	1.69	**5.46**		
BUSINESS TARIFFS							
General Supply All Time						Business	
All kWh	30.04	19.26	1.40	1.69	**7.69**	**7.9**	
Business TOU							
Peak	26.17	14.32	1.40	1.69	**8.76**		
Shoulder	26.17	14.32	1.40	1.69	**8.76**		
Off Peak	15.00	6.60	1.40	1.69	**5.31**		

Notes

1. PV export volumes have been removed for confidentiality purposes
2. Retail and network tariffs based on actual tariffs for 2011/12
3. Includes GGAS and RET schemes (incl. cost pass through) - average cost per kWh taken from IPART 'R' model
4. Equal to variable retail costs + retail margin taken from IPART 'R' model

Table K.2 Direct financial gain for EnergyAustralia 2011/12 ($2011/12)

EnergyAustralia 2011/12	Full retail tariff (c/kWh)	Unavoidable network tariffs (c/kWh)	Unavoidable green costs (c/kWh)	Unavoidable retail costs (c/kWh)	Financial gain (c/Kwh)	Financial gain residential/ business (c/kWh)	Overall financial gain (c/kWh)
	Note 2	Note 2	Note 3	Note 4			
RESIDENTIAL TARIFFS							
Domestic All Time						Residential	Total
First 1,750 kWh per quarter	20.60	10.63	1.48	1.46	**7.03**	**10.3**	**10.3**
Balance	29.10	16.40	1.48	1.46	**9.75**		
PowerSmart Home							
Peak	40.60	22.24	1.48	1.46	**15.42**		
Shoulder	16.40	4.40	1.48	1.46	**9.06**		
Off Peak	9.60	2.11	1.48	1.46	**4.55**		
BUSINESS TARIFFS							
General Supply All Time						Business	
First 2,500 kWh per quarter	20.10	9.05	1.48	1.46	**8.10**	**10.0**	
Balance	27.90	14.26	1.48	1.46	**10.69**		
PowerSmart Business							
Peak	40.10	21.97	1.48	1.46	**15.19**		
Shoulder	17.00	5.32	1.48	1.46	**8.74**		
Off Peak	9.40	2.07	1.48	1.46	**4.38**		
LoadSmart							
Peak	27.10	9.35	1.48	1.46	**14.80**		
Shoulder	22.30	7.42	1.48	1.46	**11.94**		
Off Peak	11.20	3.99	1.48	1.46	**4.26**		

Notes

1. PV export volumes have been removed for confidentiality purposes
2. Retail and network tariffs based on actual tariffs for 2011/12
3. Includes GGAS and RET schemes (incl. cost pass through) - average cost per kWh taken from IPART 'R' model
4. Equal to variable retail costs + retail margin taken from IPART 'R' model

Table K.3 Direct financial gain for Integral Energy 2011/12 ($2011/12)

Integral Energy 2011/12	Full retail tariff (c/kWh)	Unavoidable network tariffs (c/kWh)	Unavoidable green costs (c/kWh)	Unavoidable retail costs (c/kWh)	Financial gain (c/Kwh)	Financial gain residential/ business (c/kWh)	Overall financial gain (c/kWh)
	Note 2	Note 2	Note 3	Note 4			
RESIDENTIAL TARIFFS							
Domestic						Residential	Total
First 1,750 kWh per quarter	21.85	10.43	1.47	1.40	**8.5**	**8.4**	**8.4**
Balance	24.19	13.56	1.47	1.40	**7.8**		
Obsolete Domestic Tariffs							
First 1,750 kWh per quarter	21.85	10.43	1.47	1.40	**8.5**		
Balance	24.19	13.56	1.47	1.40	**7.8**		
BUSINESS TARIFFS							
General supply						Business	
First 2,500 kWh per quarter	20.18	8.97	1.47	1.40	**8.3**	**8.3**	
Balance	21.99	10.77	1.47	1.40	**8.3**		
General supply TOU							
Peak	30.01	15.79	1.47	1.40	**11.4**		
Shoulder	24.22	10.30	1.47	1.40	**11.1**		
Off Peak	11.39	4.06	1.47	1.40	**4.5**		
Obsolete GS Tariffs							
First 2,500 kWh per quarter	20.18	8.97	1.47	1.40	**8.3**		
Balance	21.99	10.77	1.47	1.40	**8.3**		

Notes

1. PV export volumes have been removed for confidentiality purposes
2. Retail and network tariffs based on actual tariffs for 2011/12
3. Includes GGAS and RET schemes (incl. cost pass through) - average cost per kWh taken from IPART 'R' model
4. Equal to variable retail costs + retail margin taken from IPART 'R' model