

Minimum Feed-in Tariff to apply from 1 July 2023

Draft Decision

20 December 2022

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Contents

Summary	4
The feed-in tariff is paid to customers for their energy exports	4
We must consider certain costs in setting the minimum feed-in tariffs	5
We protect the interests of solar and non-solar customers	5
Feed-in tariffs are decreasing during the day but increasing at night	6
Wholesale prices and solar exports drive the change in the feed-in tariffs	7
Average wholesale prices are up but prices during daylight hours are decreasing	7
The main benefit of installing solar is avoiding retail prices for electricity	11
The payback period on your solar system should account for self-consumption	11
We invite feedback on our draft decision	11
Details of our minimum feed-in tariff draft decision	13
The proposed minimum flat feed-in tariff is lower	13
We propose minimum time varying feed-in tariffs increase at night	13
A number of costs are accounted for in the minimum feed-in tariffs	14
How we set the minimum feed-in tariffs	16
The minimum feed-in tariffs promote the interests of all electricity users	16
We must consider certain costs in setting minimum feed-in tariffs	16
The steps for setting the minimum feed-in tariff	17
We used a futures market approach to forecast wholesale electricity prices	18
We forecast wholesale prices for different times of the day	19
Market fees, ancillary services and line losses	19
Market fees and ancillary service charges	19
Network or line losses	20
The cost of carbon and human health costs	20
Cost of carbon	21
Human health costs	22
Appendix A – What is a feed-in tariff?	25
What is the minimum feed-in tariff?	25
What is our role in setting the minimum feed-in tariff?	27
Producing and using your own energy is the other benefit from small renewable generation	28
What offers are currently in the market?	29
How has the feed-in tariff changed over time?	30
Premium feed-in tariff	30
Standard feed-in tariff	30
Transitional feed-in tariff	31
Minimum feed-in tariff	31
Appendix B – Minimum feed-in tariff rate comparisons	33
Comparison of feed-in tariffs with other jurisdictions	33

The level of feed-in tariffs in other jurisdictions	34
Most states base feed-in tariffs on wholesale electricity prices	35
Appendix C – Technical methodology	36
Forecasting wholesale electricity prices	37
Wholesale price forecasts for 2023–24	38
Structuring the time-varying feed-in tariff	39
Estimate of market fees and ancillary service charges	39
Market fees	40
Ancillary services	40
Estimate of the avoided transmission and distribution losses	40
Estimate of the avoided social cost of carbon	42
Human health costs	42
Appendix D – Legislation on setting feed-in tariffs	43
Appendix E: Order in Council – avoided social cost of carbon	48

Summary

- During 2023, overnight and early evening wholesale electricity prices are forecast to increase significantly, while daytime prices are forecast to fall as solar electricity output grows. The result is that for the minimum time-varying feed-in tariffs, the proposed overnight and early evening tariffs have increased for those who can export during those times.
- However, the proposed minimum flat and day feed-in tariffs are lower due to the quantities of exports during daylight hours when prices are lower.
- As a result, our draft decision is to set the minimum flat rate feed-in tariff at 4.8 cents per kWh starting 1 July 2023.
- Our draft decision also sets the minimum time-varying feed-in tariffs at rates ranging from 4.3 to 10.8 cents per kWh.
- We will update our cost forecasts when we make our final decision. Our final decision figures are very likely to be different to those in the draft decision.
- Retailers can offer the flat feed-in tariff **and/or** the time-varying feed-in tariffs.
- Retailers cannot offer feed-in tariff rates below the minimum rates, but they can offer more than the minimum.

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

Retailers must pay customers a feed-in tariff when small customers 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.¹

For simplicity, this decision refers to eligible customers as solar customers. Solar accounts for 99.9 per cent of small-scale renewable energy generation in Victoria.²

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

² Clean Energy Council, [Postcode data for small-scale installations](#), accessed 4 August 2022

The Essential Service Commission sets minimum tariffs for both the flat and time-varying feed-in tariffs that a retailer can offer. Customers on the flat feed-in tariff are paid the same amount for their exports regardless of the time of day they export energy back to the grid.

We must consider certain costs in setting the minimum feed-in tariffs

The minimum feed-in tariff reflects the value that solar customers provide to the energy market including the social benefits of reducing the pollution associated with fossil fuel electricity generation. The feed-in tariffs are determined based on cost categories set out in the *Electricity Industry Act 2000*.

The Electricity Industry Act 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.³

Under the Electricity Industry Act⁴, when setting the minimum feed-in tariffs, we must consider:

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

Further detail about the costs we must consider is in the chapter ‘How we set the minimum feed-in tariffs.’ The legislative framework for setting the minimum feed-in tariffs is set out in Appendix D.

We protect the interests of 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

³ Electricity Industry Act 2000, s. 40FBB(2)(a)

⁴ Electricity Industry Act 2000, s. 40FBB(3)(a),(b), and (c).

- development of full retail competition.^{5 6}

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 with solar exports and the value of avoiding pollution. Minimum feed-in tariffs above the value of solar exports would result in non-solar customers subsidising solar customers through higher electricity rates. Retailers must pay at least the minimum feed-in tariffs to their solar customers. As retailers set their own prices for market offers, when costs go up, retailers pass these on to customers in their market offers.

Customers paying more than needed for electricity would not be consistent with our objectives.

Feed-in tariffs are decreasing during the day but increasing at night

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

We explain this approach in detail in the chapter ‘How we set minimum feed-in tariffs.’

The draft minimum flat feed-in tariff for 2023-24 is 4.8 cents per kWh. This is eight per cent lower than the minimum rate for 2022–23. For the proposed time varying feed-in tariffs, the day rate is 14 per cent lower but the early evening and overnight rates are 30 and 52 per cent higher than those for 2022–23. The minimum feed-in tariff rates are shown in S.1.

Table S.1: Minimum feed-in tariffs to apply from 1 July 2023, excluding GST^{7*}

Flat rate		Time-varying rates (c/kWh)	
All times	Overnight (Weekdays: 10pm–7am Weekends: 10pm-7am)	Day Weekdays: 7am–3pm, 9pm–10pm Weekends: 7am–10 pm)	Early evening (Weekdays: 3pm–9pm Weekends: n/a)
4.8	10.8	4.3	9.0

⁵ Essential Services Commission Act 2001, s. 8.

⁶ Electricity Industry Act 20020. s. 10.

⁷ These tariff periods reflect arrangements in older time varying network tariffs. The periods were set in an Order in Council: Victoria Government Gazette, No S 216, 19 June 2013, Advanced Metering Infrastructure (AMI Tariffs) Order, Schedule, p 9. Accessed 15 December 2022, <http://www.gazette.vic.gov.au/gazette/Gazettes2013/GG2013S216.pdf>

*Feed-in tariffs of solar customers registered for GST are subject to GST.⁸ Most residential solar owners are not registered for GST and GST will not apply to their feed-in tariffs.

Wholesale prices and solar exports drive the change in the feed-in tariffs

The proposed minimum flat feed-in tariff for 2023–24 is 4.8 cents per kWh, which is eight per cent lower than the flat tariff that we set for 2022–23. This is mostly because of low daytime wholesale electricity prices, driven by increased solar uptake and exports during daylight hours.

On the other hand, night-time wholesale electricity prices have increased significantly. This has led to much higher early evening and overnight feed-in tariff rates. But because most solar exports happen during the day when prices are at their lowest (and often negative), the day rate and the flat feed-in tariff have decreased.

Average wholesale prices are up but prices during daylight hours are decreasing

We acknowledge that average wholesale electricity prices have increased recently and are forecast to continue to increase. However, during the daytime, when most solar exports occur, prices have decreased significantly over recent years. Increased installation of roof-top, and utility scale, solar has decreased demand for and increased supply of electricity during daylight hours. Solar customers avoid having to import as much electricity from the grid (reducing their demand) and export their excess generation (increasing supply). This has decreased daytime prices so much that during daylight hours wholesale prices now often become negative. For example, in financial year 2022, around 40 per cent of rooftop solar exports happened when wholesale prices were negative compared to around 19 per cent in financial year 2021 (See Figure S.1 below).

