

Minimum Electricity Feed-in Tariffs to Apply From 1 July 2023

Final Decision

27 February 2023

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Summary

- The minimum flat rate feed-in tariff will be 4.9 cents per kWh starting 1 July 2023.
- A second variable feed-in tariff has been added to help provide more choice for consumers.
- Option 1 for the minimum time-varying feed-in tariffs will range from 4.4 to 11.3 cents per kWh.
- Option 2 for the minimum time-varying feed-in tariffs will range from 3.9 to 10.6 cents per kWh.
- The minimum flat feed-in tariff and daytime time-varying tariffs are lower than for 2022–23. Wholesale electricity prices have been decreasing during the daytime when most solar exports happen. This is forecast to continue into 2023–24.
- Feed-in tariffs at times of peak demand, which are usually in the evening, have increased significantly. This is due to forecast increases in night-time wholesale electricity prices.
- Retailers can offer the flat feed-in tariff **and/or** time-varying feed-in tariffs.
- Our decision does not stop retailers from offering feed-in tariffs above the minimum amounts.

The feed-in tariff is paid to solar customers for their energy exports

Retailers pay a feed-in tariff to customers who send electricity into the grid.

Victorian electricity retailers with 5,000 or more customers (including non-solar customers) must offer at least the minimum feed-in tariff rates to eligible customers.

You are an eligible customer if you have a renewable energy generation facility with a capacity of less than 100 kilowatts.

For simplicity, this final decision refers to eligible customers as solar customers. Solar accounts for 99.9 per cent of small-scale renewable energy generation in Victoria.¹

¹ Clean Energy Council, Postcode data for small-scale installations, accessed 19 January 2023, <https://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations>.

We must set the minimum feed-in tariffs

The minimum feed-in tariffs reflect the value that solar customers provide to the energy market. This includes the social benefits of reducing pollution associated with fossil fuelled electricity generation.

The *Electricity Industry Act 2000* requires us to determine one or more minimum rates for the electricity that solar customers export to the grid. We refer to these rates as the minimum feed-in tariffs. While we set the **minimum** feed-in tariffs, it is electricity retailers themselves who set the feed-in tariffs they pay their customers. **Retailers can pay more than the minimum we set, but they cannot pay less.**

The Essential Services Commission must publish the minimum feed-in tariffs to apply for the next financial year by **28 February each year**.²

The Electricity Industry Act states that in setting the minimum feed-in tariffs we must consider:

- prices in the wholesale electricity market
- avoided transmission and distribution losses
- the social cost of carbon and human health costs.³

We must protect the interests of both solar and non-solar customers

Under the *Essential Services Commission Act 2001* and the Electricity Industry Act, our objectives are to promote:

- the long-term interests of Victorian consumers
- protections for customers, including in relation to assisting customers who are facing payment difficulties
- the development of retail competition.^{4 5}

In setting the minimum feed-in tariff we must consider the long-term interests of both solar and non-solar customers. We do this by setting the minimum feed-in tariffs at a level equal to the costs retailers avoid when they buy solar exports together with the value of avoiding pollution. Minimum

² *Electricity Industry Act 2000*, s. 40FBB(2)(a)

³ *Electricity Industry Act 2000*, s. 40FBB(3)(a), (b) and (c).

⁴ *Essential Services Commission Act 2001*, s. 8.

⁵ *Electricity Industry Act 2000*, s. 10.

Summary

feed-in tariffs above this value would result in non-solar customers subsidising solar customers through higher electricity rates.

If retailers were required to pay solar customers more than the value of solar exports, this would increase retailers' costs of purchasing electricity. In turn these increased costs would be reflected in higher market offer prices. Retailers' customers would then be paying more and this would not be consistent with our objectives.

We have explained this in more detail in past decisions.⁶

Our final decision leads to a lower flat feed-in tariff

Our final decision is that flat minimum flat feed-in tariff will be 4.9 cents per kWh for 2023–24. This is 5.8 per cent lower than the 2022–23 rate. The day time-varying feed-in tariff is also lower than for 2022–23, but higher for other times of the day. We have also set a second time-varying feed-in tariff option for retailers to offer their customers. Table S.1 shows the final decision tariffs.

Table S.1: Minimum feed-in tariffs to apply from 1 July 2023, excluding GST*

Flat rate	Time-varying rates (c/kWh)		
	Time-varying tariff option 1		
All times	Overnight Weekdays: 10 pm – 7 am Weekends: 10 pm – 7 am	Day Weekdays: 7 am – 3 pm, 9 pm – 10 pm Weekends: 7 am – 10 pm	Early Evening Weekdays: 3 pm – 9 pm Weekends: n/a
4.9	11.3	4.4	9.3
	Time-varying tariff option 2		
	Shoulder	Off-peak	Peak
	9 pm – 10 am, 2 pm – 4 pm	10 am – 2 pm	4 pm – 9 pm
	5.5	3.9	10.6

*Feed-in tariffs for solar customers registered for GST are subject to GST. Most residential solar owners are not registered for GST.

Summary

Solar weighted wholesale prices drive changes in the feed-in tariffs

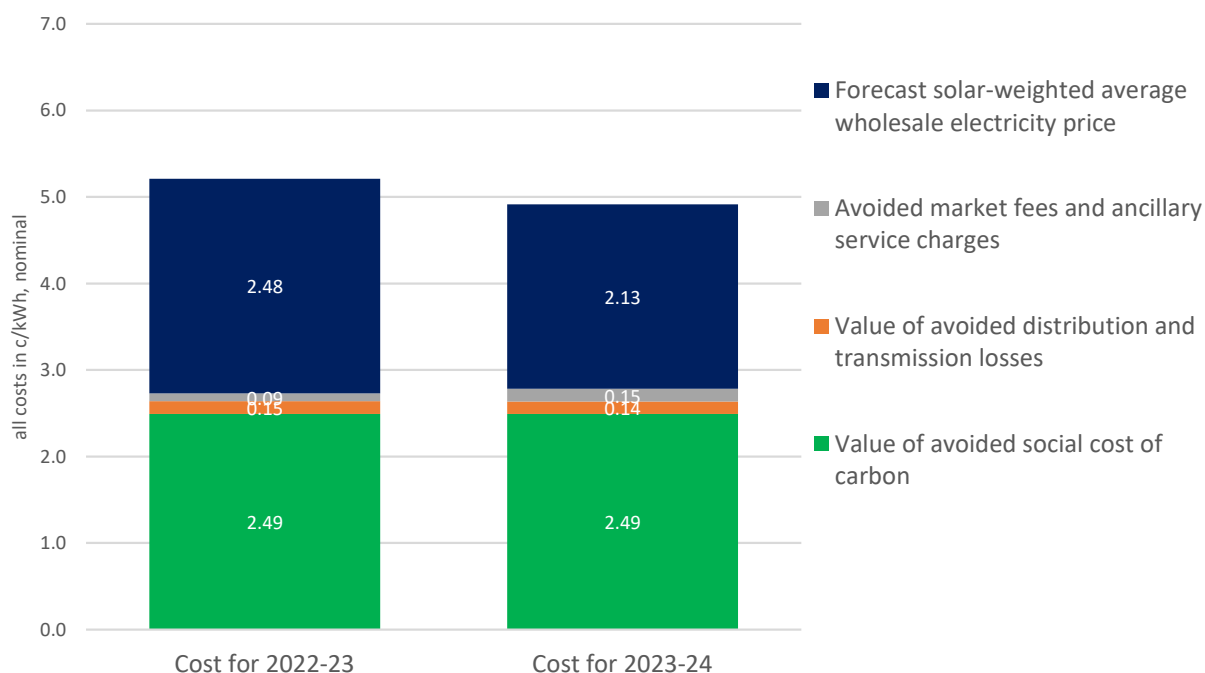
In setting the minimum feed-in tariff we use the solar weighted wholesale electricity price to determine the value of rooftop solar generation in the wholesale national electricity market.

The solar-weighted wholesale price reflects the wholesale prices of electricity at the times when solar customers export power to the grid. Times when the most solar exports happen have the most weight.

Most solar exports take place during the middle of the day. So prices around midday receive the greatest weight in determining the minimum feed-in tariffs.

Solar-weighted wholesale costs account for 29 to 72 per cent of the minimum feed-in tariffs' value (depending on time block and tariff structure).

Figure S.1: Flat feed-in tariff cost components over time



Wholesale electricity prices are low during the day but high at night

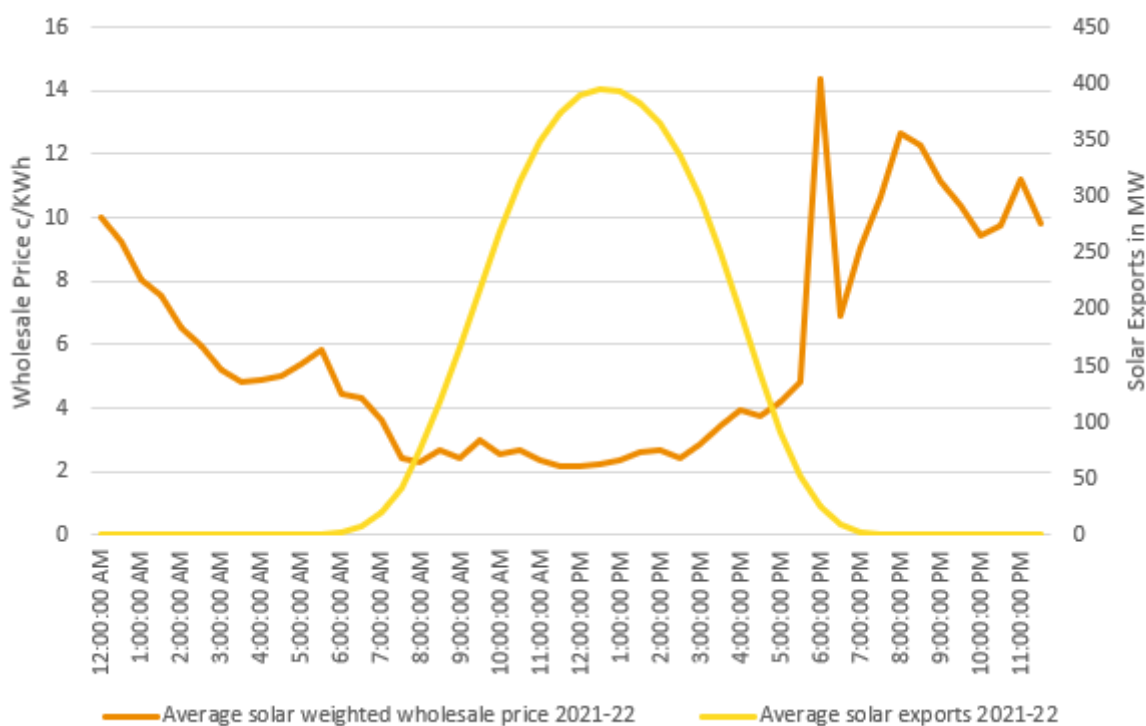
We acknowledge that average wholesale electricity prices have gone up recently and are forecast to go up further. In the evening when electricity demand is highest, wholesale electricity prices

have increased significantly due to a combination of high fuel prices, generator outages and weather conditions.⁷ This has led to much higher average wholesale prices.

However, during the daytime when most solar exports occur, wholesale electricity prices have decreased significantly over recent years. Growth in installations of rooftop, and utility-scale, solar has decreased demand for and increased supply of electricity during the day. This trend is expected to continue.⁸

During daylight hours, solar customers import less electricity from the grid (reducing demand) and export their excess generation (increasing supply). Low demand and high supply are leading to low daytime wholesale electricity prices. As most solar exports happen during the day, the **solar weighted** wholesale price is also lower even though the **average** wholesale price is higher. Figure S.2 below shows wholesale prices are lowest when solar exports are at their highest.

Figure S.2: Average actual solar weighted prices and solar exports across the day



⁷ Frontier Economics, Frontier Economics, *Wholesale price forecasts for calculating minimum feed-in tariff: Report for the Essential Services Commission*, p. 21, 3 February 2023.

⁸ AEMO, *Electricity Statement of Opportunities: A Report for the National Electricity Market*, August 2022 p. 110.

Summary

We have used the same approach as we have in past reviews

In setting the minimum feed-in tariffs to apply from 1 July 2023, we have used the same avoided costs approach as in previous tariff reviews. This approach forecasts the solar weighted wholesale prices for 2023–24 and adds these to other costs retailers and the community avoid when solar customers export their energy to the grid.

In our draft decision paper, we said we would update the wholesale electricity price forecasts in this final decision.⁹ This is the standard approach we take each year. Updating wholesale price forecasts with the most recent data can mean the prices in our final decisions are different to our draft decisions. Sometimes updating our forecasts will mean final prices are higher and other times they will be lower.

Our final decision on the minimum feed-in tariffs uses the 12-month trade weighted average wholesale price from ASX Energy (base swap futures prices for 2023-24) as reported on 20 January 2023. The average wholesale electricity futures prices up to 20 January 2023 are slightly higher than the ones we used in the draft decision. This means the forecast of solar weighted wholesale prices in this final decision are very slightly higher than the one in our draft decision.

We have had regard to stakeholders' feedback

We had a consultation period following publication of the draft decision to seek stakeholders' feedback about the methodology we used in, or other aspects of, the draft decision.

Stakeholders made 76 submissions on our draft decision. The submissions were from 71 solar customers, three customer groups, and two retailers.

We are obliged under the Electricity Industry Act to look at specific factors and costs when setting the minimum feed-in tariffs.¹⁰ We have considered all these factors and costs. Our decision on the minimum feed-in tariffs reflects actual electricity futures market outcomes and is an efficient benchmark of the estimated avoided financial, environmental and health costs. This means that solar customers are paid the value of the energy they produce.

We considered all submissions in reaching our final decision. We summarise and address the key themes from submissions in the 'Themes from submissions and our responses' chapter.

⁹ The draft flat feed-in tariff was 4.8 c/kWh and the 'time-varying' feed-in tariffs ranged from 4.3 and 10.8 c/kWh depending on the time of day. Essential Services Commission, *Minimum electricity feed-in tariff to apply from 1 July 2023: Draft decision*, December 2022, p.4.

¹⁰ *Electricity Industry Act 2000*, s. 40FBB(3).

The solar customers who made submissions in general disagreed with the minimum feed-in tariffs in our draft decision. They felt that the proposed rates were too low and therefore unfair. They also expressed concern that installing solar panels would no longer be of financial benefit and less attractive to install.

On the other hand, energy retailers who made submissions generally agreed with our methodology.

This said, retailers and a small number of consumers also made some suggestions about possible changes to the social cost of carbon and human health costs in our methodology. We note that the Victorian Government's view on the social cost of carbon is set out in an Order in Council published in February 2017.¹¹

Retail rates and feed-in tariffs are not comparable

As in past reviews, the most frequent feedback we received was that the feed-in tariff should be closer to retail tariff rates. As outlined in the previous section, the costs of electricity included in flat retail rates are substantially different to those that are factored into the flat feed-in tariffs.

Flat retail rates include substantial amounts of electricity that must be purchased during the evening, overnight, and the morning peak. At these times of the day demand is high and/or supply of solar electricity into the network is low and consequently wholesale prices are higher. In contrast, the flat rate feed-in tariff places most weight on the wholesale prices of electricity during the middle of the day, when as outlined before, prices are now relatively low.

Also, solar customers do not provide the same services as electricity retailers. Solar customers are more like electricity generators. Generators recover their expenses, such as capital and maintenance costs through the revenue they receive from selling electricity to the wholesale market or via environmental schemes.

This is the same for solar customers. Solar customers can recover some of their costs through the feed-in tariffs they receive for exporting their surplus electricity. But, unlike generators, solar customers can recover their costs through the savings they make from self-consuming the energy they produce instead of buying it from their retailer at higher prices.

The minimum feed-in tariffs also include payments for the environmental benefits solar customers generate, and for some other costs (avoided market fees and network losses). Compensation for

¹¹ Victorian Government 2017, *Victoria Government Gazette No. S 36*, Tuesday 21 February 2017, Order specifying a methodology and factors for the determination of the avoided social cost of carbon (Order in Council).

these additional avoided costs means solar customers receive more for each kWh they export than large scale generators would if they exported electricity at the same time.

Solar customers do not incur the costs that electricity retailers do. When retailers sell electricity to their customers, they must cover their costs. Retailers' costs include:

- wholesale electricity costs
- other energy market fees
- hedging wholesale cost risks
- transporting electricity (the poles and wires connecting customers to electricity generators)
- energy lost during transport
- environmental programs
- overhead costs.

When retailers buy energy from solar customers, retailers avoid only three of these categories:

- wholesale electricity costs
- energy lost during transport
- other energy market fees.

When selling solar customers' power, retailers must still be able to cover their other costs.

This means the minimum feed-in tariff will always be lower than retail electricity prices. While each customer is different, the main financial benefit for solar customers is the savings from using the electricity they generate, i.e., avoiding paying retail rates for electricity.

Next steps

The minimum feed-in tariffs will apply from 1 July 2023. All retailers with more than 5,000 total customers must pay the minimum feed-in tariffs to eligible solar customers, but retailers can pay a higher rate if they choose.

If you have additional questions on the feed-in tariff, please email us at fitreview@esc.vic.gov.au.

Final decision on minimum feed-in tariffs

Our decision is to set three minimum feed-in tariffs to apply from 1 July 2023: These are:

- a minimum flat feed-in tariff rate, and
- two minimum time-varying feed-in tariffs.

Retailers must offer a feed-in tariff to their solar customers. They are free to offer either one of the regulated tariff structures, two of them, or all three of them.

The minimum flat feed-in tariff will be 4.9 cents per kilowatt hour

The flat feed-in tariff applies regardless of the time of the day or day of the week.

Table 1.1 shows the minimum flat feed-in tariff of 4.9 cents per kWh for 2023–24, which is 5.8 per cent lower than the flat tariff we set for 2022–23.

Table 1.1: Minimum flat feed-in tariff – 2023–24 (cents per kilowatt hour, solar weighted)

	Flat rate to apply at all times
Minimum feed-in tariff	4.9 cents per kWh

Some retailers offer higher feed-in tariffs under special plans or terms and conditions. For example, if you also buy solar panels from that retailer or export lower amounts of electricity to the grid (see Appendix A for examples). Consumers should carefully examine the various elements of these offers, as a higher feed-in tariff may be, at least in part, offset by higher daily charges, or prices to purchase electricity.¹²

The chapter ‘How we set the feed-in tariffs’ explains the calculations behind the flat tariff.

There will be two minimum time-varying feed-in tariffs from 1 July 2023

Tables 1.2 and 1.3 set out the time-varying feed-in tariffs for 2023–24 and the relevant time blocks in which the time-varying feed-in tariffs apply. The time varying feed-in tariffs are voluntary so retailers may elect to offer both, one, or neither of these options.

Retailers offering a time-varying feed-in tariff option must offer at least the minimum rate that applies in each time block, meaning they are free to offer rates above the minimum we set. So long

¹² Publicly available information submitted to the government energy price comparator website Victorian Energy Compare as at 20 January 2023, <https://compare.energy.vic.gov.au/>.

as retailers meet the minimum rate at each point in time, there is flexibility for designing different time-varying feed-in tariff profiles.

The changing tariff rates across time blocks can make it more attractive for customers to install batteries or to export to the grid from their electric vehicle.

Table 1.2: Option one – Minimum time-varying feed-in tariffs 2023–24 (cents per kWh)

Time block	Overnight	Day	Early evening
Minimum feed-in tariff	11.3	4.4	9.3
Applicable time block	10 pm – 7 am	7 am – 3 pm, 9 pm – 10 pm	3 pm – 9 pm
Weekdays:	10 pm – 7 am	7 am – 10 pm	n/a
Weekend:			

Table 1.3: Option two – Minimum time-varying feed-in tariffs 2023–24 (cents per kWh)

Time block	Shoulder	Off-peak	Peak
Minimum feed-in tariff	5.5	3.9	10.6
Applicable time block	2 pm – 4 pm, 9 pm – 10 am	10 am – 2 pm	4 pm – 9 pm
Every day			

For the time-varying tariffs, we have two options. Option one is the same time-varying feed-in tariff we have used in previous decisions with the same time blocks as in past years. Option two has new time blocks.

We added the new time-varying option in response to one retailer’s feedback that the existing time blocks did not reflect their wholesale costs across the day.¹³ Few retailers have offered time-varying feed-in tariffs since the introduction of the time-varying feed-in tariff in 2018–19. Providing retailers with different options may encourage more retailers to offer time-varying tariffs.

Encouraging the use of time-varying tariffs will be beneficial to retailers and consumers. Time varying feed-in tariffs reward consumers who can install panels that generate more during higher priced feed-in tariff time blocks, even if they have lower overall output (for example, by installing more panels facing west rather than north), or who have a home battery and are able to export

¹³ Globird (ID 1077315) submission, pg. 2, 23 January 2023

their surplus power at peak times. Such exports have the potential to ultimately lower wholesale prices during these higher priced times, thus benefiting all consumers..

We also considered amending the tariff time blocks to reflect the distribution networks' time blocks. However, we found that these time blocks don't reflect the pattern of solar exports. One of the reasons we have added the time-varying tariff option two is to reflect these patterns.

As part of our next review, we will consider further options to provide retailers with more flexibility for offering new and innovative time-varying feed-in tariffs so solar customers can make the most out of their solar systems.

Components of the feed-in tariff

When setting the minimum feed-in tariffs we must have regard to certain costs that retailers avoid when they receive solar exports.¹⁴ These include:

- solar weighted wholesale electricity prices during daytime hours
- National Energy Market fees and ancillary service charges
- network or line losses.

We must also have regard to the avoided social cost of carbon and human health costs.

Solar weighted wholesale electricity prices, which make up 29 to 72 per cent of total costs, are driving the changes in the feed-in tariffs. Table 1.3 sets out the cost that make up the feed-in tariffs.

Table 1.4: Components of the 2023–24 minimum feed-in tariffs (cents per kWh)

Component	Flat	Time-varying option 1			Time-varying option 2		
		Overnight	Day	Early evening	Shoulder	Peak	Off-peak
Solar weighted wholesale electricity prices	2.1	8.2	1.6	6.3	2.7	7.5	1.1
Market fees and ancillary service charges	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Value of avoided transmission	0.1	0.5	0.1	0.4	0.2	0.5	0.1

¹⁴ *Electricity Industry Act 2000*, s. 40FBB(3)(a), (b) and (c).

and distribution losses ¹⁵							
Value of avoided social cost of carbon and human health costs	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Total	4.9	11.3	4.4	9.3	5.5	10.6	3.9

Minimum feed-in tariffs over time

Table 1.4 shows how the flat minimum feed-in tariff and time-varying feed-in tariff option one have changed over time. For further information see Appendix B. There is no historical data for time-varying feed-in tariff option two.

Table 1.5: Comparison of minimum feed-in tariffs, 2018-19 to 2023-24

Period	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24
Flat rate	9.9	12.0	10.2	6.7	5.2	4.9
Time-varying rate option one						
Early evening	29.0	14.6	12.5	10.9	6.9	9.3
Day	10.3	11.6	9.8	6.1	5.0	4.4
Overnight	7.1	9.9	9.1	6.7	7.1	11.3
Time-varying rate option two						
Peak	N/A	N/A	N/A	N/A	N/A	10.6
Off-peak	N/A	N/A	N/A	N/A	N/A	3.9
Shoulder	N/A	N/A	N/A	N/A	N/A	5.5

¹⁵ The value of network losses varies as the value of the energy transported varies. For example, as the wholesale price of electricity increases, the value of the associated losses on the transmission and distribution networks will increase.

How we set the minimum feed-in tariffs

When solar customers export electricity, retailers avoid buying electricity from the National Electricity Market. The minimum feed-in tariffs are an estimate of what retailers would pay if they bought electricity from the market plus a payment for the social benefits of renewable energy.

If the minimum feed-in tariffs were higher than this, retailers (and therefore their customers) would be better off buying electricity from the National Electricity Market.

Wholesale prices are determined by the supply of and demand for electricity in the National Electricity Market and the ASX futures market. We estimate the wholesale price for the minimum feed-in tariffs by placing greater weight on prices when more solar exports occur (the solar weighted wholesale price). We then add to this to account for avoided market fees, network costs, and the additional environmental and health benefits of green energy.

We have used this approach to determine the minimum feed-in tariffs applicable from 1 July 2023. This is the same approach we have used in previous feed-in tariff reviews.

See Appendix D – Technical Methodology for further details on the calculations.

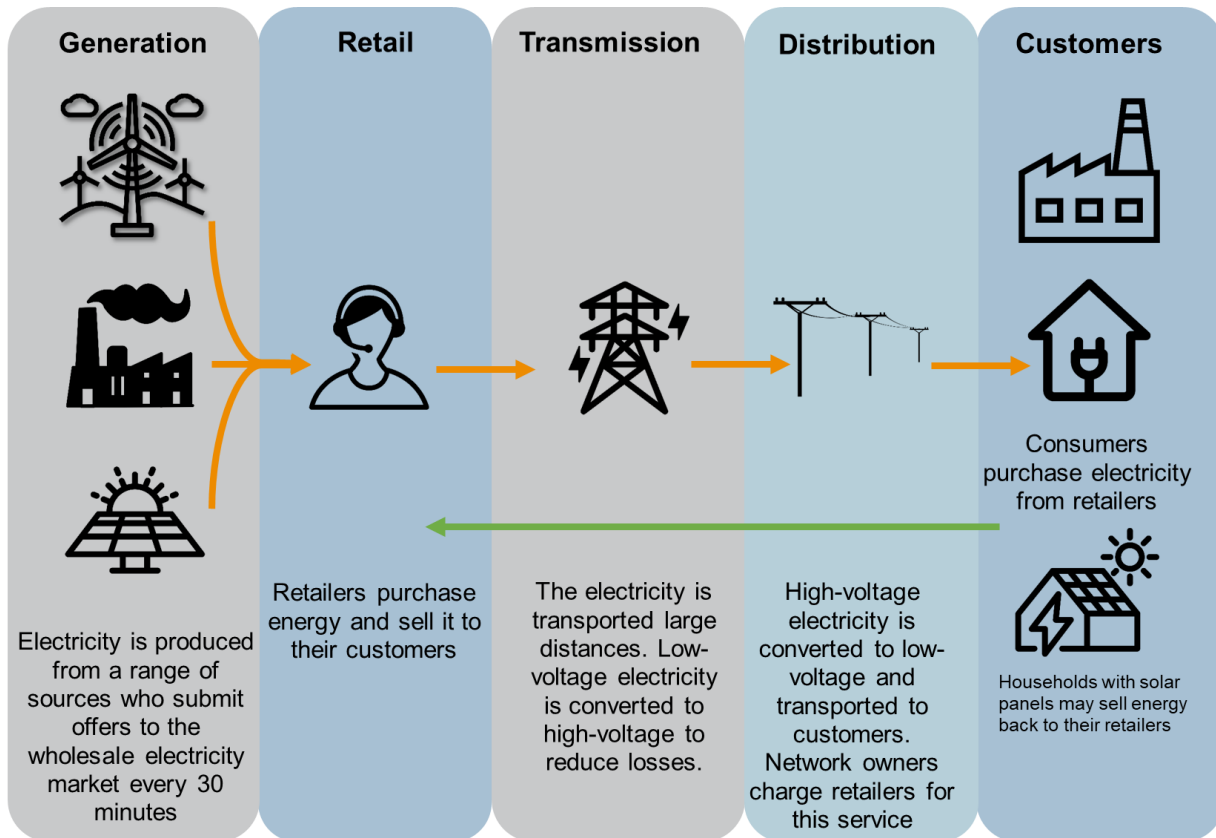
How solar energy interacts with the retail energy market

Energy supplied to Victorians is generated by various sources, such as coal, hydro, gas and renewables. Large generators, such as coal-fired power stations, wind farms and solar farms, provide most of the energy in the National Electricity Market.¹⁶ Rooftop solar panels provide a smaller but growing share.¹⁷ Figure 2.1 shows the links between solar customers and the different participants in the electricity market.

¹⁶ Australian Energy Market Operator, Data dashboard: Fuel Mix, <https://www.aemo.com.au/Energy-systems/Electricity/National-Electricity-Market-NEM/Data-NEM/Data-Dashboard-NEM>, accessed 27 January 2023.

¹⁷ OpenNEM Project, An Open Platform for National Electricity Market Data, <https://opennem.org.au/energy/nem/?range=7d&interval=30m> accessed 27 January 2023

Figure 2.1 – Solar customers’ role in the Victorian electricity market



Solar customers play a dual role in the electricity market. They are generators when they export electricity to the grid, and customers when they purchase electricity from their retailer.

Buying electricity from the National Electricity Market and selling it to customers imposes certain costs on retailers, such as:

- wholesale electricity costs
- other energy market fees
- hedging wholesale cost risks
- transporting electricity (the poles and wires connecting customers to electricity generators)
- energy lost during transport
- environmental programs
- overhead costs.

Retailers avoid some of these costs when they buy electricity from solar customers. These include:

- network losses
- market fees and
- the price of wholesale electricity.

How we set the minimum feed-in tariffs

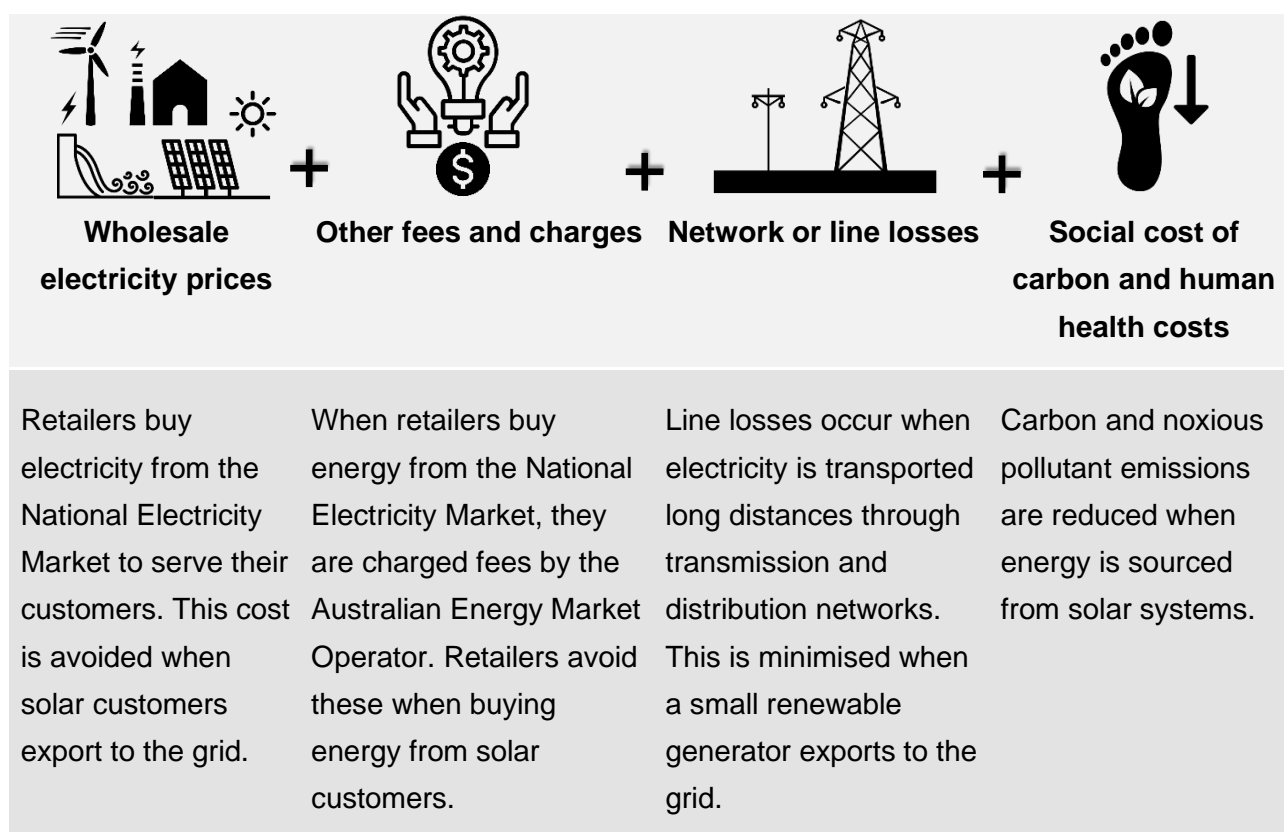
These costs reflecting the market value of solar energy and are used to set the minimum feed-in tariff (along with the environmental value of solar).

The factors we must consider in setting the minimum feed-in tariffs

Figure 2.3 outlines the avoided costs included in the minimum feed-in tariffs calculations. Under the Electricity Industry Act, we must have regard to these costs when setting the minimum feed-in tariffs.¹⁸

We set the minimum feed-in tariffs equal to the costs retailers avoid plus the social cost of carbon and avoided human health costs. This approach ensures minimum feed-in tariffs represent the value that solar customers provide to the energy market and the social benefits of lowering carbon emissions.

Figure 2.3 – Costs we must have regard to in setting the feed in tariffs



¹⁸ *Electricity Industry Act 2000*, s. 40FBB(3).