In the national electricity market, generators make bids to send electricity into the market. The generators that bid the lowest prices are then allowed to send electricity into the grid. Usually, prices are positive but when demand is low some generators will pay to make sure they can dispatch their electricity. For example, coal generators take a long time to turn off and turn back on again, and it can be operationally costly to do so. To supply electricity at high prices at night, they are willing to make a loss during the day (when wholesale prices are low or negative). Similarly, renewable generators are often willing to pay to send power into the grid if their carbon credits pay out more than the negative wholesale price.

With this increased supply and decreased demand, and the resulting lower daytime wholesale prices, the flat feed-in tariff and day rate for the time varying feed-in tariff have decreased. The

⁸ Australian Tax Office, Electricity and Gas Industry Partnerships, accessed 8 August 2022, https://www.ato.gov.au/business/gst/in-detail/gst-issues-registers/electricity-and-gas-industry-partnerships---issuesregister/?page=1#1_Are_there_any_GST_implications_for_owners_of_grid_connected_solar_power_generation_equipment_in_respect_of_electricity_supplied_via_the_network.

relationship between wholesale prices for solar exports and total solar exports is shown in Figure S.2 below. Frontier Economics' report on wholesale costs on contains further details.⁹

Figure S.1: Share of solar exports during negative price periods

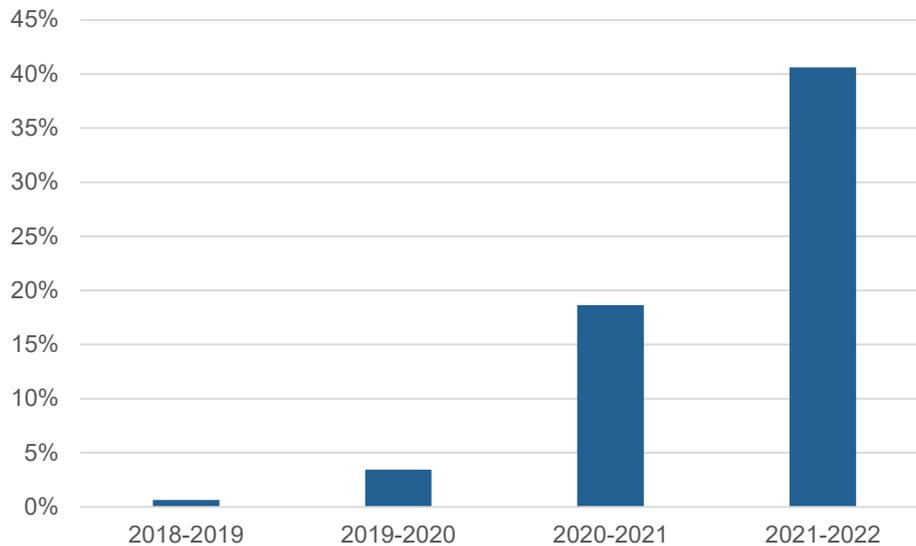
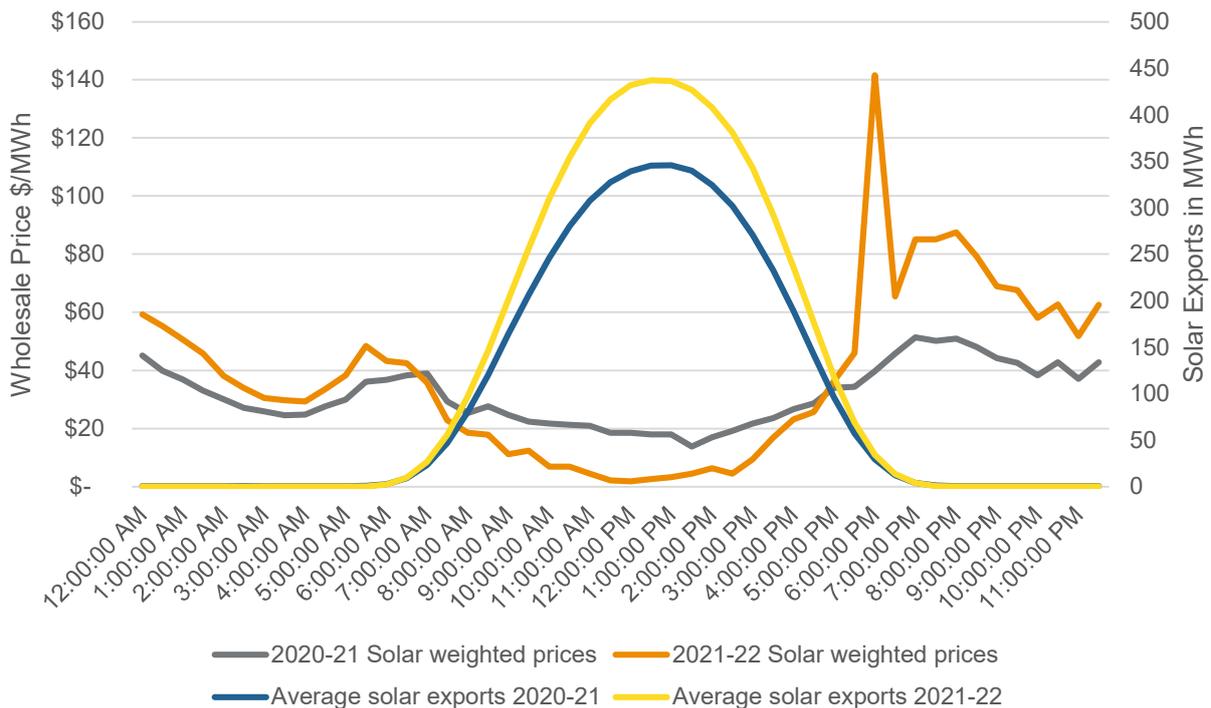


Figure S.2: Average solar weighted prices and solar exports across the day



⁹ Frontier Economics, *Wholesale price forecasts for calculating minimum feed-in tariff: Draft report for the Essential Services Commission*, November 2022, chapter 5.

The average prices in figure S.2 have been solar weighted. This means that prices when solar exports are high contributed more to the average while prices when solar exports are low contributed less. Average prices without solar weighting tend to be higher because when solar exports are low, electricity supply also tends to be lower. To calculate the solar weighted average, we multiply the price for each price interval by the share of total solar exports that happened during that interval. We then add the result for all relevant price intervals together (for example price times share of exports for all half hour intervals starting at 12pm in 2021-22) to find the solar weighted price for that year.

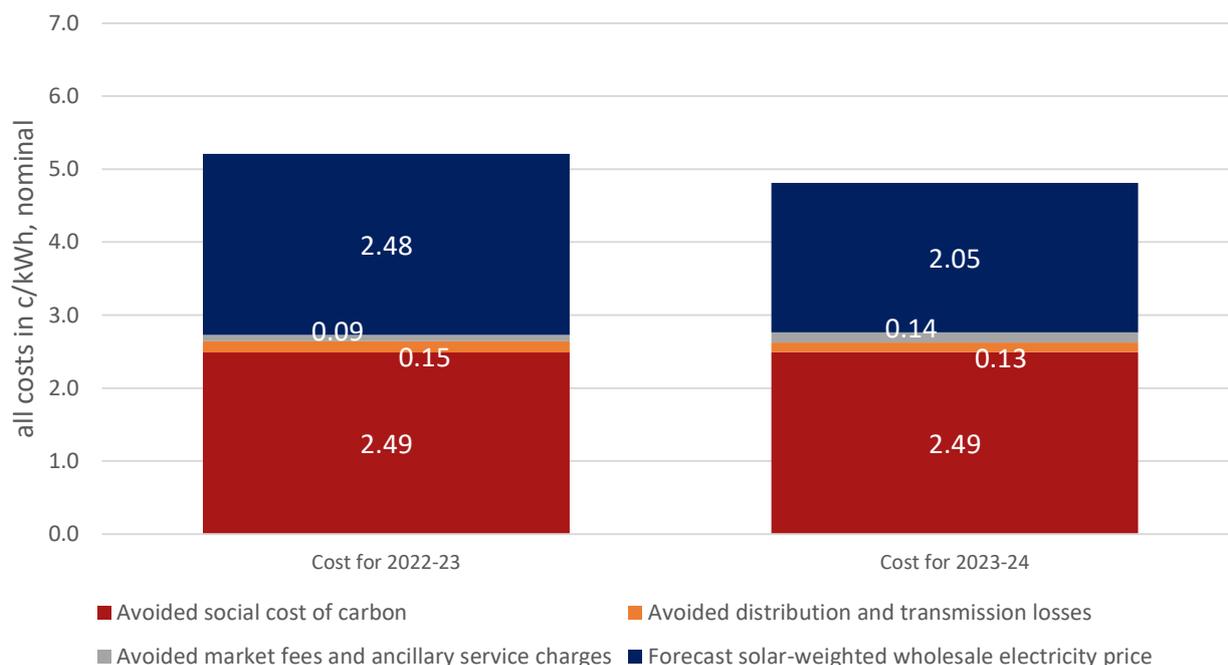
The exports and prices in figure S.2 exclude data for the autumn quarter (April-June) for both years. We removed this data from the chart because we do not think it provides a good indication of future solar weighted prices. Prices in the national electricity market for the autumn quarter were anomalously high in 2021-22 due to: abnormally cold and overcast weather, coal and gas shortages, and unusual generator and transmission network outages. These do not reflect the expected market conditions for 2023-24. Wholesale prices are usually at their lowest during the autumn quarter. ASX futures contracts also show prices in the autumn quarter are expected to be lower in 2023-24. Other feed-in tariff cost components are largely the same