Steps for setting the minimum feed-in tariffs

In line with previous years, we have used the following process to determine the minimum feed-in tariffs and account for the factors outlined in Figure 2.3:

- Develop a forecast of wholesale electricity prices (2023–24):
 - For the minimum flat feed-in tariffs – using wholesale prices in the futures market, calculate the solar weighted wholesale price.
 - For the minimum time-varying feed-in tariffs – using wholesale prices in the futures market, calculate the solar weighted wholesale price for each time block under each tariff structure.
- Add in the benefit of market fees and ancillary service charges retailers avoid when they get electricity from solar customers instead of from the wholesale market.
- Increase the resulting values to account for energy saved by not transporting the energy long distances from large scale generators (transmission and distribution losses).
- Add in the value associated with avoiding carbon emissions and other pollutants when solar customers produce energy.¹⁹

Except for the different time periods used to calculate the wholesale component of the feed-in tariffs, all other elements of the above methodology apply to both the flat and time-varying tariffs.

We used the futures market to forecast wholesale electricity prices

When retailers get energy from solar customers, they avoid buying electricity from the wholesale market. So, calculating the minimum feed-in tariff for the upcoming financial year requires that we estimate the wholesale price of energy in the National Electricity Market.

We have used a futures market approach to forecast wholesale prices. This is the same approach we used in our 2019–20, 2020–21, 2021–22, and 2022–23 (see Appendix D – Technical methodology for more information) and is largely the same as the approach used in our Victorian Default Offer decisions.²⁰ The main difference between our wholesale forecasts for the feed-in tariffs and the Victorian Default Offer is that hedging costs are included in our wholesale cost forecasts for the Victorian Default Offer. Solar customers do not incur hedging costs and solar exports do not prevent retailers from incurring hedging costs.

¹⁹ The Victorian Government provides these values in an Order in Council, which are then included in our modelling.

²⁰ Essential Services Commission, *Victorian Default Offer to apply from 1 July 2022: Final Decision 24 May 2022*.

The market's expectation of what wholesale prices will be in 2023–24 is best represented by Victorian baseload swap futures contracts that are traded on the Australian Securities Exchange.²¹

The prices in the futures market reflect retailers' and generators' expectations for wholesale electricity prices. As wholesale market participants, large scale generators and retailers have the best information about supply and demand.

Therefore, we consider that ASX Energy Victorian baseload swap futures contracts are the best indicator available of what average wholesale prices in 2023–24 will be.

Calculating solar weighted wholesale costs for the minimum flat feed-in tariff

Solar panels account for 99.9 per cent of small-scale renewable generation in Victoria and export electricity to the grid during the daytime.²² Unmodified futures prices are not appropriate for setting the feed-in tariffs because most feed-in tariff exports from solar panels happen during the day. Unmodified futures prices reflect the average wholesale price for both the day and night. To calculate the minimum feed-in tariffs, we need to estimate the average wholesale price when electricity from solar panels is being exported: the solar weighted wholesale price.

We do this by 'weighting' prices by the share of solar exports that happen at each price level. For example, for the flat feed-in tariff, we multiply the price for each half hour wholesale market interval by the amount of solar exports that took place at that price and then divide by the total amount of solar exports for the year. We then add all the results together to find the solar weighted average price for the year. Therefore, our estimates of wholesale costs reflect the average value of electricity exported by solar systems. We refer to this process as 'solar weighting'

Solar weighting means that prices for electricity when solar panels are not exporting— such as in the evening – have almost no impact on the calculation of the feed-in tariff.²³ Said another way, small scale solar generators do not get paid the wholesale price that applies when they are not exporting to the grid. This helps the minimum feed-in tariffs reflect the value consumers get from solar energy exports.

²¹ Frontier Economics, *Wholesale Price Forecasts for Calculating Minimum Feed-In Tariff: Final Report for the Essential Services Commission*, 27 January 2022, p. 10.

²² Clean Energy Council, Postcode data for small-scale installations, accessed 27 January 2023, <http://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations#Installation-numbers-for-small-scale-systems-by-stateterritory>.

²³ A very small amount of exports from small-scale renewable generators happen at night (for example from small wind turbines or small batteries). For this reason, some weight is placed on overnight prices, but not very much.

How we set the minimum feed-in tariffs

Calculating solar weighted wholesale costs for the time-varying feed-in tariffs

Wholesale prices change depending on the time of day. They are generally lower during daylight hours, when there are more solar exports, and higher at night times when there is no solar electricity supplied. To reflect these changes in wholesale prices, we have minimum time-varying tariffs in addition to the minimum flat feed-in tariff. We allow retailers to choose whether to offer customers time-varying feed-in tariffs, a flat tariff or both.

The pre-existing time-varying feed-in tariff will remain the same as in past years, but we have added an additional set of time-varying feed-in tariff time blocks for 2023-24. We sought feedback in our draft decision on the appropriateness of the time-varying feed-in tariffs, based on information from retailers. We consider that the additional tariff will help retailers to offer more options to solar customers. Time-varying feed-in tariffs one and two are set out in Table 2.1 and Table 2.2.

Table 2.1 – Time-varying feed-in tariff option one: time block structure

Time block	Weekday	Weekend
Overnight	10pm–7am	10pm–7am
Day	7am–3pm, 9pm–10pm	7am–10pm
Early evening	3pm–9pm	n/a

Table 2.2 – Time-varying feed-in tariff option two: time block structure

Time block	Everyday
Shoulder	9pm–10am, 2pm to 4pm
Off-peak	10am–2pm
Peak	4pm–9pm

The same forecast wholesale prices for 2023–24 are used to calculate the flat and time varying feed-in tariffs. But for the time-varying feed-in tariffs, we calculated the solar weighted average value of wholesale electricity for each time block separately.

Our wholesale price forecasts have very slightly increased from those used in the draft decision due to higher electricity futures contract prices. This signals that the market expects higher wholesale prices over 2023–24 than it did when we made our draft decision in December 2022.

Market fees and ancillary service charges

When retailers buy energy from the wholesale spot market, they must pay market fees and ancillary service charges to the Australian Energy Market Operator (market operator).²⁴

Retailers avoid these fees when they buy electricity from solar customers. These cost savings increase the value of energy produced by solar customers. Including these savings in the value of the feed-in tariff is consistent with the approach we have used in past reviews.

The fees levied by the market operator are set each year through its annual budgeting process. However, the market operator has not published an estimate of the fees for 2023–24. We have used the market operator's 2022–23 budget fees for retailers as a proxy for 2023–24 in this review.

We have used an average of the ancillary services recovery rates in Victoria for 2022. This results in an average ancillary service payment of \$0.42/MWh, which we use as our best estimate of the ancillary service charges for 2023–24. This ancillary services recovery data is more recent than that used in our draft decision. However, the impact of these changes on the minimum feed-in tariffs since our draft decision is very small.

Transmission and distribution losses

Most energy consumers (households and business) are far away from where large-scale generators are located, so energy must travel long distances through the grid (transmission and distribution networks) to reach consumers.

When energy moves through the grid, some of it is lost as heat and sound. We refer to this as 'network losses' or 'line losses'. The magnitude of network losses depends on the location of the generation facility and factors like the quality of the powerline.

In contrast, the energy generated by solar systems is typically close to the point of consumption, so less energy is lost because it travels a shorter distance along the grid. We account for the network losses that retailers avoid when they buy energy from solar customers by using a loss factor which we apply to the (avoided) solar weighted cost of wholesale energy.

We have used the market operator's estimates of distribution loss factors for 2022–23 and preliminary estimates of marginal loss factors for 2023–24 to develop a loss factor adjustment for Victoria. The market operator has not yet published preliminary estimates of distribution loss

²⁴ The Australian Energy Market Operator manages electricity and gas systems and markets across Australia. This includes the National Energy Market (NEM), which connects the power systems of Queensland, New South Wales, the Australian Capital Territory, Victoria, South Australia and Tasmania.

factors for 2023–24. Further details on the calculation of network losses and market fees can be found in Appendix D – Technical methodology.

Our draft decision used estimates of marginal loss factors for 2022–23. We have updated the data to use the most recent estimates of the value of network losses. However, the impact of this update is very small.

Social cost of carbon and human health costs assumptions

We have kept the same assumptions for the social cost of carbon and human health costs that we have used in the draft decision and in previous decisions.

We note that the Department of Energy, Environment and Climate Action is currently reviewing the methodology specified for determining the avoided social cost of carbon. This review will also consider whether it is appropriate to specify a methodology to separately determine the avoided human health costs attributable to a reduction in air pollution.

Cost of carbon

The National Electricity Market uses energy generated from a variety of fuel sources and technologies.²⁵ These sources include:

- coal
- natural gas
- biomass
- wind
- solar
- hydro-electric power.

Emissions released during gas or coal-fired generation impose a cost by contributing to the greenhouse effect. This cost is often referred to as the cost of carbon. Solar customers help reduce this cost when their energy replaces fossil fuel generation. The avoided social cost of carbon reflects the value of these emissions reductions.

The Victorian Government published an Order in Council in February 2017.²⁶ The Order in Council specifies a methodology and the factors that we must have regard to when setting the social cost

²⁵ Australian Energy Market Operator, Data dashboard: Fuel Mix, <https://www.aemo.com.au/Energy-systems/Electricity/National-Electricity-Market-NEM/Data-NEM/Data-Dashboard-NEM>, accessed 11 January 2023

²⁶ Victorian Government 2017, *Victoria Government Gazette No. S 36*, Tuesday 21 February 2017, Order specifying a methodology and factors for the determination of the avoided social cost of carbon (Order in Council).

How we set the minimum feed-in tariffs

of carbon. We consider this methodology to reflect policy on the preferred approach to calculating the social cost of carbon, so we have adopted this methodology for our decision.

The Order in Council methodology gives the avoided social cost of carbon a value of 2.5 cents per kWh. This is the same value as for previous years.

We have added this to the flat feed-in tariff and time-varying feed-in tariffs (see Appendix C – Technical methodology for more details).

Human health costs

The human health costs are the estimated health costs of air pollution (such as particulate matter) associated with fossil fuel powered electricity generation.²⁷

There is no Order in Council that specifies a factor or method for determining the avoided human health costs attributable to a reduction in air pollution and there are different methods to estimate these costs.

After considering the:

- cost estimates available
- absence of definitive information for Victoria
- potential overlap with the benefits of avoiding carbon emissions and other pollutants harmful to human health and
- subsidies available for solar panel installation

our decision is to set the standalone avoided human health costs at 0 cents per kWh.

Methods for assessing human health costs

There are a variety of methodologies to price the avoided human health costs attributable to the reduction in air pollution, with no approach widely accepted. These methodologies fall into two broad categories:

- the damages caused by the pollution (damages costs)
- the costs of avoiding the pollution (abatement costs).

²⁷ Victorian Government 2016, Energy Legislation Amendment (Feed-in Tariffs and Improving Safety and Markets) Bill 2016, Explanatory Memorandum, p. 4.

Damages costs

Under the damages cost approach, the avoided human health costs are calculated using estimated health costs of pollution from electricity generation. The costs of the damages vary significantly according to where the generation, and therefore pollution, occurs.²⁸ The dispersion of pollutants depends heavily on local conditions.

If the generators are in a densely populated area, the pollution will affect more people and the human health costs will be higher. In contrast, if the generation occurs in a low population area, there will be lower health costs.

There is no detailed research on the dispersion of pollutants in Victoria. Victoria's coal generation is in the Latrobe Valley. In many other parts of the world, the distance between generation and consumption is not as large. While there is some gas generation within Melbourne, it accounts for only a small share of total generation.

The current estimates of human health costs are based on international damages costs studies adapted for Victoria.²⁹ No research at the necessary level of detail has been published on the dispersion of pollutants from fossil fuel generation in Victoria.

To calculate the damages costs, it would be necessary to establish pollutant dispersion to come to the unit health costs of fossil fuel generation. We would then also have to assess how solar exports displaces fossil fuel generation to find the total avoided human health costs. Neither of these tasks is straight forward.

Abatement costs

An alternative is to use the cost of avoiding pollution. This involves measuring the cost of avoiding pollution to get the value of avoided human health costs. This approach can be especially helpful when abatement costs are known but damages costs are not.

Some other jurisdictions have adopted abatement costs as a possible way of measuring environmental externalities (such as the cost of carbon) when damages costs are unknown or

²⁸ Department of Environment, Land, Water and Planning 2019, *Estimating the health costs of air pollution in Victoria*, pp. 3-5, Accessed 3 February 2023 https://www.climatechange.vic.gov.au/_data/assets/pdf_file/0022/421717/Final_Health-costs-of-air-pollution-in-Victoria.pdf.

²⁹ PAE Holmes with NSW EPA, 2013, *Methodology for valuing the health impacts of changes in particle emissions – final report*, p.10, Accessed 3 February 2023 www.epa.nsw.gov.au/~media/EPA/Corporate%20Site/resources/air/HealthPartEmiss.ashx

uncertain.³⁰ The Order in Council uses an abatement cost approach for determining the avoided cost of carbon.³¹

When using an abatement cost approach there may be an overlap between the avoided health costs and the social cost of carbon. If we pay to avoid carbon pollution, we also avoid other types of pollution, so the social cost of carbon also pays for the abatement of other harmful pollutants associated with fossil fuel generation, at least in part and possibly in full.

This suggests that the current method for determining the social cost of carbon may cover the human health cost. As carbon abatement avoids both carbon emissions and other harmful pollutants, when you pay to stop carbon emissions you are also paying to stop those other harmful pollutants. In this way the social cost of carbon could also account for the avoided human health costs.

³⁰ Department of Energy and Climate Change 2009, *Carbon Valuation in UK Policy Appraisal: A Revised Approach*, July 2009, pp. 10-11, [DECC report \(publishing.service.gov.uk\)](#).

³¹ Victorian Government 2017, *Victoria Government Gazette* No. S 36, Tuesday 21 February 2017, Order specifying a methodology and factors for the determination of the avoided social cost of carbon (Order in Council).

How we set the minimum feed-in tariffs

Themes from submissions and our responses

In this chapter, we address the key themes raised by stakeholders in response to our draft decision. We received 76 submissions. These include written submissions made through Engage Victoria and our fitreview@esc.vic.gov.au mailbox. We received submissions from 71 solar customers, three consumer groups, and two energy retailers.

In general, the submissions we received from solar customers opposed the reduction of the minimum feed-in tariffs. Most solar customers said the minimum feed-in tariffs should be higher or closer to retail tariffs.

Solar customers felt the minimum feed-in tariffs do not fairly compensate them and that the difference between the feed-in and retail rates is unfairly large. Some said the low feed-in tariffs favour retailers and asserted that retailers are making large profits from the electricity generated by solar customers. Others expressed concern about the economic incentives to install solar panels and cost recovery for existing owners.

The energy retailers' submissions in general agreed with our methodology, however they were of the view that the social cost of carbon component was too high.

There were consumers and retailers who thought that the time-varying feed in tariffs should change to better reflect the dynamics of supply of and demand for electricity.

We have added a new time-varying feed-in tariff option

Several consumers were of the view that we should require retailers to offer time-varying feed-in tariffs. They felt this would help solar customers maximise their returns and incentivise investment in new technologies such as battery storage.

An option for time-varying feed-in is a logical step – although most customers will struggle to feed back into the grid without a significant battery/storage setup.³²

Retailers submitted that they were of the view that the current time-varying feed-in tariff structure does not reflect the dynamics of the wholesale electricity market.³³ One retailer proposed alternative time blocks.

³² Anonymous submission (ID 1077173), 11 January 2023.

³³ GloBird Energy (ID 1077315), pg. 2; 23 January 2023; Simply Energy submission, (ID 1077382), pg. 1, 24 January 2024

In response to these submissions, we have included an additional time-varying feed-in tariff option (time-varying feed-in tariff option two) that reflects feedback from retailers on what peak, off-peak and shoulder time blocks are for solar exports.

In future reviews, we will look into options for developing a more flexible approach to time-varying feed-in tariffs. The aim of this will be to increase the number of retailers offering time-varying feed-in tariffs, to give consumers more choice.

At this point, we have not mandated that retailers offer the time-varying feed-in tariffs. Updating billing systems to allow for time varying feed-in tariffs could be a costly exercise for many retailers.

We also note that some consumers found it strange that there is a night-time feed-in tariff. The feed-in tariffs apply to all small-scale distributed electricity generation. While most of this is rooftop solar, some consumers have other technologies that can export at night. These include wind turbines and batteries.

The minimum feed-in tariffs reflect the true value of solar exports

Most solar customers felt that our proposed feed-in tariffs were too low especially while retailers are increasing their prices. One solar customer typified those of many by submitting:

I fail to see how you are proposing a drop in the FIT when energy prices are rising.³⁴

We acknowledge that average wholesale electricity prices have increased recently and that retailers' market offers have become more expensive. However, the increased availability of solar energy has decreased demand for and increased the supply of electricity during daylight hours. This is why feed-in tariffs are going down but retail rates are going up.

With increased supply and decreased demand, wholesale prices during the day have declined. This has resulted in lower rates for the flat feed-in tariff and day rates for the time varying feed-in tariffs.

It is notable though that wholesale prices are much higher early morning, and from early evening through the night. Solar exports are very low at those times. This can be seen in figure S.2 on page 9 and is reflected in the time varying feed-in tariffs increasing for 2023–24 during those periods (see Table 1.4).

³⁴ Daryl Hodson (ID 1076964) submission, 20 December 2022

Frontier Economics' report on wholesale costs contains further details.³⁵

The minimum feed-in tariffs promote the interests of all customers

Some solar customers felt that our proposed feed-in tariffs were unfair and favoured industry. For example, one solar customer wrote:

Individual households pay out a considerable amount in Solar Panels / Inverters and Batteries. Excess power should be higher than the 4.8c considering for us to buy from retailer it is 23c plus daily cost of \$1.16.³⁶

The minimum feed-in tariffs for 2023–24 give solar customers a payment that reflects the value of their exports without other non-solar customers paying too much for electricity.

Solar customers are electricity generators when they export energy. The feed-in tariffs reflect how much their energy is worth in the energy market at the time they export it. Under the costs outlined in the Electricity Industry Act, this value is equal to the costs retailers avoid when they purchase electricity from solar customers rather than from the National Electricity Market (plus the environmental and health benefits).

In this way, the minimum feed-in tariffs benefit solar customers by ensuring they are being paid at least an efficient price for their energy. With the additional payment they receive for the social cost of carbon, solar customers get more through the feed-in tariffs than they would selling their energy at the spot price in the National Electricity Market.

If retailers had to pay solar customers more than the true value of solar exports, they would incur higher costs when selling solar customers' exports. To recover these increased costs, retailers would have to increase the retail rates for all their customers. As noted below, retailers have additional costs that they must cover regardless of where they source energy. These costs – as well as their wholesale costs – are recovered from all customers, so if the feed-in tariffs are higher than the wholesale price, all customers' retail prices are higher.

Solar customers can offset higher retail prices through consuming their own energy, which non-solar customers cannot. Many customers cannot install solar panels. Maybe they live in an apartment or an embedded network. Maybe they cannot afford them. Or maybe they are renting, and the property owner is unwilling or unable to install them.

³⁵ Frontier Economics, *Wholesale price forecasts for calculating minimum feed-in tariff: Report for the Essential Services Commission*, 3 February 2023, chapter 5.

³⁶ Anonymous submission (ID 1076962), 20 December 2022

Non-solar customers are limited to purchasing energy at the retail rate to meet their household demand and subsidising solar customers would expose them to increased energy prices.

Therefore, by setting the feed-in tariffs at the level the energy is worth in the energy market at the time it's exported, the decision is in the long-term interest of all of consumers.

The decision gives solar customers more than a market return on their investment

Some solar customers felt that our proposed feed-in tariffs would not allow them to recover their investments in solar panels. One solar customer wrote:

We should consider the investment's return. If solar does not reduce electricity bills, then what is the point of the investment in solar?³⁷

Some submissions also noted that solar customers incurred maintenance costs for their systems, for example:

There should be an increase in rate for the feed in rate or a discount applied to the daily supply fee – considering they want us to put power into the grid, and we maintain our side of the system.³⁸

We acknowledge solar customers incur these costs. When electricity generators bid into the national electricity market, they take all their costs (including both capital and operating costs) into account. As the feed-in tariffs account for the wholesale price of electricity paid to generators, it also includes the maintenance and operating costs of generating electricity.

Unlike traditional large-scale generators, solar generation customers also benefit by using the energy they generate. Self-consumption is a major advantage of installing a solar system and it is critical to include the value of avoided electricity imports from the grid when calculating how long it will take for a solar system to pay for itself.

We also note that solar installations are subsidised by the state and federal governments. These subsidies mean that customers receive financial support to install solar systems, which lowers the upfront costs.

³⁷ Tom Gojrzewski (ID 1077016) submission, 21 December 2022

³⁸ Anonymous submission (ID 1076962) submission, 20 December 2022

Victorians still see value in installing solar

Solar customers expressed concerns that our decision will discourage solar uptake. A solar customer wrote:

The minimum Feed-in tariff is too low. With the price of electricity going up and the feed-in going down I just don't understand why people would invest in solar.³⁹

We are responsible for setting an efficient price that mirrors the true value of solar to maximise the wellbeing of all Victorian consumers. If we were to set feed-in tariffs above the true value of solar, then Victorians without solar panels would pay for this inefficiency. This would go against our legislative obligation to promote the long-term interests of all Victorian consumers.⁴⁰

We have also observed that the number of solar installations in Victoria continues to increase, with another 53,000 new systems installed in 2022 so that there have been around 650,000 small scale solar systems installed in Victoria.⁴¹ This suggests that Victorians still see value in installing solar systems.

The feed-in tariffs reflect the wholesale value of renewable electricity

Some customers suggested that the minimum feed-in tariffs should equal retail rates. For example, one solar customer wrote:

We should get the same rate that we are charged.⁴²

Solar customers are electricity generators, not electricity retailers. The minimum feed-in tariffs are a payment to solar customers for generating electricity.

When retailers provide electricity to their customers, they must cover the following costs:

- wholesale electricity costs
- other energy market fees
- hedging wholesale cost risks
- transporting electricity (the poles and wires connecting customers to electricity generators)

³⁹ Anonymous submission (ID 1076952), 20 December 2022

⁴⁰ *Essential Services Commission Act 2001*, s. 8(1), (2).

⁴¹ Clean Energy Council, Postcode data for small-scale installations, accessed 25 January 2023, <https://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations>. The data is current as of 31 December 2022, but may increase as new systems are registered.

⁴² Paul Matin (ID 1077014) submission, 21 December 2022

- energy lost during transport
- environmental programs
- retail overhead costs (for example, billing and revenue collection systems, information technology systems, call centre costs, human resources, finance, legal services, regulatory compliance costs, licence costs and marketing).

When retailers buy energy from solar customers, they only avoid the wholesale costs and market fees associated with buying electricity from the wholesale market. Retailers must still recover all the other costs listed above.

If the feed-in tariffs were set to the retail rate of energy, it would make the energy that solar customers provide more expensive than energy bought in the National Electricity Market. Electricity retailers would need to recover these higher costs through higher retail rates for all energy consumers in Victoria. This would mean non-solar customers would be subsidising high feed-in tariffs.

Our objective when setting the minimum feed-in tariffs is to promote the long-term interests of Victorian energy consumers. This is achieved by the feed-in tariffs reflecting the value of solar energy. This means solar customers receive the right incentives to export and Victorian customers pay no more than they need to for solar energy.

Network costs are recovered through both variable and fixed charges

Some solar customers understood that retailers incur more costs than solar customers, but understandably did not realise how network costs are recovered from retailers. Many solar customers who made submissions to the review seemed to think that network costs are recovered solely through the 'daily charge'. This led them to the mistaken view that retailers do not incur network costs when they 're-sell' solar energy to other customers.

['Electricity Retailers are already and have been \(forever\) Billing Consumers for the ongoing Maintenance costs of providing "Service to Property" using these same Poles and Wires.'](#)⁴³

The daily charge is not just for network investment and maintenance. It also includes the recovery of a number of other fixed costs.⁴⁴ In fact, most network costs are recovered through variable

⁴³ Alan Devlin (ID 1077049), 24 December 2022.

⁴⁴ Essential Services Commission, *Victorian Default Offer 2022–23: Final decision*, p. 58, 24 May 2022.

charges. This reflects the fact that much investment in the electricity network happens to meet peak demand (higher demand requires more wires, more poles, and more transformers).

Retailers still incur network costs when they 're-sell' solar customers' energy to other customers. Electricity meters have no way to tell that electricity has come from a solar customer instead of from a large electricity generator hundreds of kilometres away. So, the electricity network operator charges the customer's retailer the same amount for transport regardless of where the electricity comes from.

Futures prices are the best way to forecast wholesale prices

Some submissions questioned if the ASX Energy contract prices are the most appropriate method for determining the wholesale price. They were concerned that solar customers would be disadvantaged if the spot price is lower than the forecast price. One customer wrote:

Stop calculating the feed-in-tariffs on forecast prices. Back in June/July 2022 I submitted an inquiry re electricity fees increasing to 27.26c/KWH while the feed-in-tariff decreasing to 5.2c/KWH. The Commission's response was that the feed-in-tariff was decreased based on forecast decreases in wholesale energy prices.⁴⁵

Basing prices on forecasts of future costs is a common commercial practice. This also reflects the way that electricity retailers set prices. While the forecasts might be lower than actual spot prices sometimes, at other times they will be higher. For example, our forecast of the solar weighted average spot price was 3.92 c/kWh for 2021–22⁴⁶ but the actual solar weighted average price was 2.75 c/kWh.⁴⁷

We remain of the view that the ASX Energy futures contract prices are the best method for determining the wholesale price. Futures contract prices are the best available guide to forecast changes in the spot market. Prices on ASX Energy reflect the prices generators and retailers are willing to sell and buy electricity for in the future. If prices were higher than the best estimates available of future wholesale prices retailers would not buy the contracts. If prices were lower than the best estimates generators would not sell the contracts.

⁴⁵ Lia Annunziato (ID 1077067) submission 2 January 2023

⁴⁶ Essential Services Commission, *Minimum electricity feed-in tariff to apply from 1 July 2021: Final decision*, p. 14, 25 February 2021.

⁴⁷ ESC of AEMO aggregate demand and price data. AEMO data available at: <https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/data-nem/aggregated-data> (last accessed 14 February 2023).

The social cost of carbon is set out in the Order in Council

Three stakeholders submitted that we should update the social cost of carbon. One submission wrote:

The Feed-in Tariff (FiT) component *Value of avoided costs of carbon* has not been updated for six years.⁴⁸

The Order in Council, which we must have regard to, provides the methodology and factors that we must consider when calculating the social cost of carbon.⁴⁹

The methodology and factors in that Order set out the Victorian government's policy on the social cost of carbon. If the Victorian government had changed its position, it would have issued a new Order in Council.

A consumer submission suggested we should update the social cost of carbon to reflect the current price of Victorian Energy Efficiency Certificates which have risen in recent years.⁵⁰

Some submissions from retailers suggested we should also update the emissions intensity factor which has decreased.^{51 52 53}

If we were to update the prices of Victorian Energy Efficiency Certificates to calculate the social cost of carbon we would also have to update the emissions intensity factor. The increase in Victorian Energy Efficiency Certificate prices and the decrease in the emissions intensity factor would largely offset each other.

We have considered the human health costs avoided due to solar generation

Some consumers were of the view that we had not considered human health costs. Geelong Sustainability stated that:

⁴⁸ Anonymous (ID 1077560) submission, 25 January 2023

⁴⁹ Victorian Government 2017, *Victoria Government Gazette No. S 36*, Tuesday 21 February 2017, Order specifying a methodology and factors for the determination of the avoided social cost of carbon (Order in Council).

⁵⁰ Anonymous (ID 1077560), pg.9, 25 January 2023

⁵¹ GloBird Energy (ID 1077315), pg. 1, 20 January 2023, Simply Energy (ID 1077382), pg. 1, 24 January 2023

⁵² Victorian Government 2017, *Victoria Government Gazette No. S 36*, Tuesday 21 February 2017, Order specifying a methodology and factors for the determination of the avoided social cost of carbon (Order in Council).

⁵³ Victorian Energy Upgrades Targets and Lighting Consultation 2019, Accessed 2 February 2023, <https://engage.vic.gov.au/project/victorian-energy-upgrades/page/targets>.

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the Essential Services Commission can no longer assign zero human health costs avoided as numerous methodologies have been pioneered and a reliable methodology must be sought.⁵⁴

We consider that this misrepresents our position. We have not assigned a value of zero for the human health costs.

We are of the view that the human health costs are non-zero, but there is a reasonable amount of evidence that the health benefits for solar generation are already accounted for elsewhere. That's either through solar subsidies or the social cost of carbon (as defined by Order in Council).

There were three main points raised by consumers and their representative groups. We address each below.

We have considered the human health costs

Some consumers were of the view that existing estimates should be used to value the avoided human health costs. For example:

...the rate that should be introduced is 1.3 c/kWh, as identified as being in the lower end of last year's Final Decision⁵⁵

In last year's decision we noted that other parties had estimated the human health costs could be between 0 and 5 c/kWh and that most of these estimates were between 0 and 1.3 c/kWh.⁵⁶ Those amounts are not our forecasts and we have not adopted those estimates as we consider that they are not reliable. Estimating particulate dispersion accurately for health damages associated with electricity generation requires extremely complicated and computationally intensive airshed modelling that has not yet been done by anyone for Victoria.

As previously mentioned, there may be overlap between the human health costs and other government policies. When using an abatement cost approach there may be an overlap between the avoided health costs and the social cost of carbon. There are also a number of subsidies for solar installations. Subsidies from the Small-Scale Renewable Scheme alone are roughly 4

⁵⁴ Department of Environment, Land, Water and Planning, Annual Report 2020, p. 184.

⁵⁵ Anonymous submission (ID 1077560), 25 January 2023.

⁵⁶ Essential Services Commission, *Minimum electricity feed-in tariff to apply from 1 July 2022: Final decision*, p. 20, 24 February 2022.

c/kWh.⁵⁷ This is higher than most of the currently available estimates of the avoided human health costs.

This area is also the subject of ongoing review by the Department of Energy, Climate and Energy Action and we will continue to monitor developments in this area.

Government subsidies should be considered when setting regulated prices

There was a view that we should not consider the subsidies that solar customers receive when making our determinations. For example, Geelong Sustainability stated:

This position should be reconsidered as the subsidy of solar panel installation has reduced significantly, while the human health costs of non-renewable energy only appear to be growing. In addition, these subsidies do not appear to make public a consideration of human health costs in their own value determination⁵⁸

The per kilowatt hour subsidy for solar installation varies significantly depending on system size and installation date. However, there are a number of significant subsidies available. These include the Small-scale Renewable Energy Scheme (mentioned above) and Victoria's Solar Homes Program. Both the schemes refer to the reduction of gases that are harmful to human health as reasons for their introduction.

The Department of Energy, Environmental and Climate Action's 2020 annual report states the output of the Solar Homes Program is to:

...provide 770,000 households with either solar panel energy systems, solar hot water systems, or battery storage for homes with existing solar energy systems, as Victoria transitions to a lower emissions future, reducing fossil fuel usage and air pollution.⁵⁹

The Clean Energy Regulator's webpage states that:

⁵⁷ Clean Energy Regulator, Small-scale technology certificates, September 2022, available at: [https://www.cleanenergyregulator.gov.au/Infohub/Markets/Pages/qcmr/september-quarter-2022/Small-scale-technology-certificates-\(STCs\).aspx](https://www.cleanenergyregulator.gov.au/Infohub/Markets/Pages/qcmr/september-quarter-2022/Small-scale-technology-certificates-(STCs).aspx) (last accessed 14 February 2023).

⁵⁸ Geelong Sustainability (ID 1077793), 30 January 2023.

⁵⁹ *Department of Environment, Land, Water and Planning Annual Report 2020*, p. 184.

Themes from submissions and our responses

The Renewable Energy Target is an Australian Government scheme designed to reduce emissions of **greenhouse gases** in the electricity sector and encourage the additional generation of electricity from sustainable and renewable sources.⁶⁰

We also note that acknowledging subsidies in regulated prices is standard practice in economic regulation. For example, when the government or property developers gift assets to water networks we do not allow those assets to be included in the regulatory asset base, and therefore regulated prices.

The health impacts of fossil fuel fired generation largely depend on location

One of the reasons currently available estimates for the avoided human health costs are not fit for purpose is that they are based on international damages costs estimates. The population densities and relative electricity generation location are quite different to those in Australia. One stakeholder submitted that:

The transport sector produces 25% of Victoria's greenhouse gas emissions, so the action of solar customers generating clean, green energy will help this sector produce less pollution as the shift to EVs continues. As metropolitan Melbourne contains the vast majority of the transport sector, this place-based region is set to be the recipient of using in cleaner electricity, as less particulate matter is then generated from the cleaner vehicle fleet.⁶¹

The vast majority of the pollutants (harmful to human health) from Victoria's electricity production come from coal fired power in the Latrobe valley. When solar displaces generation from those coal fired plants air pollution is reduced in the Latrobe Valley.

While electrification of appliances and vehicles can reduce air pollution around population centres, this is separate to reducing air pollution from electricity generation. They are different investment decisions and have different environmental impacts. If someone chooses to buy an electric vehicle, they are the ones reducing the local air pollution, not electricity generators.

Some consumers found our decision difficult to understand

Some consumers expressed difficulty in understanding our draft decision. For example, one consumer said of our draft decision:

⁶⁰ Clean Energy Regulator, History of the scheme, available at: <https://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/History-of-the-scheme> last accessed (14 February 2023).

⁶¹ Anonymous submission (ID 1077560), 25 January 2023.

It is incomprehensible to me that a flat rate of 4.8c/kWh can be concluded. Your conclusions need to be better explained and justified in the context of the staggering forecast in retail electrical energy costs...Justice must be seen to be done.⁶²

Geelong Sustainability noted that:

... only a small subset of energy consumers are adequately energy – and governance – literate to participate in this review's current format. This is evidenced by individual submissions addressing the mFIT value determination and not the methodology or inputs that result in the mFIT value. This could be overcome through facilitated consultation.