In general, we have used largely the same approach as we have in past feed-in tariff reviews. There were some minor changes to the amount of some cost components, such as avoided transmission losses. This is because we have used more recent data.

We will update all cost components with the most recent data available, including wholesale price data, when we make our final decision in February 2023.

We explain the methodology we use to forecast minimum feed-in tariff costs in later chapters.

Figure S.3: Comparison of costs in the flat feed in tariffs for 2022-23 and 2023-24



Electricity generators and retailers have different costs

Solar customers are electricity generators. They are not electricity retailers. The minimum feed-in tariff is a payment for generating electricity. Solar customers do not incur the costs that electricity retailers do. When retailers sell electricity to their customers, they must cover other costs in addition to the costs of generation. These costs include:

- buying energy from the wholesale market
- hedging energy risks
- transporting electricity
- environmental obligations
- regulatory obligations
- overheads.

It would not be appropriate to compensate solar customers for value they do not provide when exporting electricity to the grid. Solar customers do not have ongoing regulatory or environmental costs, billing systems, or hedging costs for their solar panels.

These extra costs retailers face mean that the minimum feed-in tariffs will always be lower than retail tariffs.

The main benefit of installing solar is avoiding retail prices for electricity

While each customer is different, the main financial benefit for solar customers is the savings from using the electricity they generate during the day and avoiding paying retail rates for electricity. These savings can be increased if consumers can shift some of their demand (for example by running a clothes or dishwashing machine, hot water systems during the day) to when their solar system is operating rather than in the evening or late afternoon.

The feed-in tariff provides a financial benefit to solar customers when they export unused electricity, but generally solar customers will have greater savings when they use the electricity they generate themselves.

The payback period on your solar system should account for self-consumption

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. To maximise the return on investment on a solar system, it is best to install a system that roughly matches your daytime electricity requirements and not significantly more. If you connect a system which far exceeds your daily usage the return per kW will be lower, and your payback period will be longer.

We invite feedback on our draft decision

We want to hear your views on our draft decision. Submissions should be made by 5pm, 30 January 2023. We will publish the final decision by 28 February 2023.

Go to Engage Victoria's website to make a submission: www.engage.vic.gov.au.

If this is an issue, please email us at fitreview@esc.vic.gov.au to discuss other options for making a submission.

Table S.2: Timeframes for the 2023–24 minimum feed-in tariff review

Tariff	Date
Draft decision	20 December 2022
Submissions on draft decision close	30 January 2022
Final decision	By 28 February 2023
Price determination gazettal	By 28 February 2023
Minimum feed-in tariff 2023-24 takes effect	1 July 2023

All submissions come under the commission's submissions policy.¹⁰ We will publish all submissions on the commission's website unless they include commercially sensitive or confidential information. Submissions should identify which information is sensitive or confidential and the reasons why we should not publish them.

¹⁰ The commission's submission policy can be found at www.esc.vic.gov.au/submissions.

Details of our minimum feed-in tariff draft decision

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

- a minimum flat feed-in tariff
- a minimum time-varying feed-in tariff made up of overnight, day, and early evening rates.

Solar customers with a flat feed-in tariff get paid the same amount regardless of the time of day or day of the week. Solar customers with time varying feed-in tariffs get paid different amounts at different times of the day and week.

The proposed minimum flat feed-in tariff is lower

The proposed minimum flat feed-in tariff for 2023–24 is 4.8 cents per kWh. The minimum flat feed-in tariff for 2022–23 was 5.2 cents per kWh.

While wholesale electricity prices have increased overall, wholesale electricity prices are forecast to be lower during daylight hours. The growing number of solar installations have caused lower daytime prices by adding supply of and reducing demand for electricity during the day. The minimum flat feed-in tariff reflects these lower daytime wholesale prices. See chapter 5 of Frontier Economics' report for further details.¹¹

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

Tariff	Flat rate to apply at all times
Minimum feed-in tariff	4.8

We propose minimum time varying feed-in tariffs increase at night

Table 1.2 sets out the proposed time-varying feed-in tariffs for 2023–24 and the time blocks for when they apply. Retailers with time varying feed-in tariffs must offer at least the minimum rate that applies in each time block but are free to offer higher rates. So long as retailers meet the minimum rate for each time block, they can design their own time-varying tariff profiles.

While wholesale prices have decreased during the day, in the evening when demand for electricity is highest, wholesale electricity prices have increased. For this reason, the minimum time varying feed-in tariffs for the early evening and overnight periods have increased. Our draft decision is that in 2023–24 the early evening tariff will be 9 cents per kWh and the overnight rate will be

¹¹ Frontier Economics, *Wholesale price forecasts for calculating minimum feed-in tariff: Draft report for the Essential Services Commission*, November 2022, chapter 5.

10.8 cents per kWh. This compares to the current rates of 6.9 cents per kWh and 7.1 cents per kWh respectively.

Table 1.2: Minimum time-varying feed-in tariffs – 2023–24 (cents per kWh, solar-weighted)

Time block	Overnight	Day	Early evening
Minimum feed-in tariff	10.8	4.3	9.0
Time period weekdays	10 pm–7 am	7 am–3 pm, 9 pm–10 pm	3 pm–9 pm
Time period weekends	10 pm–7 am	7 am–10 pm	n/a

We have chosen to keep the same tariff periods as in past years. We considered amending the tariff periods to reflect the distribution networks' time blocks. However, these different time blocks would lead to exports during the overnight feed-in tariff period being paid at the daytime rate, or close to it. That would remove the incentive for customers to export into the grid at night. Therefore, we have decided to retain the current time blocks to create better incentives to export energy overnight.

However, we have received some feedback that other time blocks would be preferable. For example, having a peak block (4pm to 9pm), an off-peak block (10am to 2pm) and a shoulder block (all other times). We seek further feedback on the time blocks for the time-varying feed-in tariffs. Any proposals should explain how the proposed time blocks:

- reflect solar weighted wholesale costs,
- improve solar export incentives, and
- are as simple as is practical – to ensure they can be understood by consumers.

A number of costs are accounted for in the minimum feed-in tariffs

When setting the minimum feed-in tariffs, we must have regard to the costs set out in the Electricity Industry Act 2000.¹² These include:

- wholesale electricity prices
- market fees and ancillary service charges for participating in the National Energy Market
- network or line losses
- the avoided social cost of carbon and human health costs attributable to air pollution.

¹² *Electricity Industry Act 2000*, s. 40FBB(3)(a), (b) and (c).

We outline the details of these components in the next chapter. Wholesale prices make up most of the costs in the feed-in tariffs and are the main reason why the minimum feed-in tariffs change.¹³

Table 1.3 sets out how the various cost components make up the feed-in tariffs.

Table 1.3: Components of the 2023–24 minimum feed-in tariffs (cents per kWh)

Feed-in tariff component	Flat	Overnight	Day	Early evening
Forecast solar-weighted average wholesale electricity price	2.1	7.7	1.6	6.0
Avoided market fees and ancillary service charges	0.1	0.1	0.1	0.1
Value of avoided distribution and transmission losses	0.1	0.5	0.1	0.4
Value of avoided social cost of carbon	2.5	2.5	2.5	2.5
Total feed-in tariff rate	4.8	10.8	4.3	9.0

¹³ Wholesale electricity prices accounted for almost 71 per cent of the 2020–21 feed-in tariffs, 60 per cent of the 2021–22 feed-in tariffs, 47 per cent of the draft feed-in tariffs for 2022–23 and 42 per cent of the draft feed-in tariffs for 2023–24.

Details of our minimum feed-in tariff draft decision

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 tariff is an estimate of what a retailer would pay if they bought electricity from the market plus a payment for the social benefits of renewable energy. If the minimum feed-in tariff were higher than this, electricity retailers (and therefore their customers) would be better off buying electricity from the National Electricity Market.

When solar customers export electricity into the grid, they are electricity generators. Retailers pay generators the wholesale price of electricity. So, when we set the minimum feed-in tariff, we start with prices in the National Electricity Market. These prices are determined in a competitive market through the supply of and demand for electricity. We then add:

- the costs of avoided market fees
- energy saved by not transporting power long distances
- the avoided social cost of carbon and human health costs attributable to air pollution.

We have used this approach to determine the draft minimum feed-in tariffs for financial year 2023–2024. This is the same approach we have used in previous feed-in tariff reviews.

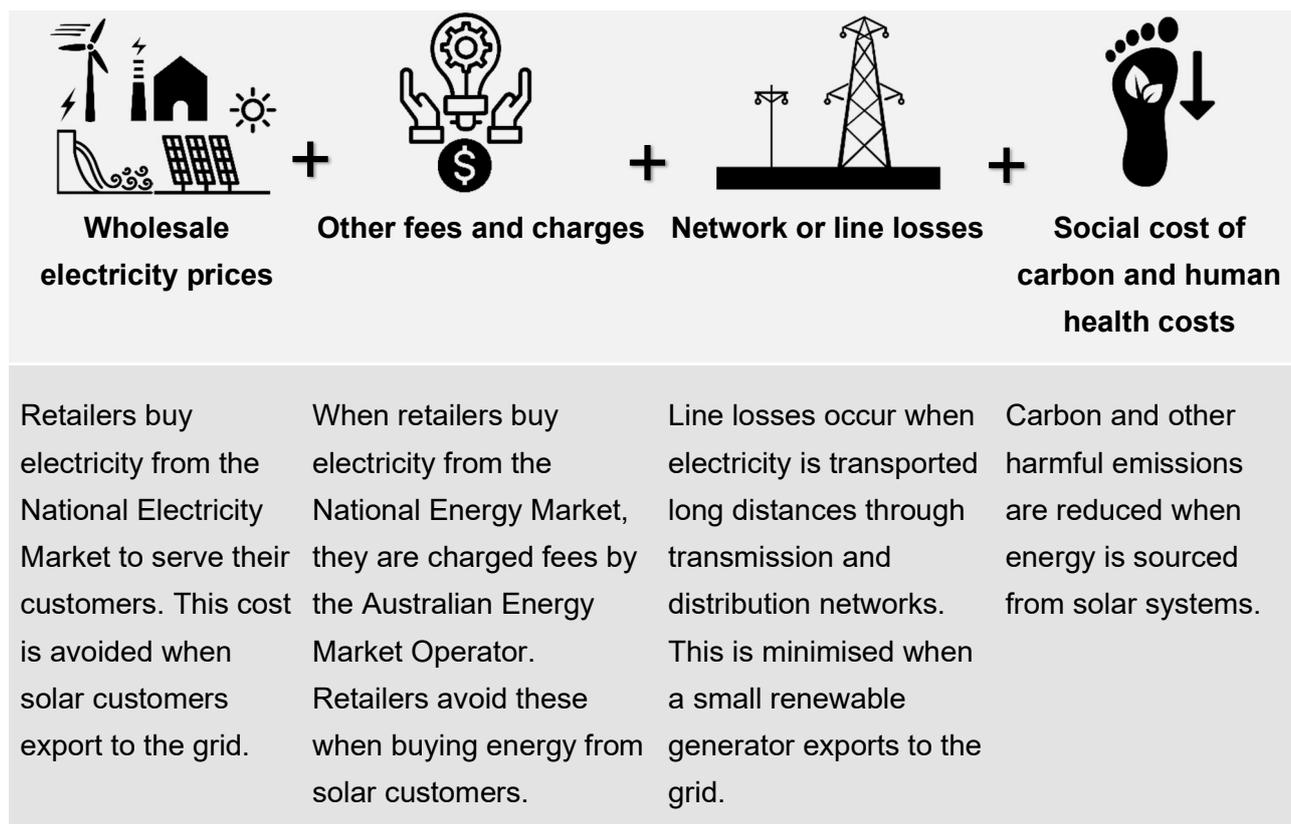
The minimum feed-in tariffs promote the interests of all electricity users

We must consider certain costs in setting minimum feed-in tariffs

The costs we add in the minimum feed-in tariff calculations are outlined in Figure 2.1. Under the Electricity Industry Act, we must have regard to these costs when setting the minimum feed-in tariffs.¹⁴

¹⁴ *Electricity Industry Act 2000*, s. 40FBB(3)

Figure 2.1: Costs we must have regard to in setting the minimum feed-in tariff



The steps for setting the minimum feed-in tariff

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 2.1:

- Develop a forecast of wholesale electricity prices to reflect market expectations for 2023–24 at that point in time:
 - for the minimum flat feed-in tariff using forecast wholesale prices, calculate the average value of wholesale electricity weighted by the export share during the times that solar systems typically export to the grid.
 - for the minimum time-varying feed-in tariffs using forecast wholesale prices, calculate the average value of wholesale electricity weighted by predicted export share during each time block under this tariff structure.
- Add in the benefit of market fees, ancillary service charges and other market operator 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).

How we set the minimum feed-in tariffs

- Add the avoided social cost of carbon and human health costs attributable to air pollution.¹⁵

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

We used a futures market approach to forecast wholesale electricity prices

When retailers get electricity from solar customers, they avoid paying the wholesale price for it. So, calculating the minimum feed-in tariff requires that we estimate the wholesale price of electricity in the National Electricity Market. We have used a futures market approach to forecast wholesale prices. This is the same approach we have used in past minimum feed-in tariff decisions (see Appendix C – Technical methodology for more information).¹⁶ We also use a similar approach for our wholesale cost forecasts for our Victorian Default Offer decisions.¹⁷

Prices in the wholesale market reflect retailers' and generators expectations for future wholesale prices. As wholesale market participants, generators and retailers have the best information about supply and demand available. 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.

Futures prices alone are not suitable for setting the feed-in tariffs. Most solar exports happen during the day when wholesale prices have been declining. To estimate the average wholesale price when electricity from solar panels is being exported, we weight historic spot prices by the share of solar exports that happened at each price. We then scale those prices using ASX Energy futures contracts. With this method our forecast of wholesale prices accounts for the relationship between solar exports and wholesale prices.

We will update our wholesale price forecasts in our February 2023 final decision, to reflect market expectations at that point in time. This is likely to result in a difference between the estimates in this draft decision, and the final decision in February 2023.

¹⁵ The Victorian Government provides the value for the Social Cost of Carbon in an Order in Council, which are then included in our modelling.

¹⁶ Essential Services Commission 2020, Minimum electricity feed-in tariffs to apply from 1 July 2020: Final Decision, 25 February; Essential Services Commission 2019, Minimum electricity feed-in tariffs to apply from 1 July 2019: Final Decision, 28 February; Frontier Economics 2020, Wholesale Price Forecasts for Calculating Minimum Feed-in Tariff: Final Report for the Essential Services Commission, 24 February.

¹⁷ Essential Services Commission, Victorian Default Offer to apply from 1 July 2019: Advice to the Victorian Government. May 2019; Essential Services Commission, Victorian Default Offer to apply from 1 January 2020: Final report, November 2019; Essential Services Commission, Victorian Default Offer 2021: Draft Decision, September 2020.