We acknowledge that energy economics can be a complicated subject. We also accept that without a thorough understanding of how roof-top solar fits into the wholesale electricity market our decision will seem counter-intuitive.

In undertaking our reviews, we have taken steps to make our decisions easier to understand. These include publishing 'explainer articles' on our website and on social media. After doing this the number of queries we receive on the feed-in tariffs decreased. For this review we have also published a new explainer article on solar weighting to help consumers understand how the feed-in tariff can decrease while retail tariffs increase.

As part of our next review of the feed-in tariffs we will also consider alternative engagement strategies: such as facilitated consultation groups to gather meaningful feedback.

Legislation places limits on how we can set the minimum feed-in tariffs

A number of stakeholders suggested policy alternatives to what is currently set out in legislation. For example, Ballarat Renewable Energy and Zero Emissions submitted:

...our premise in responding to the Draft ... is about the underlying principles and thinking that inform the newly proposed feed-in tariff, rather than offering a critique of the chosen methodology.⁶³

We are unable to change the legislative framework under which we operate. The methodology we use to determine the feed in tariffs, as set out under section 40FBB of the *Electricity Industry Act*

⁶² Graeme Simpson (ID 1076967), 20 December 2022

⁶³ Ballarat Renewable Energy and Zero Emissions (ID 1077750), 29 January 2023.

2000 (Vic). As a regulator, our role is to determine the minimum feed in tariff rates in accordance with the legislation and any policy changes are a matter for the Victorian Government.

The feed-in tariffs are part of Victoria’s environmental policy

Consumers were of the view that our decision did not account for the environmental value that roof-top solar provides. Some were also of the view that it did not appear to be consistent with broader government environmental policy. One consumer said:

The impact of solar being fed into the grid is saving significant use of fossil fuels. Your current methodology is giving little credit for this.⁶⁴

We have used the social cost of carbon as set out in the Order in Council and have considered estimates of the avoided human health costs. We have also considered subsidies provided by the state and federal government in recognition of the social benefits of rooftop solar.

The feed-in tariff accounts for small-scale battery exports

One individual submitted that we should consider the ability for grid scale batteries to store electricity at times of low prices and then sell it at times when prices are high.

‘the ESC must accept that ... solar customers should benefit from higher evening wholesale prices when their solar electricity generated during the day and stored in large-scale grid batteries is released and used during the night time.’⁶⁵

Solar customers receive the value of their exports at the time they occur. In this way, solar customer benefit from grid-scale batteries. These batteries drive higher daytime demand which increases the daytime wholesale price (relative to what prices would be without those batteries). Consequently, solar customers should not also be paid when large scale batteries discharge into the electricity market. To do so would lead to grid-scale batteries subsidising solar customers.

Also, owners of small-scale batteries receive the feed-in tariff when they export power into the grid. Doing so at times when wholesale electricity prices are high (in the evening) increases the solar weighted average price. As a result, solar customers and small-scale battery owners benefit from the extra value provided by small-scale battery storage.

⁶⁴ Richard Wilmore (ID 1076999), 21 December 2022.

⁶⁵ Anonymous submission (ID 1077560), 25 January 2023.

Appendix A – What is a feed-in tariff?

A feed-in tariff is the rate per kilowatt hour (kWh) that customers are credited when they export excess energy generation from their small-scale solar, wind, hydro or biomass generation sources. We set the minimum feed-in tariffs that energy retailers must pay solar customers for feeding their energy back into the grid.

How does solar energy fit into the broader energy market?

The electricity available for consumption in the National Electricity Market is a mix of primarily fossil fuels (coal, oil, and gas) and renewable energy.⁶⁶ Electricity generators supply this energy, and the market operator ensures the wholesale energy market matches generation with energy demand in real time.⁶⁷

Energy retailers engage with the National Electricity Market to provide electricity to their customers and meet their demand. This means the electricity sold to all energy consumers in Victoria, regardless of having rooftop solar or not, is a mix of fossil fuels and renewable energy. Government subsidies such as the Small-scale Renewable Energy Scheme and Solar Homes Program provide a financial incentive to households and businesses in Victoria to install solar panels and generate renewable energy.^{68, 69, 70}

Solar customers use the energy they generate from their photovoltaic solar panels first, if demand for energy is low in the property at the time of generation, then any excess energy is exported to the grid. If a household needs energy when its solar panels are not generating sufficient electricity,

⁶⁶ Department of Industry, Science, Energy and Resources (2022), Australian Energy Statistics, Table C, accessed 11 January 2023, <https://www.energy.gov.au/data/energy-consumption>

⁶⁷ Australian Energy Market Operator 2022, About the National Electricity Market, accessed 23 January 2023, <https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/about-the-national-electricity-market-nem>

⁶⁸ Clean Energy Regulator 2022, Small-scale Renewable Energy Scheme, accessed 9 January 2023, <http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/How-the-scheme-works/Small-scale-Renewable-Energy-Scheme>

⁶⁹ Solar Victoria 2021, Solar panel PV rebate, accessed 9 January 2023, <https://www.solar.vic.gov.au/solar-panel-rebate>.

⁷⁰ Department of Environment, Land, Water and Planning, Premium feed-in tariff, accessed 9 January 2023, <https://www.energy.vic.gov.au/for-households/solar-premium-feed-in-tariff>

for example when its cloudy or at night-time, customers import that energy from the grid and are charged for that usage at retail tariff rates.⁷¹

Some customers must seek pre-approval from their distributor to connect to the grid before they install solar panels (a distributor is the business that owns and operates the poles and wires that transport energy). Most solar customers have a grid-connected solar system to ensure reliable access to energy at any time of day. However not everyone is able to export excess energy back to the grid as customers can experience export limits imposed by their distributor.⁷²

Export limitations can prevent a solar customer from exporting energy and receiving a feed-in tariff. Solar energy export limitations could also be affected by rules governing the National Energy Market.^{73, 74, 75} For information on the Australian Energy Market Commission's new energy guide and changes to the National Electricity Rules visit <https://new-energy-guide.aemc.gov.au/>.

Who is eligible to receive minimum feed-in tariffs?

The minimum feed-in tariffs apply to small renewable energy generation facilities with capacities of less than 100 kilowatts (kW), producing electricity using renewable energy sources such as wind, solar, hydro or biomass. An important exception is that a 'small renewable energy generation facility' does not include a generating facility that is under the premium or transitional solar feed-in tariff scheme.⁷⁶

Further, the Governor in Council, by order published in the Government Gazette, can specify a facility or class of facility that generates electricity in any way as a small renewable energy generation facility.⁷⁷ No order has been issued on this to date.

⁷¹ Solar Victoria 2022, Section 3: Grid-connected solar explained, accessed 9 January 2023, <https://www.solar.vic.gov.au/solar-panel-pv/section-3-grid-connected-solar-explained>.

⁷² Powercor/Citipower 2023, Solar Energy, accessed 9 January 2023, <https://www.powercor.com.au/for-your-home/solar-and-other-technologies/rooftop-solar/>

⁷³ Australian Energy Market Commission 2021, The AEMC smart solar reforms, accessed 9 January 2023, <https://new-energy-guide.aemc.gov.au/preparing-the-grid-of-the-future#the-aemc-smart-solar-reforms>

⁷⁴ Australian Energy Market Commission 2020, Network planning and access for distributed energy resources, accessed 9 January 2023, <https://www.aemc.gov.au/rule-changes/network-planning-and-access-distributed-energy-resources>.

⁷⁵ On 12 August 2021 the Australian Energy Market Commission made a final determination on updates to the National Electricity Rules and National Energy Retail Rules to integrate distributed energy resources such as small-scale solar and batteries more efficiently into the electricity grid. Australian Energy Market Commission 2021, Access, pricing and incentive arrangements for distributed energy resources, accessed 9 January 9, 2023, <https://www.aemc.gov.au/rule-changes/access-pricing-and-incentive-arrangements-distributed-energy-resources>

⁷⁶ *Electricity Industry Act 2000*, s. 40F(1).

⁷⁷ *Electricity Industry Act 2000*, s. 40F(2).

Retailers may offer rates above the minimum feed-in tariffs and can offer either a flat tariff and/or the time-varying tariffs. Since 2018–19, the commission has set the minimum tariffs for both the flat and time-varying feed-in tariffs that a retailer can offer.

Retailers pay customers on the flat feed-in tariff the same amount for their exports regardless of when the customer exports their energy to the grid. We have two different time-varying feed-in tariffs each with three different tariff blocks.

The wholesale spot price of electricity is determined through an auction, which the Australian Energy Market Operator conducts every five minutes. However, due to a lack of historical data on five-minute settlements, we are continuing with the average price generators are paid every half hour in our future's market approach to forecasting wholesale energy prices for 2023–24.

What is our role?

The Electricity Industry Act 2000 requires the Essential Services Commission to determine the minimum rate or rates an electricity retailer must pay its customers, who are small renewable energy generators, for electricity they produce and export to the grid.⁷⁸

When making the determination for the minimum feed-in tariff the commission must consider its objectives under the *Essential Services Commission Act 2001* which are:

- to promote the long-term interests of Victorian consumers
- to have regard to the price, quality, and reliability of electricity.

We must also pursue our objectives under the Electricity Industry Act. Those most relevant to our role in setting the minimum feed-in tariffs are:

- to promote the development of full retail competition
- to promote protections for customers, including in relation to assisting customers who are facing payment difficulties.⁷⁹

In addition to matters we must consider in seeking to achieve our objectives under the Essential Services Commission Act, the commission must also consider specific factors in determining the minimum feed-in tariff under the Electricity Industry Act.⁸⁰ These factors are:

- the prices of electricity in the wholesale electricity market

⁷⁸ *Electricity Industry Act 2000*, s. 40FBB.

⁷⁹ *Electricity Industry Act 2000*, s. 10.

⁸⁰ *Essential Services Commission Act 2001*, s. 8A.

- any distribution and transmission losses that are avoided in Victoria, because of small renewable energy generation
- the avoided social cost of carbon and avoided human health costs which can be attributed to reduced air pollution caused by small renewable energy generators.⁸¹

The Electricity Industry Act allows the Governor in Council to issue an order specifying a methodology or factors for determining the avoided social cost of carbon and avoided human health costs.⁸² An order made in 2017 sets out factors and methodologies for determining avoided social cost of carbon including:

- methodologies for determining the number of units of carbon dioxide equivalent (CO₂e) reduced per unit of electricity exported from a small renewable energy generator
- the monetary value for each unit of CO₂e that is reduced because of the exports of a small renewable energy generator.⁸³

The order did not specify factors or methodologies for determining the avoided human health costs caused by a reduction in air pollution however we consider there is evidence to suggest human health costs may be included in the value determined by the current Order in Council for the social cost of carbon.

Each year, the commission determines the minimum feed-in tariffs for the forthcoming financial year. The feed-in tariffs described in this document will apply from 1 July 2023 to 30 June 2024.⁸⁴

Why is the retail rate higher than the feed-in tariff?

Solar customers are electricity generators, not electricity retailers. The minimum feed-in tariff is a payment solar customers receive for **generating** electricity.

When retailers provide electricity to their customers, they must cover the following costs:

- the 'spot price' of wholesale electricity in the national electricity market paid to generators
- other energy market fees
- hedging wholesale cost risks

⁸¹ *Electricity Industry Act 2000*, s. 40FBB(3).

⁸² *Electricity Industry Act 2000*, s. 40FBB(3B).

⁸³ *Victorian Government 2017*, *Victoria Government Gazette No. Section 36*, Tuesday 21 February 2017.

⁸⁴ Amendments to *Energy Legislation Amendment (Feed-in Tariffs and Improving Safety and Markets) Act 2017*, assent date 14 February 2017, requires the commission to set one or more rates (Section 40 FBB(2) of the *Electricity Industry Act 2000*) by 28 February in the financial year preceding the financial year in which it is to apply; previously determinations applied to the following calendar year.

- transporting electricity (the poles and wires connecting customers to electricity generators)
- energy lost during transport
- complying with environmental programs
- operating a retail business (for example, managing energy market risk, billing and revenue collection systems, information technology systems, call centre costs, human resources, finance, legal services, regulatory compliance costs, licence costs and marketing).

While retailers avoid some of these costs when they buy solar exports (market fees and wholesale electricity) retailers still have to pay the remaining costs. These additional costs that retailers incur but solar customers do not, mean the minimum feed-in tariffs will always be lower than the retail electricity tariff.

We set the feed-in tariff to reflect the value of solar exports as if retailers bought the energy from the National Electricity Market, by building in the 'spot price' plus avoided costs. This means that retailers pay solar customers the value of their solar exports.

If the feed-in tariffs were set to match the retail rate of energy, it would also make the energy that solar customers provide more expensive than energy bought in the National Electricity Market. Electricity retailers would need to recover these higher costs through higher retail rates for all energy consumers in Victoria. This would mean non-solar customers would be subsidising higher feed-in tariffs.

Our objective when setting the minimum feed-in tariffs is to promote the long-term interests of Victorian energy consumers. This is achieved by the feed-in tariffs reflecting the value of solar energy. This means solar customers receive the right incentives to export and Victorian customers pay no more than they need to for solar energy.

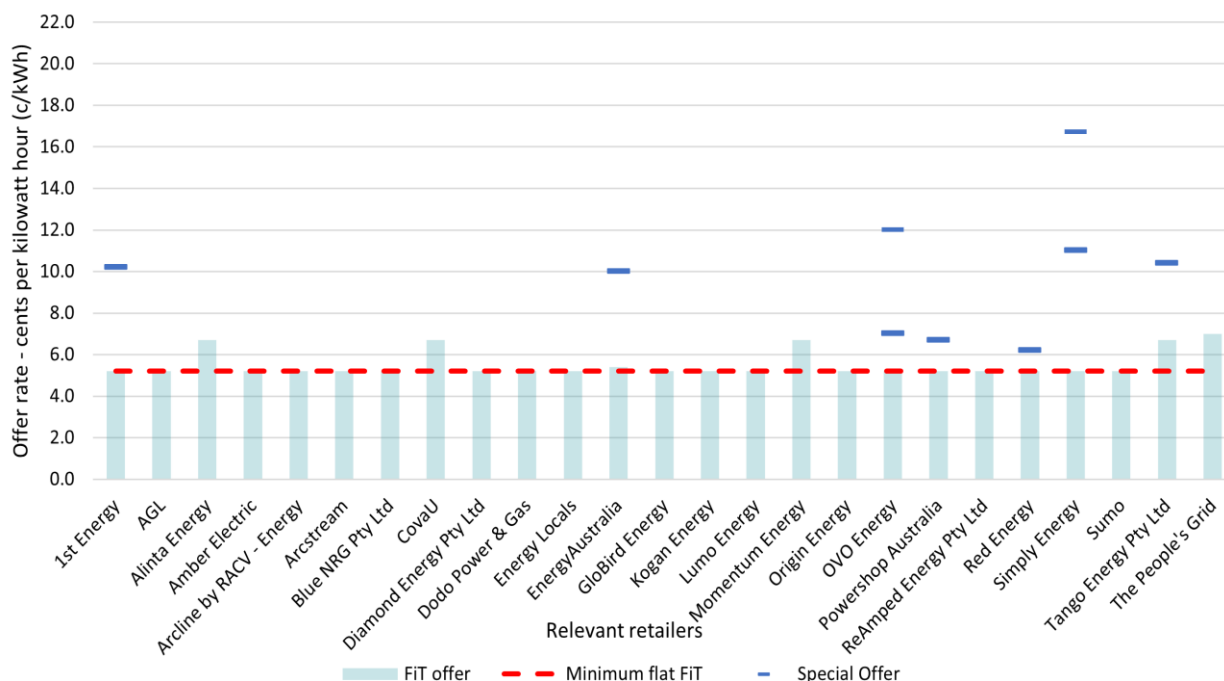
What offers are currently in the market?

All relevant Victorian energy retailers are required to provide at least the minimum feed-in tariffs on all offers.⁸⁵ Retailers are free to offer feed-in tariffs above the minimum tariffs we set. We surveyed the flat feed-in tariffs available in the market in January 2022, see Figure A.3.⁸⁶

⁸⁵ The relevant electricity retailer is a person that holds a licence to sell electricity and sells to more than 5000 customers in Victoria. See section 40F Definitions of the Electricity Industry Act 2000. Not all Australian states mandate a feed-in tariff.

⁸⁶ Publicly available information submitted to the government energy price comparator website Victorian Energy Compare as of 20 January 2023, <https://compare.energy.vic.gov.au/>.

Figure A.1: Victorian feed-in tariff offers as at 20 January 2023



Our research found 11 energy retailers offering flat feed-in tariffs higher than the current minimum 5.2 cents per kWh. The gaps between these offers and the current minimum, range from as low as 1 cent per kWh to as high as approximately 11 cents per kWh.