We forecast wholesale prices for different times of the day

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.

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 time blocks for the time-varying feed in tariffs is shown in Table 2.1.

Table 2.1: Time block structure for the time-varying feed-in tariff

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

We use the same forecast wholesale prices to calculate the flat feed-in tariff and time-varying feed-in tariffs. The flat tariff is based on the overall weighted average for all times. However, the time varying feed-in tariffs, are calculated using the solar weighted average wholesale electricity price for the day, early evening and overnight tariff periods.

Market fees, ancillary services, and line losses

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).¹⁸

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.

¹⁸ 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.

The fees levied by the market operator are set for each year through its annual budgeting process. However, the market operator has not provided an estimate of the fees for 2023–24. We have used fees from the market operator’s 2022–23 budget for this draft decision.

In the 2022–23 financial year, the market operator also updated the fees to recover the costs of the five-minute and global settlement upgrades. As for market fees and ancillary charges, for our draft decision we have used the fees in the market operators’ 2022–23 budget.

The value of market fees and ancillary service charges will be updated if newer data is available when we make our final decision in February 2023.

Compensation payments

In June 2022, the market operator made interventions through administered pricing and then the suspension of the wholesale electricity market. At this stage, although compensation payments are expected to be relatively small in Victoria, the form and total amount of payments are still unknown. It is also unclear if either of these things will be known when we make our final decision in February. We will consider this further as more information becomes available.

Network or line losses

Most energy consumers are far away from where large-scale generators are located, so the energy they produce must travel long distances through the grid (transmission and distribution network). Some energy is lost when it moves through the grid, and we refer to this as ‘network losses’ or ‘line losses’. The magnitude of network losses depends on the location of the generator and factors like the quality of the line.

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) cost of wholesale energy.

We have used the market operator’s estimates of distribution loss factors and marginal loss factors for 2022–23 to develop a loss factor for Victoria. Further details on the calculation of network losses and market fees are in Appendix C – Technical methodology.

We will update the value of network losses if more up to date data is available when we are preparing our final decision for release in February 2023.

The cost of carbon and human health costs

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

We note that the Department of Environment, Land, Water and Planning¹⁹ 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.

In particular, the review will consider the extent to which the avoided human health costs from a reduction in air pollution are already accounted for through the abatement cost approach for determining the social cost of carbon. Abatement measures that reduce greenhouse gas emissions from electricity generation in Victoria also reduce air pollutants.

That there is overlap between the avoided human health costs attributable to a reduction in air pollution and the avoided social cost of carbon was noted at the time these avoided costs were introduced into the minimum feed-in tariff.²⁰ The Department of Environment, Land, Water and Planning will also consider a range of other possible issues concerning how methodologies to determine these avoided costs interact.

The Department of Environment, Land, Water and Planning has advised that any changes to these methodologies will be in place in time to inform the 2024–25 minimum feed-in tariff determination.

Cost of carbon

The National Electricity Market uses energy generated from a variety of fuel sources and technologies.²¹ These sources include:

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

The damage caused by emissions released during gas or coal-fired generation imposes a cost known as the cost of carbon. Solar customers help reduce this cost when their energy replaces fossil fuel generation. The avoided cost of carbon reflects the value of these emissions reductions.

¹⁹ On 1 January 2023, the Department of Environment, Land, Water and Planning will become the Department of Energy, Environment and Climate Action.

²⁰ Victorian Government 2016, Energy Legislation Amendment (Feed-in Tariffs and Improving Safety and Markets) Bill 2016, Explanatory Memorandum, p. 4.

²¹ 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 8 August 2022

The Victorian Government published an Order in Council in February 2017.²² The Order in Council specifies a methodology and the factors that we must have regard to when setting the social cost of carbon. 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.²³

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, the potential overlap of the benefits of avoiding carbon emissions and other pollutants harmful to human health, and subsidies available for solar panel installation, our draft 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).

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

²² 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).

²³ Victorian Government 2016, Energy Legislation Amendment (Feed-in Tariffs and Improving Safety and Markets) Bill 2016, Explanatory Memorandum, p. 4.

according to where the generation, and therefore pollution, occurs.²⁴ 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. This is a relatively long distance from Victoria's larger population centres. 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.

To calculate the damages costs, it would be necessary to establish the unit health costs of fossil fuel generation and then assess how solar exports displaces fossil fuel generation to find the total avoided human health costs.

Abatement costs

An alternative is to use the cost of avoiding pollution. Under this method, we measure 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 uncertain.²⁵ The Order in Council uses an abatement cost approach for determining the avoided cost of carbon.²⁶

When using an abatement cost approach there may be an overlap between the avoided health costs and the social cost of carbon. Abatement of fossil fuel generation is paid for through the social cost of carbon. Both carbon emissions and other harmful pollutants are avoided when this abatement takes place. If we pay to avoid carbon pollution, we also avoid other types of pollution.

This suggests that the human health costs may be covered by the current method for determining the social cost of carbon. Both carbon emissions and other harmful pollutants are avoided when

²⁴ 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.

²⁵ Department of Energy and Climate Change 2009, *Carbon Valuation in UK Policy Appraisal: A Revised Approach*, July 2009, pp. 10-11, [DECC report \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/131111/Carbon_Valuation_in_UK_Policy_Appraisal_A_Revised_Approach.pdf).

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).

carbon abatement takes place. When you pay to stop carbon emissions you are also paying to stop those other harmful pollutants. In this way the avoided human health costs could be accounted for through the social cost of carbon.

Subsidies for installing solar panels

To encourage solar installations, in acknowledgement of the social benefits that solar energy provides, solar customers receive subsidies when they install solar systems. These include both state (Victorian solar panel rebate scheme) and federal programs (small scale renewable energy scheme).

As the main social benefits of solar installation are carbon emission reduction and a reduction in noxious pollutants, there may be some overlap between these subsidies and the avoided cost of carbon and avoided health costs.

Appendix A – What is a feed-in tariff?

Customers receive money through the feed-in tariff when they export electricity from their small-scale generator (solar, wind, hydro or biomass) or battery. We set the minimum feed-in tariffs that electricity retailers must pay customers for feeding electricity into the grid.²⁷

What is the minimum feed-in tariff?

The minimum feed-in tariff applies to renewable energy generation facilities such as solar, wind, hydro, biomass, and batteries with a capacity of less than 100 kilowatts (kW).²⁸ 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.²⁹

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

Customers on the flat feed-in tariff receive the same amount for their exports regardless of the time of day they export energy to the grid. The time varying feed-in tariff has different rates for day, early evening, and overnight structure. This better reflects the underlying value of electricity, based on wholesale electricity market prices.

Figure A.1 and A.2 show the minimum flat and time-varying feed-in tariffs proposed for 2023–24 on both weekdays and weekends.

²⁷ *Electricity Industry Act 2000*, s.40F(1). The relevant electricity retailer is a person that holds a licence to sell electricity and sells to more than 5,000 customers

²⁸ *Electricity Industry Act 2000*, s. 40F(1)

²⁹ *Electricity Industry Act 2000*, s. 40F(1)

Figure A.1 – Minimum time-varying and flat feed-in tariffs, 2023–24 (weekday)

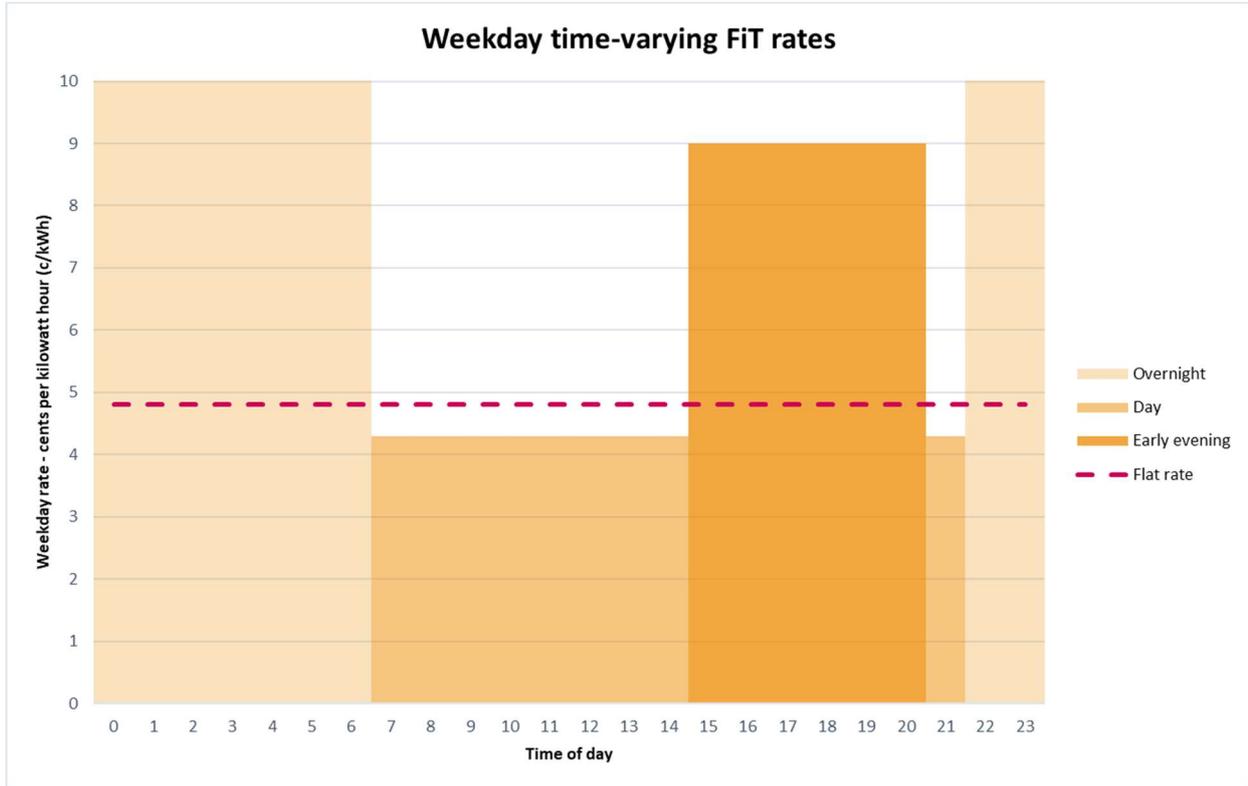


Figure A.2 – Minimum time-varying and flat feed-in tariffs, 2023–24 (weekend)



What is our role in setting the minimum feed-in tariff?

The Essential Services Commission is required by the *Electricity Industry Act 2000* to determine the minimum rate or rates an electricity retailer must pay its customers, who are small renewable energy generators, for the electricity they produce and export to the grid.³⁰

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 2024.³¹

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

- to promote the long-term interests of Victorian consumers
- to have regard to the price, quality and reliability of electricity.³²

We must also pursue our objectives under the *Electricity Industry Act*. Those most relevant to our role in setting the minimum feed-in tariff 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.³³

We must consider a range of matters in seeking to achieve our objectives under the *Essential Services Commission Act*. These matters include:

- the particular circumstances of the regulated industry and the prescribed goods and services
- the efficient costs of producing or supplying regulated goods or services and of complying with relevant legislation and relevant health, safety, environmental and social legislation applying to the regulated industry
- the return on assets in the regulated industry
- any relevant interstate and international benchmarks for prices, costs and return on assets in comparable industries, and

³⁰ *Electricity Industry Act 2000*, s. 40FBB

³¹ *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 40FBB(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.

³² *Essential Services Commission Act 2001*, s. 8

³³ *Electricity Industry Act 2000*, s. 10

- any other factors that the commission considers relevant.³⁴

The commission must also consider specific factors under the Electricity Industry Act.³⁵ These factors are:

- the prices of electricity in the wholesale electricity market
- 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 small renewable energy generators reducing air pollution.³⁶

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.³⁷ An order made in 2017 sets out factors and methodologies for determining the 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 CO₂ that is reduced because of the exports of a small renewable energy generator.³⁸

The order does not specify factors or methodologies for determining the avoided human health costs caused by a reduction in air pollution, however 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.

Producing and using your own energy is the other benefit from small renewable generation

As the solar feed-in tariffs will always be lower than the retailer's tariffs, solar customers will get the greatest benefit from using 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.

³⁴ *Electricity Industry Act 2000*, s. 33(3)

³⁵ *Essential Services Commission Act 2001*, s. 8A

³⁶ *Electricity Industry Act 2000*, s. 40FBB(3)

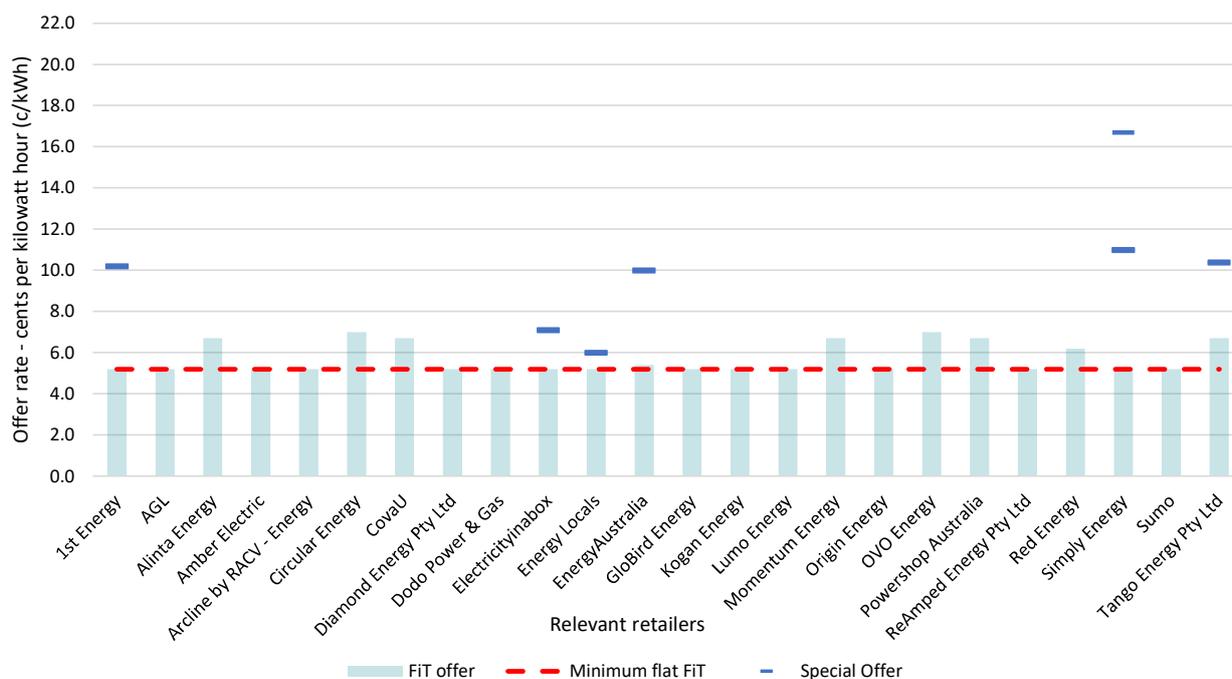
³⁷ *Electricity Industry Act 2000*, s. 40FBB(3B)

³⁸ *Victorian Government 2017, Victorian Government Gazette* No. S 36, Tuesday 21 February 2017

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.³⁹ Retailers are free to offer a feed-in tariff above the minimum tariffs we set. We surveyed the feed-in tariffs available in the market in October 2022, see Figure A.3.

Figure A.3 – Residential feed-in tariff offers available in October 2022



Source: Victoria Energy Compare, accessed 17 October 2022, <https://compare.energy.vic.gov.au>

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.

The review also found at least one retailer is offering the time varying tariffs.

The presence of offers with higher feed in tariffs illustrates the benefits of shopping around, although customers should carefully consider the net cost of such offers, as higher standing charges and/or prices for purchase of electricity may offset the benefits of the higher feed-in tariffs.

³⁹ 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.

Changing or extending past feed-in tariff incentives and schemes, or any bonus that retailers may offer above the minimum feed-in tariff, are outside the scope of our role to set minimum feed-in tariffs.