We found some retailers offer higher feed-in tariffs on certain plans or under special terms and conditions. For example, some retailers will offer customers higher feed-in tariffs if they export lower amounts of electricity, or if they purchase solar panels from the retailer.⁸⁷

EnergyAustralia appears to be the only retailer to offer a time-varying feed-in tariff and a flat feed-in tariff as part of their electricity plans for Victorian customers. We will continue to monitor whether more retailers offer a time-varying feed-in tariff in the future.

Several other retailers offered contractual arrangements to battery owners which involved dynamic pricing of electricity exports.

The premium feed-in tariff (60 cents per kWh, which is closed to new customers), or any bonus that retailers may offer above this, is outside the scope of our role to set minimum feed-in tariffs.

⁸⁷ Origin Energy, Feed-in Tariff Rates, accessed 9 January 2023 <https://www.originenergy.com.au/solar/feed-in-tariff-rates/>

We encourage customers to shop around because some retailers offer feed-in tariffs higher than the minimum we set.

It is important to look at more than just the feed-in tariffs when deciding on an electricity plan. Some plans which offer higher feed-in tariffs may have less competitive prices for the electricity you consume from the grid, and this may outweigh the benefit received from a higher feed-in tariff.

You should consider your energy consumption and generation as a whole when you choose an electricity plan: including your patterns of use, the rates you pay for the electricity you use and the electricity you export.

Using your own energy is the main financial benefit from rooftop solar

As solar feed-in tariffs set at efficient levels will always be lower than retailer tariffs, solar customers will get the greatest benefit self-consuming their power to avoid paying retail prices. For example, they could run power intensive appliances like hot water systems, dishwashers, and clothes dryers at times when they would otherwise send power to the grid.

How has the feed-in tariff changed over time?

The feed-in tariff has developed significantly since it started in 2008. Table A.1 below sets out the schemes that pre-date the minimum feed-in tariffs.

Table A.1: Current and closed feed in tariff schemes since 2008

Tariff	Minimum rate	Closed to new applicants	Scheme end date
Premium Feed-in Tariff for solar (PFiT)	60 cents per kWh	29 December 2011	1 November 2024
Standard Feed-in Tariff (SFiT)	'One for one', based on the customer's retail electricity rate	31 December 2012	31 December 2016
Transitional Feed-in Tariff for solar (TFiT)	25 cents per kWh	31 December 2012	31 December 2016
Minimum Feed-in Tariff	Updated annually (5.2 cents per kWh for 2022–23)	Ongoing	Ongoing

Premium feed-in tariff

To provide an incentive for households, small businesses and community groups to invest in small-scale solar systems, a premium feed-in tariff of at least 60 cents per kilowatt hour was provided to customers from late 2009. This scheme closed to new applicants at the end of 2011, although customers signed up prior to then remain eligible to receive the premium rate until 1 November 2024.⁸⁸

Standard feed-in tariff

Initially, the standard feed-in tariff was offered to customers from January 2008 until it was closed to new applicants at the end of 2012. Standard feed-in tariff payments ended in 2016. The standard feed-in tariff provided a 'one-for-one' rate for excess renewable electricity generated by eligible properties across Victoria, based on the retail electricity rate paid by the customer.

Transitional feed-in tariff

The transitional feed-in tariff replaced the premium feed-in tariff in 2011 and closed to new customers at the end of 2012. This scheme provided customers with a minimum credit of 25 cents per kilowatt hour until the scheme ended on 31 December 2016.⁸⁹

Minimum feed-in tariff

From 2014, the Essential Services Commission has determined the minimum feed-in tariffs that can be offered to customers by electricity retailers.

The Essential Services Commission must set the minimum feed-in tariffs based on costs set out in legislation. These costs represent the value of exports to society. They include including wholesale prices and avoided distribution and transmission losses.

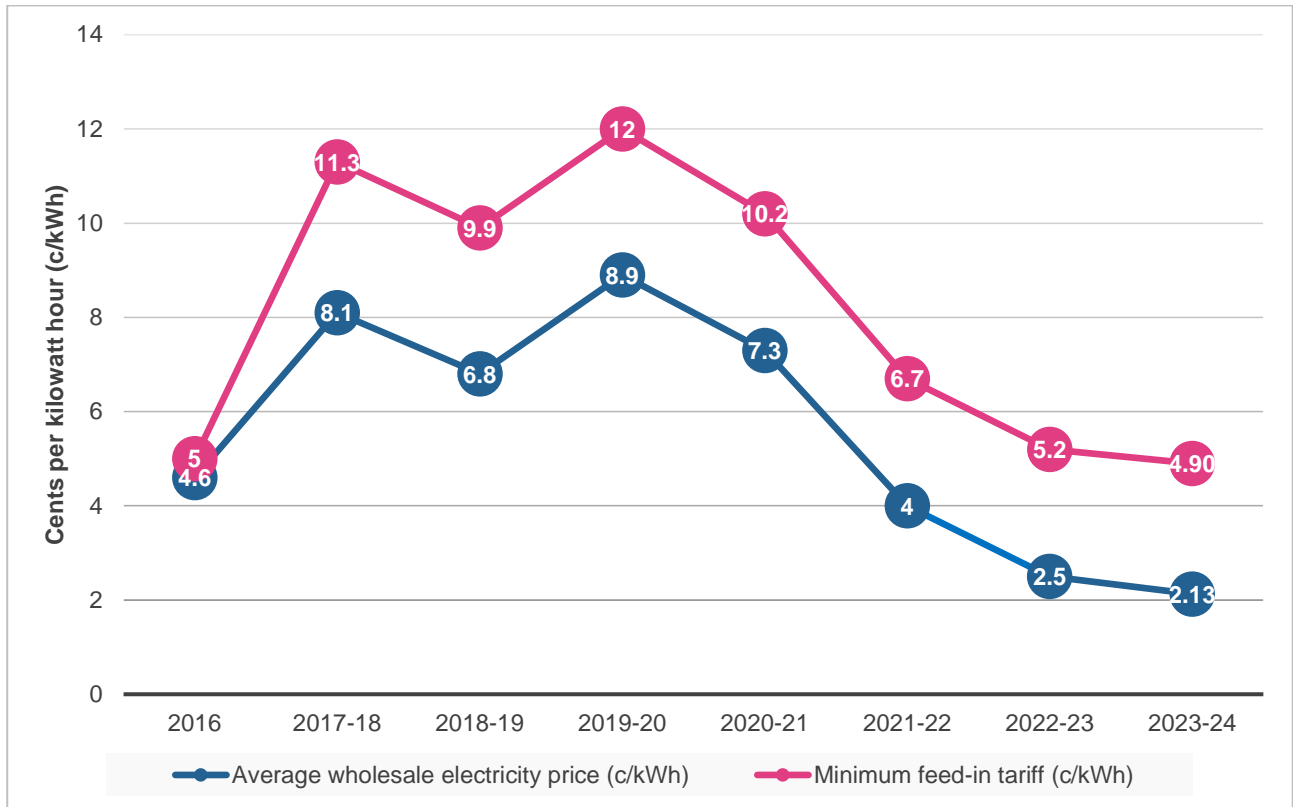
These minimum feed-in tariffs are updated on an annual basis to account for changes in costs over time. From 2017–18, legislation required that we take the avoided social cost of carbon (set at a rate of 2.5 cents per kWh) into account when determining the minimum feed-in tariff.

Figure A.4 below shows the gap between the wholesale electricity price and the minimum feed-in tariff coincides with the introduction of the 2.5 cents per kWh for the social cost of carbon in 2017.

⁸⁸ Essential Services Commission 2022, *Minimum feed-in tariff 2022-3: final decision*, 24 February 2022, p. 42-43.

⁸⁹ Essential Services Commission 2022, *Minimum feed-in tariff 2022-3: final decision*, 24 February 2022, p. 41.

Figure A.2: Comparison of flat feed-in tariffs and wholesale costs 2016 to 2023-24



Appendix B – Historic feed-in tariffs

Comparison of 2022–23 minimum feed-in tariff with historical rates

Table B.1: Minimum flat feed-in tariff: 2015–2023 (cents per kWh)

Tariff component	2015 ⁹⁰	2016 ⁹¹	2017– 18 ⁹²	2018– 19 ⁹³	2019– 20 ⁹⁴	2020– 21 ⁹⁵	2021– 22 ⁹⁶	2022– 23 ⁹⁷	2023– 24
Forecast solar-weighted average wholesale electricity price	5.7	4.6	8.1	6.8	8.9	7.3	3.9	2.5	2.1
Market fees and ancillary service charges	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Value of avoided transmission and distribution losses	0.4	0.3	0.6	0.5	0.5	0.3	0.2	0.2	0.1
Value of the avoided social cost of carbon	n/a	n/a	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Minimum flat feed-in tariff	6.2	5.0	11.3	9.9	12.0	10.2	6.7	5.2	4.9

Note: Table may not add due to rounding

⁹⁰ Essential Services Commission 2014, *Minimum feed-in tariff 2015: final decision*, August 2014, p. 24.

⁹¹ Essential Services Commission 2015, *Minimum electricity feed-in tariff to apply from 1 January 2016 to 31 December 2016: final decision*, August 2015, p.17.

⁹² Essential Services Commission 2017, *Minimum electricity feed-in tariff to apply from 1 July 2017: final decision*, February 2017, p. 9.

⁹³ Essential Services Commission 2018, *Minimum electricity feed-in tariffs to apply from 1 July 2018: final decision*, 27 February 2018, p. 20.

⁹⁴ Essential Services Commission 2019, *Minimum electricity feed-in tariffs to apply from 1 July 2019: final decision*, 28 February 2019, p. 28.

⁹⁵ Essential Services Commission 2020, *Minimum electricity feed-in tariff to apply from 1 July 2020: final decision*, 25 February 2020, p. 31.

⁹⁶ Essential Services Commission 2021, *Minimum electricity feed-in tariff to apply from 1 July 2021: final decision*, 25 February 2021, p. 14.

⁹⁷ Essential Services Commission 2022, *Minimum electricity feed-in tariff to apply from 1 July 2022: final decision*, 24 February 2022, p. 8.

Table B.2: Minimum time-varying feed-in tariff option one: 2018 – 2023 (cents per kWh)⁹⁸

Period	2018–19 ⁹⁹	2019–20 ¹⁰⁰	2020–21 ¹⁰¹	2021–22 ¹⁰²	2022–23 ¹⁰³	2023–24
Early evening	29.0	14.6	12.5	10.9	6.9	9.3
Day	10.3	11.6	9.8	6.1	5	4.4
Overnight	7.1	9.9	9.1	6.7	7.1	11.3

See Chapter 5 of Frontier Economics’ report for details on the comparison of wholesale electricity price forecasts applied to the 2022–23 and 2023–24 minimum feed-in tariffs decisions.¹⁰⁴

⁹⁸ Optional time-varying feed-in tariffs were introduced in 2018–19. The time-varying feed-in tariff for 2018–19 and 2019–20 was time-weighted while the 2020–21 and 2021–22 rates are solar-weighted.

⁹⁹ Essential Services Commission 2018, *Minimum electricity feed-in tariffs to apply from 1 July 2018: final decision*, 27 February 2018, p. 20.

¹⁰⁰ Essential Services Commission 2019, *Minimum electricity feed-in tariffs to apply from 1 July 2019: final decision*, 28 February 2019, p. 28.

¹⁰¹ Essential Services Commission 2020, *Minimum electricity feed-in tariff to apply from 1 July 2020: final decision*, 25 February 2020, p. 31.

¹⁰² Essential Services Commission 2021, *Minimum electricity feed-in tariff to apply from 1 July 2021: final decision*, 25 February 2021, p. 15.

¹⁰³ Essential Services Commission 2022, *Minimum electricity feed-in tariff to apply from 1 July 2022: final decision*, 24 February 2022, p. 8.

¹⁰⁴ Frontier Economics, *Wholesale Price Forecasts for Calculating Minimum Feed-in Tariff: Final report for the Essential Services Commission*, 3 February 2023, Chapter 5.

Appendix C – Feed-in tariffs in other jurisdictions

Other states also regulate their feed-in tariffs based on wholesale electricity prices

Different states have slightly different methodologies for calculating their regulated feed-in tariffs, but all set their rates largely following changes in forecast wholesale electricity prices (see Table C.1).

Wholesale electricity price component

New South Wales

New South Wales' methodology is very similar to Victoria's when forecasting future wholesale electricity prices. The Independent Pricing and Regulatory Tribunal (IPART) sources price data from NSW baseload electricity futures contracts from the ASX for the previous 12 months. These values are averaged over 40 trading days to establish the top end of the benchmark range and are then reduced by five per cent for a contract premium. A volume weighted average of all historical trades available is used to establish the lower end of the range. These two approaches to setting each end of the benchmark range are used to represent the variation in price setting methodologies used by retailers, which can be based on either the market price of electricity or the actual cost avoided by purchasing solar exported electricity. A solar multiplier is then applied to adjust the forecast price to account for variation in the wholesale electricity price when solar exports occur.¹⁰⁵

Queensland

In Regional Queensland, the Queensland Competition Authority approximates the half-hourly usage of customers by considering the distribution network system load profile. They use this data and the trade-weighted average of the ASX Energy daily settlement prices of base, peak and cap contracts to estimate wholesale electricity costs. The wholesale electricity price for the upcoming period is then forecast by a third-party consultant through multiple simulations to cover a wide

¹⁰⁵ Independent Pricing and Regulatory Tribunal, *Solar feed-in tariff benchmarks Final Report June 2021*, accessed 5 January 2023, https://www.ipart.nsw.gov.au/sites/default/files/cm9_documents/Final-Report-Solar-feed-in-tariffs-benchmarks-2021-22-June-2021.PDF.

range of demand outcomes and potential risks.¹⁰⁶ Feed-in tariffs in the southeast Queensland electricity market are not regulated.

Tasmania

To set the feed-in tariff at the appropriate rate, Tasmania uses the wholesale electricity price determined by the Tasmanian Economic Regulator for standing offer prices. However, if there is a Wholesale Electricity Price Order issued by the Treasurer, that wholesale electricity price is used to set the feed-in tariff.¹⁰⁷

Other jurisdictions

From our research, there is less publicly available data on the methodology adopted by Western Australia and the Northern Territory. Western Australia has introduced a time of export payment system to reflect the variation in the wholesale cost of electricity. The Distributed Energy Buyback Scheme was adopted in 2020 and applies to new solar customers.¹⁰⁸ The scheme was introduced to 'better represent the actual cost of electricity at different times of day'.¹⁰⁹ The Northern Territory also seeks to provide a feed-in tariff which mirrors forecast wholesale electricity prices. The Northern Territory has closed its premium feed-in tariff offers to new entrants as of April 2020 and their feed-in tariff is set 'equivalent to the value of electricity exported to the grid'.¹¹⁰

Other components

New South Wales, Queensland and Tasmania also explicitly factor in costs other than the wholesale price of energy to set the feed-in tariff. These include avoided network losses, avoided national energy market costs, and avoided ancillary costs.

¹⁰⁶ Queensland Competition Authority, *Regional Queensland 2022-23 Solar feed-in tariff Determination*, accessed 5 January 2023, <https://www.qca.org.au/wp-content/uploads/2022/05/solar-feed-in-tariff-202223-report.pdf>.

¹⁰⁷ Office of the Tasmanian Economic Regulator, *Investigation to Determine the Regulated Feed-in Tariff Rate Final Report* May 2019, accessed 25 January 2023, <https://www.economicregulator.tas.gov.au/Documents/19%20687%202019%20Regulated%20Feed-in%20Tariff%20Investigation%20Final%20Report.pdf>

¹⁰⁸ *Western Australia government Energy Buyback Schemes*, accessed 5 January 2023, <https://www.wa.gov.au/organisation/energy-policy-wa/energy-buyback-schemes>

¹⁰⁹ Synergy, *Distributed Energy Buyback Scheme (DEBS)*, accessed 5 January 2023, <https://www.synergy.net.au/Your-home/Manage-account/Solar-connections-and-upgrades/Distributed-Energy-Buyback-Scheme>.

¹¹⁰ Department of Trade, Business and Innovation, *Changes to Feed in Tariffs*, accessed 5 January 2023, https://industry.nt.gov.au/_data/assets/pdf_file/0008/811628/changes-to-feed-in-tariffs-fact-sheet.pdf.

Network costs, which are paid by retailers to the utilities that maintain and operate distribution networks, are an unavoidable cost for retailers. Our research indicates it is not added as a cost when setting feed-in tariffs in any jurisdiction including Victoria.

Victoria is the only state with a social cost of carbon component

Victoria is the only jurisdiction which must consider the avoided social cost of carbon and avoided human health costs when setting the minimum feed-in tariffs.