How has the feed-in tariff changed over time?

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

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	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)	Not closed	No end date

Source: Department of Environment, Land, Water and Planning, Closed feed-in tariff schemes, accessed 28 July 2022, <https://www.energy.vic.gov.au/renewable-energy/victorian-feed-in-tariff/closed-feed-in-tariff-schemes>

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 also provided to customers from late 2009. This scheme closed to new applicants at the end of 2011, although customers that signed up to the premium scheme will remain eligible to receive the premium rate until November 2024.⁴⁰

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 and ended in 2016. The standard feed-in tariff provided a

⁴⁰ Department of Environment, Land, Water and Planning, Standard feed-in tariff and transitional feed-in tariff, accessed 28 July 2022, <https://www.energy.vic.gov.au/renewable-energy/victorian-feed-in-tariff/standard-feed-in-tariff-and-transitional-feed-in-tariff>

'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 2016.⁴¹

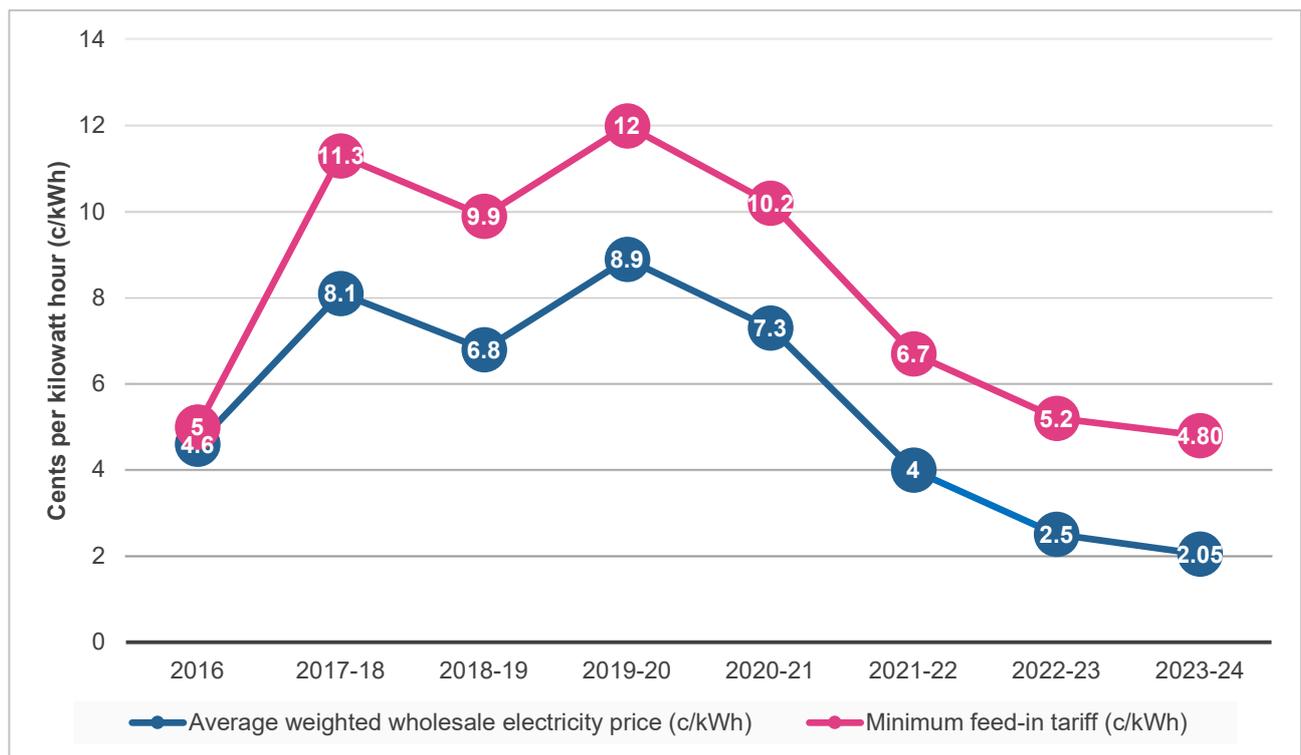
Minimum feed-in tariff

From 2014, the Essential Services Commission has determined the minimum feed-in tariffs to reflect the factors set out in the Electricity Industry Act. These factors represent the value of solar customers' exports.

The Essential Services Commission updates the minimum feed-in tariffs each year to update for changes in the factors that determine the feed-in tariff. From 2017–18, legislation required that we also consider the social cost of carbon (set at a rate of 2.5 cents per kWh). This has caused the forecast wholesale electricity price and the minimum feed-in tariff to diverge. Figure A.4 shows the difference coincides with the introduction of the social cost of carbon in 2017.

⁴¹ Department of Environment, Land, Water and Planning, Premium feed-in tariff, accessed 28 July 2022, <https://www.energy.vic.gov.au/renewable-energy/victorian-feed-in-tariff/premium-feed-in-tariff>

Figure A.4: Comparison of flat feed-in tariffs and solar weighted wholesale costs 2015–16 to 2023–24



Appendix B – Minimum feed-in tariff rate comparisons

Table B.1: Minimum flat feed-in tariff from past years and proposed for 2023-24 (c/kWh)

Feed-in tariff component	2016	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24
Forecast solar-weighted average wholesale electricity price	4.6	8.1	6.8	8.9	7.3	3.9	2.5	2.1
Avoided market fees and ancillary service charges	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Value of avoided distribution and transmission losses ⁴²	0.3	0.6	0.5	0.5	0.3	0.2	0.2	0.1
Value of avoided social cost of carbon	n/a	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Feed-in tariff rate	5	11.3	9.9	12.0	10.2	6.7	5.2	4.8

Table B.2: Minimum time-varying feed-in tariff from previous years (c/kWh)⁴³

	2019–20	2020–21	2021–22	2022–23	2023–24 (proposed)
Early evening	14.6	12.5	10.9	6.9	9.0
Day	11.6	9.8	6.1	5	4.3
Overnight	9.9	9.1	6.7	7.1	10.8

Comparison of feed-in tariffs with other jurisdictions

Feed-in tariffs are regulated in all other Australian jurisdictions except for South Australia, the Australian Capital Territory and South East Queensland. In Victoria and Tasmania retailers can offer higher than the regulated rate.⁴⁴ In Western Australia, the Northern Territory and Regional

⁴² The value of avoided distribution and transmission losses has declined over time as the value of the wholesale component has declined.

⁴³ The time-varying FIT for 2019–20 is time-weighted while those from 2020–21 are solar-weighted.