Table C.1: Regulated feed-in tariff methodology comparisons in other jurisdictions (excluding South Australia, ACT, and South-East Queensland)

State/territory	Avoided wholesale electricity costs	Avoided network losses	Avoided ancillary & NEM costs	Avoided social cost of carbon and human health costs
Victoria	✓	✓	✓	✓
New South Wales	✓	✓	✓	✗
Queensland (excl. SEQ Queensland)	✓	✓	✓	✗
Tasmania	✓	✓	✓	✗
Western Australia ¹¹¹	✓	Uncertain	Uncertain	✗
Northern Territory ¹¹²	✓	Uncertain	Uncertain	✗

The level of feed-in tariffs in other jurisdictions

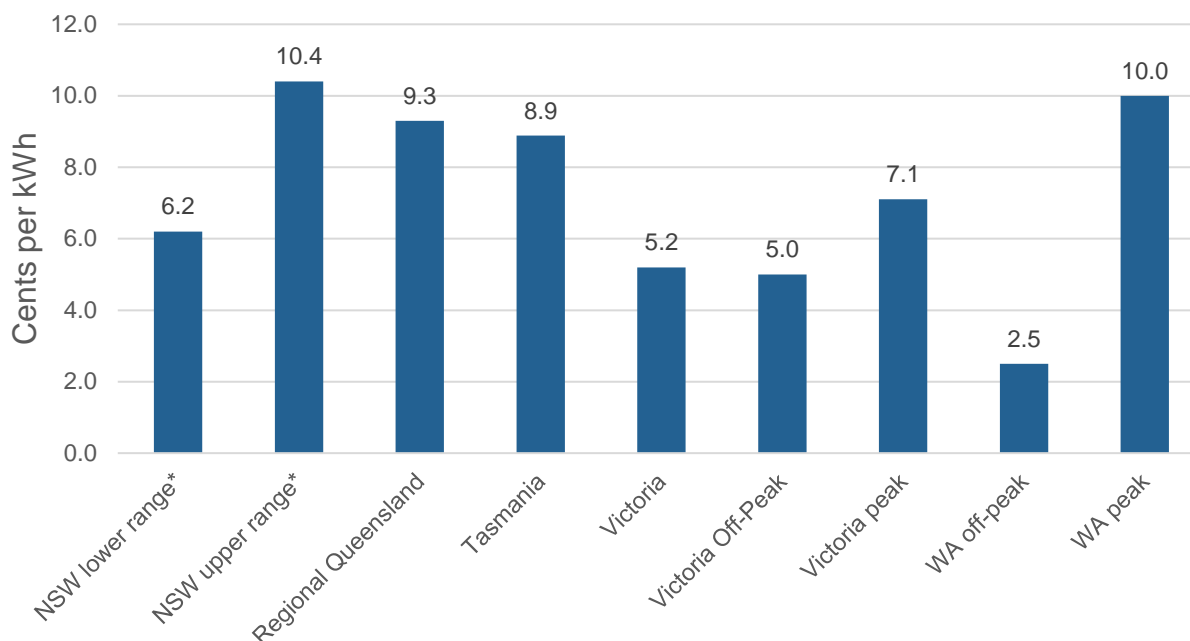
Figure C.1 compares the regulated flat feed-in tariffs across Australia in January 2023.

¹¹¹ It is unclear if Western Australia includes transmission and distribution losses, or market operator costs in its feed-in tariff.

¹¹² It is unclear if the Northern Territory includes transmission and distribution losses, or market operator costs in its feed-in tariff.

In Western Australia, the 10 cents per kWh (applies during peak times of 3pm-9pm) and three or 2.75 cents per kWh depending on the energy retailer (all other hours) under Western Australia’s Distributed Energy Buyback Scheme. These tariffs have been set to encourage households to either self-consume or store their solar energy generation in the middle of the day when it is plentiful and to install west facing panels.¹¹³

Figure C.1: Feed-in tariff flat rates in other jurisdictions January 2023^{a, b, c}



^aVictoria also has time-varying feed-in tariffs ranging from 6.1 to 10.6 cents per kWh for July 2022 to June 2023.

^bWestern Australia’s new Distributed Energy Buyback Scheme has two rates: 10 cents per kWh (Peak 3pm-9pm) and 3 or 2.5 cents per kWh (Off-Peak/all other times) depending on the energy retailer. *WA Synergy customers receive an off-peak feed in tariff of 2.5 cents per kWh, while WA Horizon Power customers receive 3 cents per kWh. ^cIPART also sets NSW benchmarks for time-varying feed-in tariffs at different times of the day, these range from 6.3 cents per kWh (8pm to 6am) and 27.4 cents per kWh (between 6pm-7pm).

¹¹³ WA Synergy customers receive an off-peak feed in tariff of 2.5 cents per kWh, while WA Horizon Power customers receive 3 cents per kWh. Areas that Horizon Power services have higher costs to generate energy. Western Australia Energy Buyback Scheme, accessed 05 January 2023, <https://www.wa.gov.au/organisation/energy-policy-wa/energy-buyback-schemes>

Sample feed-in tariffs offered across Australia

In Victoria, most retailers offer the 5.2 c/kWh rate which matches the current flat minimum feed-in tariff. In less regulated states, retailers tend to offer a wider range of feed-in tariffs, both below and above what is common in Victoria.

It is worth noting higher feed-in tariffs are normally conditional on purchasing solar panels from the retailer or new solar customers changing retailers, and caution should be taken when directly comparing feed-in tariffs. Some retailers also offer a higher feed-in tariff until a certain threshold of energy is exported; once the threshold is reached, the feed-in tariff is reduced.

Appendix D – Technical methodology

Our approach to determining the minimum feed-in tariffs for 2023–24 is largely the same as the approach used to set the minimum feed-in tariffs for 2022–23.

The methodology comprises the following components:

- The solar weighted value of electricity sourced from small scale renewable generators, based on the avoided cost of purchasing an equal amount of electricity from the wholesale market, accounting for price changes throughout the day and seasonally, including:
 - both flat rate and time-varying rate wholesale electricity price forecasts
 - avoided market fees and ancillary service charges.
- Avoided transmission and distribution losses.
- Avoided social cost of carbon and avoided human health costs.

Table D.1 shows how the minimum feed-in tariff is calculated from these components.

Table D.1 – Calculating the minimum feed-in tariff (2023–24)

Component	Calculation	Flat rate	Time-varying rate option 1			Time-varying rate option 2		
			Overnight	Day	Early evening	Shoulder	Peak	Off peak
A: Wholesale electricity prices	Solar export-weighted average price forecast (cents per kWh)	2.13	8.19	1.62	6.28	2.73	7.46	1.13
B: Avoided market fees and ancillary service charges	Budget National Electricity Market fee for 2021–22 used as a best estimate for 2022–23 + Average of the ancillary service charges recovered from customers between week 44 of 2020 and week 45 of 2021 (cents per kWh)	0.15	0.15	0.15	0.15	0.15	0.15	0.15
C: Transmission and distribution loss adjustment	Multiply overall losses for each distribution business by the share of total customer numbers and sum these then make loss adjustment.	6.19%	6.19%	6.19%	6.19%	6.19%	6.19%	6.19%
D: Value of avoided transmission and distribution losses	Multiply (A + B) by C	0.14	0.52	0.11	0.40	0.18	0.47	0.08
E: Value of avoided social cost of carbon	See Appendix F for more information.	2.49	2.49	2.49	2.49	2.49	2.49	2.49
F: Value of avoided human health costs	Not accounted for separately for a number of reasons including overlap	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Component	Calculation	Flat rate	Time-varying rate option 1			Time-varying rate option 2		
			Overnight	Day	Early evening	Shoulder	Peak	Off peak
	with social cost of carbon and installation subsidies.							
Total (rounded to one decimal place)	A + B + D + E + F	4.9	11.3	4.4	9.3	5.5	10.6	3.9

Forecasting wholesale electricity prices

We have used a futures market approach to estimate wholesale electricity prices in 2023–24. This approach best meets our legislative objectives.

We used a futures market approach in previous feed-in tariff decisions. Benefits of using a futures market approach include:

- Providing more transparency to stakeholders than a market modelling approach.
- Ensuring our decision matches the view of ‘the market’ as represented by contract prices.

Increased transparency over the inputs for analysis is consistent with our objectives to promote protections for customers and to promote the long-term interests of Victorian consumers.^{114, 115} Increased transparency gives stakeholders greater opportunities to understand and provide meaningful feedback on our decisions.

Wholesale price forecasts for 2023–24

We engaged Frontier Economics to forecast wholesale electricity prices for 2023–24 using a futures market approach. The following section outlines the approach.

Wholesale price forecast for the flat feed-in tariff

Forecasting the relevant wholesale price for the minimum flat feed-in tariff involves five steps. The purpose of this is to estimate what retailers would pay for customers’ solar exports if this electricity were sold in the wholesale spot market in 2023–24 in the same way as other generators’ do.

1. Calculating the price level for 2023–24. Using the average price of 2022–23 quarterly baseload future swaps from the Australian Stock Exchange (after adjusting for an assumed

¹¹⁴ *Electricity Industry Act 2000*, s. 10(c).

¹¹⁵ *Essential Services Commission Act 2001*, s. 8.

contract premium of five per cent) weighted by traded volume across the most recent 12 months up to a particular date (for this final decision this was 20 January 2022). The 12-month average price is reflective of retailers' approach to buying contracts.

Table D.2 provides the value of these contracts over the 12 months up to and including 20 January 2023. Frontier Economics has updated these estimates from our December 2022 draft decision, to reflect current market expectations. These updates are slightly higher than the estimates contained in our draft decision.

Table D.2 – Average baseload swap contract prices for 2023-24

Calendar quarter	Trade-weighted average price in 12 months to 20 January 2023 (cents per kWh)
Q3 2023	13.47
Q4 2023	6.85
Q1 2024	8.24
Q2 2024	9.49

Source: Base swap price data from ASX Energy and analysis from Frontier Economics.¹¹⁶

2. Selecting the appropriate historical prices and export profile. The commission received half-hourly actual export data for customers across each Victorian electricity distribution network for the period from 1 July 2021 to 30 June 2022. The most recent data is likely to be the best indicator of solar export profiles in 2022–23. Similarly, corresponding spot price data for the same time period is available from the Australian Energy Market Operator.
3. Scaling historical prices to 2023–24 levels. After averaging prices for each quarter for the relevant historical base year, they are compared to the quarterly futures prices in step 1 to determine a scaling factor for each quarter.
4. Apply the scaling factor to the historical prices. Each half-hourly price in the base year is scaled by the relevant factor calculated in step 3 to forecast the half-hourly prices expected in 2023–24.
5. Calculate the flat feed-in tariff. The wholesale electricity component of the flat feed-in tariff is calculated by averaging the half-hourly prices from step 4, weighted according to the volume of solar exports from step 2. The formula for this is:

¹¹⁶ Frontier Economics, *Wholesale Price Forecasts for Calculating Minimum Feed-In Tariff: Final Report for the Essential Services Commission*, 3 February 2023, Chapter 5.

$$\text{Flat FiT wholesale price} = \frac{\sum_{t=1}^{17,568} \text{Expected price 2023} - 24_t \times \text{Exports 2021} - 22_t}{\sum_{t=1}^{17,568} \text{Exports 2021} - 22_t}$$

Wholesale price forecast for the time-varying feed-in tariffs

Steps 1 to 4 of forecasting the time-varying feed-in tariffs are the same for forecasting the flat feed-in tariff. Like the flat feed-in tariff approach, the commission has set the time-varying feed-in tariffs using weightings based on solar export profiles. For step 5, the only difference is that the above weighting is done three times, once for each time block, using only the expected prices and solar exports from the relevant time block.

Estimate of market fees and ancillary service charges

When retailers purchase energy from the wholesale market, they must pay market fees and ancillary service charges to the Australian Energy Market Operator (market operator). The market operator charges these fees based on the amount of electricity that retailers purchase from the wholesale market. Retailers can avoid them if they get electricity from small scale renewable generators.

We have included these fees and charges (shown in Table D.3 below) in our calculation of avoided costs. The total value of market fees and ancillary services are 0.14 cents per kWh.

Table D.3 – Market fees and ancillary service charges

Item	Fee	
	\$/MWh	cents per kWh
National Electricity Market fees	1.07	0.107
Ancillary service charges	0.42	0.042
Total	1.49	0.149

Source: AEMO, 2022–23 Budget and Fees report and ancillary services recovery summaries for 2021 and 2022

Market fees

The National Electricity Market fee levied by the market operator is set in advance of each year through its annual budgeting process. However, the 2022–23 market operator Budget and Fees

paper does not provide an estimate of the fee for 2023–24. Therefore, we have used the 2022–23 market fee of 0.11 cents per kWh for retailers as a best estimate for 2023–24.¹¹⁷

From 2021–22, the market operator levied two new, additional fees on market customers to recover the consolidated costs of the Five-Minute and Global Settlements.¹¹⁸ We have included these new fees in our calculation of the market fees component of the minimum feed-in tariffs. The above changes only have a minor impact on the feed-in tariffs.

Ancillary services

The market operator recovers the cost of providing ancillary services from market participants (retailers) and publishes the recovery rate of ancillary service charges on a weekly basis. In determining feed-in tariffs that apply from 1 July 2023, we have assumed that the average cost of ancillary services in 2023–24 will be consistent with its average over the 2022 calendar year.¹¹⁹

Estimate of the avoided transmission and distribution losses

Electricity supplied to the wholesale market is often produced by large generators located some distance away from the point of consumption. Electricity is transported to households and businesses via a transmission and distribution network (also known as the 'grid'). During this process, a small portion of electricity originally exported to the grid is lost as heat and sound. This is referred to as network or line losses.

Small scale renewable generation reduces network losses because the generated electricity is typically consumed close by. The extent of the associated cost saving varies depending on the location of the generation facility (among other factors such as the quality of the line and the amount of electricity flowing through it). We have incorporated this cost saving into the feed-in tariffs by applying a 'loss factor' to the avoided cost of purchasing electricity in the wholesale market, including market fees and ancillary service charges.

Using the market operator's estimates of distribution loss factors for 2022–23 and their preliminary estimates of marginal loss factors for 2023–24, we have estimated a flat customer share-weighted

¹¹⁷ Australian Energy Market Operator 2022, *2022–23 AEMO Budget and Fees*, published in June 2022, accessed 11 January 2023, https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/aemo-engagement-model/budget-and-fees/aemo-2022-23-budget-and-fees.pdf?la=en

¹¹⁸ Australian Energy Market Operator 2022, *2022–23 AEMO Budget and Fees*, published in June 2022, accessed 11 January 2023, https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/aemo-engagement-model/budget-and-fees/aemo-2022-23-budget-and-fees.pdf?la=en

¹¹⁹ Australian Energy Market Operator 2022, *Ancillary services payments and recovery*, accessed 01 September 2022 <https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/data-nem/ancillary-servicesdata/ancillary-services-payments-and-recovery>.

loss factor of 1.0619 for Victoria. We have then applied this loss factor to derive the value of avoided network losses used in the minimum feed-in tariff calculations. Table D.4 below sets out the inputs to the loss factor calculation which are publicly available on the market operator's website.

In this review, we have used the same approach to network losses as we have in the Victorian Default Offer. We have taken the load weighted average of the short and long sub-transmission distribution loss factors and calculated the transmission loss factors by taking a simple average of the marginal loss factors across each distribution area (after removing some nodes that have no residential or small business load).^{120, 121} These factors are then weighted by the number of low voltage residential and non-residential customers in each distribution zone to develop a Victoria wide loss factor.¹²²

Table D.4 – Inputs for calculating loss factors

Distribution business	Distribution loss factor	Average marginal loss factor	Total loss factor	Number of customers
CitiPower	1.0488	0.9967	1.0453	343,144
Powercor	1.0776	0.9991	1.0766	893,146
United Energy	1.0471	0.9963	1.0432	701,454
AusNet Services	1.0768	1.0034	1.0805	790,228
Jemena	1.0379	0.9994	1.0372	370,535
Customer share-weighted			1.0619	

¹²⁰ Australian Energy Market Operator 2022, *Distribution loss factors for the 2022/23 Financial Year*, accessed 11 January 2023 https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/loss_factors_and_regional_boundaries/2022-23/distribution-loss-factors-for-the-2022-23-financial-year.pdf?la=en

¹²¹ Australian Energy Market Operator 2022, *Preliminary Marginal Loss Factors for the 2023-24 Financial Year*, accessed 20 January 2023, https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/loss_factors_and_regional_boundaries/2023-24-financial-year/preliminary-marginal-loss-factors-for-the-2023-24-financia-year-pdf.pdf?la=en

¹²² Australian Energy Regulator, *Performance reporting*, accessed 10 February 2023, <https://www.aer.gov.au/networks-pipelines/performance-reporting>.

Estimate of the avoided social cost of carbon

In February 2017, the Victorian Government issued an Order in Council ('Order') specifying a methodology for determining the social cost of carbon and the factors we must consider when applying this methodology.¹²³

It defines the avoided social cost of carbon as the avoided 'cost per kilowatt-hour (kWh) of small renewable energy generation electricity purchased by a relevant licensee' (e.g., retailer), determined in accordance with the following methodology and factors:

$$\text{Avoided social cost of carbon} = \text{Volume factor} \times \text{Price factor}$$

The volume factor, in the Order is an emissions intensity coefficient factor of 1.27 kilograms (kg) of carbon dioxide equivalent (CO₂e) per kWh of electricity exported by a small renewable energy generator. This means that 1.27 kg (or 0.00127 tonne) of CO₂e is assumed to be avoided for each kWh of electricity exported by a small renewable energy generator.

For the price factor, we have used the method specified in the Order to determine the value of a tonne of CO₂e. It results in a value of \$19.63 per tonne of CO₂e.

The resulting avoided social cost of carbon is 2.5 cents per kWh.

Human health costs

The Victorian Government has not made a separate Order in Council that specifies a factor or method for determining avoided human health costs attributable to a reduction in air pollution.

We reviewed the associated health benefits as part of our inquiry into the energy value of distributed generation in 2016.¹²⁴ We have also re-examined this matter a number of times since. However, due to a lack of sufficient evidence and data, we could not reliably place a separate monetary value on the avoided human health costs. Additionally, there is no consensus on the appropriate methodology to estimate the health benefits attributable to a reduction in air pollution.

¹²³ Victorian Government 2017, *Victoria Government Gazette No. S 36*, Tuesday 21 February 2017, Order specifying a methodology and factors for the determination of the avoided social cost of carbon (Order in Council).

¹²⁴ Essential Services Commission, *The energy value of distributed generation, August 2016*, pp. 62-63, <https://www.esc.vic.gov.au/sites/default/files/documents/Distributed-Generation-Inquiry-Stage-1-Final-Report-Energy-Value-FINAL-20160916.pdf>.

The Department of Environment, Land, Water and Planning has noted similar issues around data and raised concerns about reliably estimating these health costs in a Victorian context.¹²⁵

We also note that there is some evidence that the avoided social cost of carbon and other government subsidies already account for the human health benefits. As a result, in the absence of one definitive and reliable quantification methodology and data source, our decision is to set the stand-alone avoided human health costs at 0 cents per kWh.

¹²⁵ Department of Environment, Land, Water and Planning 2019, *Estimating the health costs of air pollution in Victoria*, pp. 3-5, https://www.climatechange.vic.gov.au/_data/assets/pdf_file/0022/421717/Final_Health-costs-of-air-pollution-in-Victoria.pdf.

Appendix E – Legislation on setting feed-in tariffs

Table D.1: Relevant sections of the Essential Services Commission Act

Section	
s. 8(1)	<p>Objective of the Commission</p> <p>In performing its functions and exercising its powers, the objective of the Commission is to promote the long-term interests of Victorian consumers.</p>
s. 8(2)	<p>Without derogating from subsection (1), in performing its functions and exercising its powers in relation to essential services, the Commission must in seeking to achieve the objective specified in subsection (1) have regard to the price, quality and reliability of essential services.</p>
s. 8A(1)	<p>Matters which the Commission must have regard to</p> <p>In seeking to achieve the objective specified in section 8, the Commission must have regard to the following matters to the extent that they are relevant in any particular case—</p> <ul style="list-style-type: none"> (a) efficiency in the industry and incentives for long term investment; (b) the financial viability of the industry; (c) the degree of, and scope for, competition within the industry, including countervailing market power and information asymmetries; (d) the relevant health, safety, environmental and social legislation applying to the industry; (e) the benefits and costs of regulation (including externalities and the gains from competition and efficiency) for— <ul style="list-style-type: none"> (i) consumers and users of products or services (including low income and vulnerable consumers); (ii) regulated entities [electricity distributors and retailers]; (f) consistency in regulation between States and on a national basis; (g) any matters specified in the empowering instrument [in this case, the Electricity Industry Act (the Act)].
s. 8A(2)	<p>Without derogating from section 8 or subsection (1), the Commission must also when performing its functions and exercising its powers in relation to a regulated industry do so in a manner that the Commission considers best achieves any objectives specified in the empowering instrument [the Act].</p>

Table D.2: Relevant sections of the Electricity Industry Act

Section	
s. 10	<p>Objectives of the Commission</p> <p>The objectives of the Commission under this Act are—</p>

- (a) to the extent that it is efficient and practicable to do so, to promote a consistent regulatory approach between the electricity industry and the gas industry; and
- (b) to promote the development of full retail competition; and
- (c) to promote protections for customers, including in relation to assisting customers who are facing payment difficulties.

s. 40F(1)

Definitions

In this Division—

biomass energy generation facility means a generation facility that generates electricity by utilising energy from the combustion of—

- (a) biomass; or
- (b) biogas;

general renewable energy feed-in terms and conditions has the meaning given by section 40FB;

hydro generation facility means a generation facility that generates electricity by utilising the energy from moving water;

non-complying licensee means—

- (a) a relevant licensee that has not complied with a condition set out in section 40FF(1) or 40G(1); or
- (b) a small retail licensee that has not complied with the condition set out in section 40FG(3);

qualifying customer, of a relevant licensee or small retail licensee, means a person who—

- (a) purchases electricity from that relevant licensee or small retail licensee; and
- (b) engages in the generation of electricity—
 - (i) at a property that the person occupies as their principal place of residence by means of one qualifying solar energy generating facility at the property; or
 - (ii) at one or more properties—
 - (A) that the person occupies, otherwise than as a place of residence, by means of one qualifying solar energy generating facility at each of those properties; and
 - (B) at which the person's annual consumption rate of electricity is 100 megawatt hours or less; and
- (c) has been exempted by Order under section 17 from the requirement to hold a licence in respect of the generation of electricity for supply and sale;

qualifying solar energy generating facility means a photovoltaic generation facility that—

- (a) has an installed or name-plate generating capacity of 5 kilowatts or less; and
- (b) is connected to a distribution system;

qualifying solar energy generation electricity means electricity that a qualifying customer generates and does not use;

relevant generator means—

- (a) a generation company; or
- (b) a person engaging in the generation of electricity for supply or sale that has been exempted by Order under section 17 from the requirement to hold a licence in respect of that activity;

relevant licensee means a person that—

- (a) holds a licence to sell electricity; and
- (b) sells electricity to more than 5000 customers;

small renewable energy generation electricity means non-pool electricity supplied by a relevant generator from a small renewable energy generation facility operated by that generator;

small renewable energy generation facility means a facility of the following kind, connected to a distribution system, that generates electricity and has an installed or name-plate generating capacity of less than 100 kilowatts—

- (a) a wind energy generation facility;
- (b) a solar energy generation facility;
- (c) a hydro generation facility;
- (d) a biomass energy generation facility;
- (e) a facility or class of facility specified for the purposes of this definition under subsection (2)—

but does not include a qualifying solar energy generating facility or a TFiT scheme generating facility that is connected to a distribution system under the premium solar feed-in tariff scheme or TFiT scheme;

small retail licensee means a person that—

- (a) holds a licence to sell electricity; and
- (b) sells electricity to 5000 or less customers;

solar energy generation facility means a generation facility that generates electricity by converting solar energy into electricity;

feed-in tariff

wind energy generation facility means a generation facility that generates electricity by converting wind energy into electricity.

s. 40F(2)

The Governor in Council, by Order published in the Government Gazette, may, for the purposes of paragraph (e) of the definition of **small renewable energy generation facility**, specify a facility or class of facility that

generates electricity in any way as a small renewable energy generation facility.

s. 40FB(1) **Meaning of general renewable energy feed-in terms and conditions**

General renewable energy feed-in terms and conditions are the prices, terms and conditions comprising an offer under which a relevant licensee will purchase, from a relevant generator, **small renewable energy generation electricity**.

s. 40FB(2) Without limiting subsection (1), on and after the commencement of section 4 of the **Energy Legislation Amendment (Feed-in Tariffs and Other Matters) Act 2013**, general renewable energy feed-in terms and conditions must, as a minimum, include terms and conditions under which—

(a) an amount, specified for a financial year under section 40FBA, is credited against the charges payable to the relevant licensee by a customer who is a relevant generator for electricity the licensee supplies to the customer (a **general renewable energy credit**); and

(b) a general renewable energy credit that arises during a period of supply of electricity to that customer is included in the electricity bill of that customer that relates to that period of supply; and

(c) if, in a period of supply of electricity to the customer, a general renewable energy credit exceeds the amount owed by that customer for electricity supplied to that customer in that period of supply, the excess general renewable energy credit amount is—

(i) credited against the charges payable to the relevant licensee by that customer for electricity the licensee supplies to that customer in the next period of supply of electricity to that customer; and

(ii) included in that customer's electricity bill that relates to that period of supply of electricity; and

(d) any excess general renewable energy credit amount referred to in paragraph (c) is extinguished on the day the contract for the supply of electricity by the relevant licensee to the customer ends.

s. 40FBA **Rates for purchases of small renewable energy generation electricity**

For the purposes of section 40FB(2)(a), in each financial year the amount to be credited against the charges payable to a relevant licensee by a customer who is a relevant generator is determined at—

(a) the rate or rates determined by the Commission under section 40FBB for that financial year; or

(b) if the Commission has not determined one or more rates under section 40FBB for that financial year—the rate or rates that applied immediately before the commencement of that financial year.

s. 40FBB(1) **Commission to determine one or more rates for purchases of small renewable energy generation electricity**

The Commission may determine one or more rates for the purposes of section 40FBA(a).

- s. 40FBB(2) A rate determined under subsection (1) must be—
- (a) determined not later than 28 February in the financial year preceding the financial year in which it is to apply; and
 - (b) published in the Government Gazette not later than that date.
- s. 40FBB(3) In determining a rate for the purposes of section 40FBA(a), the Commission must have regard to—
- (a) prices of electricity in the wholesale electricity market; and
 - (b) any distribution and transmission losses avoided in Victoria by the supply of small renewable energy generation electricity; and
 - (c) the following avoided costs—
 - (i) the avoided social cost of carbon;
 - (ii) the avoided human health costs attributable to a reduction in air pollution.
- s. 40FBB(3A) If an Order under subsection (3B) is in effect, the avoided costs that the Commission must have regard to under subsection (3) are the avoided costs determined in accordance with the methodology or factor specified in the Order for the relevant avoided costs.
- s. 40FBB(3B) The Governor in Council, by Order published in the Government Gazette, may specify a methodology or factor for the determination of—
- (a) the avoided social cost of carbon; or
 - (b) the avoided human health costs attributable to a reduction in air pollution.
- s. 40FBB(4) A determination of the Commission under this section is not a determination for the purposes of the **Essential Services Commission Act 2001**.

Appendix F: Order in Council – avoided social cost of carbon



Victoria Government Gazette

No. S 36 Tuesday 21 February 2017
By Authority of Victorian Government Printer

Electricity Industry Act 2000

ORDER SPECIFYING A METHODOLOGY AND FACTORS FOR THE DETERMINATION OF THE AVOIDED SOCIAL COST OF CARBON

Order in Council

The Governor in Council makes the following Order:

1. **Purpose**
The purpose of this Order is to specify a methodology and factors for the determination of the avoided social cost of carbon which the Essential Services Commission (ESC) must have regard to under section 40FBB(3)(c) of the *Electricity Industry Act 2000*.
2. **Authorising provision**
This Order is made under section 40FBB(3B) of the *Electricity Industry Act 2000*.
3. **Commencement**
This Order takes effect on the day it is published in the *Victoria Government Gazette*.
4. **Definitions**
In this Order –
avoided, in relation to CO₂e, has the meaning given by clause 5;
CO₂e has the same meaning as *carbon dioxide equivalent of a greenhouse gas* (as defined in section 3(3) of the *Victorian Energy Efficiency Target Act 2007*);
relevant financial year means the 2017/18 financial year, for which a rate or rates determined under section 40FBB of the *Electricity Industry Act 2000* will apply;
relevant period means the five-year period ending on 31 December of the calendar year that ends 6 months prior to the commencement of the relevant financial year.
5. **Meaning of avoided (in relation to CO₂e)**
For the purposes of this Order, CO₂e is *avoided* if demand for electricity generated by a generation facility that is not a small renewable energy generation facility falls because of the export of small renewable energy generation electricity.
6. **Methodology and factors for determining social cost of carbon**
For the purposes of section 40FBB(3)(c)(i) of the *Electricity Industry Act 2000*, the avoided social cost of carbon for the relevant financial year is the cost per kilowatt-hour of small renewable energy generation electricity purchased by a relevant licensee, determined in accordance with the following methodology and factors –
$$\text{Avoided social cost of carbon} = \text{Volume factor} \times \text{Price factor}$$
where –
Avoided social cost of carbon is the cost per kilowatt-hour of small renewable energy generation electricity purchased by a relevant licensee, expressed in dollars;
Volume factor is the volume of CO₂e that is avoided by each kilowatt-hour of small renewable energy generation electricity purchased by a relevant licensee, expressed in tonnes and calculated in accordance with the formula in clause 7; and
Price factor is the value of a tonne of CO₂e for the relevant financial year, expressed in dollars and calculated in accordance with the formula in clause 8.

SPECIAL

7. **Formula for calculating Volume factor**

For the purposes of clause 6, the Volume factor must be calculated in accordance with the following formula –

$$\text{Volume factor} = \frac{\text{Coefficient factor} \times X}{1000}$$

where –

Volume factor is the volume of CO₂e that is avoided by each kilowatt-hour of small renewable energy generation electricity purchased by a relevant licensee, expressed in tonnes; and
X is 1 (representing 1 kilowatt-hour of electricity exported by a small renewable energy generation facility); and

Coefficient factor is 1.27 (reflecting that 1.27 kilograms of CO₂e are avoided by the export of every kilowatt-hour of small renewable energy generation electricity).

8. **Formula for calculating Price factor**

(1) For the purposes of clause 6, the Price factor must be calculated in accordance with the following formula –

$$\text{Price factor} = \left(\sum_{m=1}^q P_m \right) \div q$$

where there are *q* months within the relevant period and –

Price factor is the value of a tonne of CO₂e for the relevant financial year, expressed in dollars; and

P_m is the VEET average market spot price of one tonne of CO₂e for month *m* of the relevant period.

(2) For the purposes of subclause (1), the *VEET average market spot price* is, for a month specified in column 1 of the following Table, the corresponding amount specified in column 2 of the Table opposite that month.

Table

Column 1	Column 2
Month	VEET average market spot price
Jan 2012	\$ 33.51
Feb 2012	\$ 23.81
Mar 2012	\$ 22.09
Apr 2012	\$ 21.89
May 2012	\$ 23.71
Jun 2012	\$ 23.95
Jul 2012	\$ 21.32
Aug 2012	\$ 21.17
Sep 2012	\$ 22.55
Oct 2012	\$ 21.56
Nov 2012	\$ 20.00
Dec 2012	\$ 20.00

Column 1	Column 2
Month	VEET average market spot price
Jan 2013	\$ 19.85
Feb 2013	\$ 18.13
Mar 2013	\$ 17.19
Apr 2013	\$ 17.60
May 2013	\$ 17.10
Jun 2013	\$ 14.80
Jul 2013	\$ 13.88
Aug 2013	\$ 14.84
Sep 2013	\$ 13.65
Oct 2013	\$ 12.64
Nov 2013	\$ 15.25
Dec 2013	\$ 16.59
Jan 2014	\$ 16.21
Feb 2014	\$ 18.38
Mar 2014	\$ 19.70
Apr 2014	\$ 19.13
May 2014	\$ 18.41
Jun 2014	\$ 19.29
Jul 2014	\$ 17.40
Aug 2014	\$ 15.76
Sep 2014	\$ 14.48
Oct 2014	\$ 14.37
Nov 2014	\$ 17.25
Dec 2014	\$ 19.96
Jan 2015	\$ 18.36
Feb 2015	\$ 18.42
Mar 2015	\$ 18.76
Apr 2015	\$ 18.73
May 2015	\$ 18.90
Jun 2015	\$ 19.24
Jul 2015	\$ 20.69
Aug 2015	\$ 26.10
Sep 2015	\$ 32.73
Oct 2015	\$ 32.97
Nov 2015	\$ 27.20
Dec 2015	\$ 27.25

Column 1	Column 2
Month	VEET average market spot price
Jan 2016	\$ 24.76
Feb 2016	\$ 23.07
Mar 2016	\$ 22.51
Apr 2016	\$ 20.87
May 2016	\$ 18.84
Jun 2016	\$ 17.78
Jul 2016	\$ 16.62
Aug 2016	\$ 14.61
Sep 2016	\$ 14.37
Oct 2016	\$ 16.13
Nov 2016	\$ 15.80
Dec 2016	\$ 15.40

Dated 21 February 2017

Responsible Minister:

HON LILY D'AMBROSIO MP

Minister for Energy, Environment and Climate Change

MONICA BIRD

Acting Clerk of the Executive Council