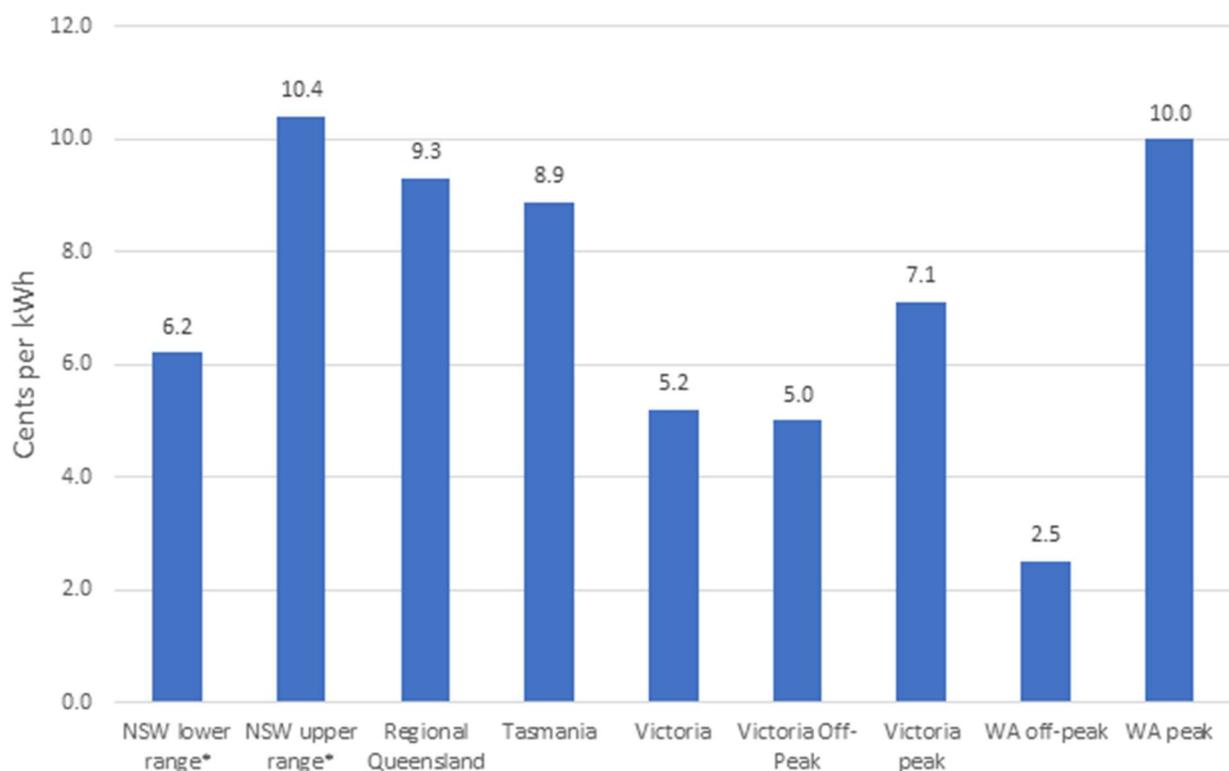
⁴⁴ Office of the Tasmania Regulator, Feed-in Tariffs, accessed 17 August 2022, <https://www.economicregulator.tas.gov.au/electricity/pricing/feed-in-tariffs>.

Queensland, a set rate is mandated.^{45 46 47} New South Wales does not regulate feed-in tariffs but the Independent Pricing and Regulatory Tribunal, on request by the NSW government, sets a benchmark range annually as a guide.

The level of feed-in tariffs in other jurisdictions

Victoria’s flat minimum feed-in tariff is currently lower than other regulated flat feed-in tariffs. This is because some other jurisdictions do not solar weight the wholesale prices included in their feed-in tariffs, or solar weighting has less of an impact as solar penetration is lower. Some other regulators also include hedging costs in the wholesale prices they use to determine feed-in tariffs. This also leads to higher feed-in tariffs.

Figure B.1 - Feed-in tariff benchmarks across Australia October 2022



⁴⁵ Western Australia Government, Energy Buyback Schemes, accessed 17 August 2022, <https://www.wa.gov.au/organisation/energy-policy-wa/energy-buyback-schemes>.

⁴⁶ Northern Territory Government, Changes to Feed in Tariffs, accessed 17 August 2022, https://industry.nt.gov.au/_data/assets/pdf_file/0008/811628/changes-to-feed-in-tariffs-fact-sheet.pdf.

⁴⁷ Queensland Competition Authority, Regional Queensland solar feed-in tariff 2020-21, accessed 17 August 2021, <https://www.qca.org.au/project/customers/solar-feed-in-tariffs/regional-queensland-feed-in-tariff-2022-23/>.

Most states base feed-in tariffs on wholesale electricity prices

Different states have slightly different methodologies for calculating their regulated feed-in tariffs, but all set their rates primarily on forecast wholesale electricity prices (see Table B.3).

Table B.3: Regulated feed-in tariff methodology comparisons in other jurisdictions

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	✓	Uncertain	Uncertain	✗
Northern Territory	✓	Uncertain	Uncertain	✗

Appendix C – 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 is made up of the steps below:

- **Forecast wholesale costs:** the 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
- **Account for electricity lost in transport:** increase wholesale costs to account for avoided transmission and distribution losses.
- **Account for social benefits:** add the avoided social cost of carbon and avoided human health costs.

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

Table C.1: Calculating the minimum feed-in tariff

Component	Calculation	Flat rate	Overnight	Daytime	Early evening
A: Wholesale electricity prices	Solar export-weighted average price forecast (cents per kWh)	2.05	7.71	1.56	5.97
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)	0.14	0.14	0.14	0.14
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	5.98%	5.98%	5.98%	5.98%
D: Value of avoided transmission and distribution losses	Multiply (A + B) by C	0.13	0.47	0.10	0.37
E: Value of avoided social cost of carbon	Multiply the volume factor by the price factor	2.49	2.49	2.49	2.49
F: Value of avoided human health costs	Set at 0 cents per kWh after having regard to a number of different methodologies that provide a range of values (including zero), and potential overlap with the cost of carbon and other subsidies.	0.00	0.00	0.00	0.00
Total (rounded to one decimal place)	A + B + D + E + F	4.8	10.8	4.3	9.0

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. The benefits of using a futures market approach include:

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

Having a price that reflects efficient market outcomes is in the long-term interests of Victorian Consumers. It also promotes competition in the energy industry by creating the right investment incentives.

Transparency of the inputs for analysis is consistent with our objectives to promote protections for customers⁴⁸ and to promote the long-term interests of Victorian consumers.⁴⁹ 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.

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' output. The steps we take to calculate the flat feed-in tariff are as follows:

1. **Calculating the price level for 2023–24.** Using the average price of 2023–24 quarterly baseload future swaps from the Australian Stock Exchange (after adjusting for an assumed contract premium of five per cent) weighted by traded volume across the most recent 12 months up to a particular date (for this draft decision this was 1 October 2022). The 12-month average price reflects retailers' approach to building a portfolio of contracts over time.

Frontier Economics will update these estimates for our February 2023 final decision, to reflect market expectations at that point in time. These updates are likely to result in a difference between the estimates contained in our draft and final decisions.

2. **Selecting the appropriate historical prices and export profile.** The commission received half-hourly actual export data for customers from 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 period is available from the Australian Energy Market Operator.
3. **Calculating the scaling factor 2023–24.** After averaging prices for each quarter for the relevant historical year, they are compared to the quarterly futures prices in step 1 to determine a scaling factor for each quarter.

⁴⁸ *Electricity Industry Act 2000*, s. 10(c).

⁴⁹ *Essential Services Commission Act 2001*, s. 8.

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 time of solar exports from step 2. The formula for this is:

$$\text{Flat feed-in tariff export weighted wholesale electricity price} = \frac{\sum_{t=1}^{17,568} (\text{expected price } 2023 - 24_t \times \text{solar exports}_t)}{\text{Total solar exports } 2021 - 22}$$

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 weighting 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.

Structuring the time-varying feed-in tariff

We have also set a time-varying feed-in tariff with overnight, day and early evening periods. The time periods – or ‘time blocks structure’ – for the time-varying feed-in tariff are set out in Table C.5.

Table C.5: Time block structure for time-varying feed-in tariff 2023-24

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

Note: All times are in local times

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 solar customers.

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

Table C.3: Market fees and ancillary service charges

Item	Fee \$ per MWh	cents per kWh
National Electricity Market fees	1.06	0.11
Ancillary service charges	0.34	0.03
Total	1.41	0.14

Source: AEMO 2022–23 Budget and Fees report for market fees; AEMO ancillary services recovery summaries for 2022.

Market fees

The National Electricity Market fee levied by the market operator is set in advance each year through its annual budgeting process. However, the 2022–23 the 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 2023–2024⁵⁰.

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 our estimating feed-in tariffs that will 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 last 12 months (or 52 weeks) from October 2021 to October 2022.⁵¹

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

⁵⁰ Australian Energy Market Operator 2022, 2022–23 AEMO Budget and Fees, published in June 2022, accessed 15 November 2022, <https://aemo.com.au/consultations/current-and-closed-consultations/2022-23-aemo-budget-and-fees>

⁵¹ 4 Australian Energy Market Operator 2021, *Ancillary services payments and recovery*, accessed 01 September 2022, <https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/data-nem/ancillary-services-data/ancillary-services-payments-and-recovery> .

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 and marginal loss factors for 2022–23, we have estimated a flat customer share-weighted loss factor of 1.0598 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 C.4 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 took the load weighted average of the short and long sub-transmission distribution loss factors⁵² and calculated the transmission loss factors using the simple average of the marginal loss factors across each distribution area (removing some nodes that have no small business or residential load). These factors are then weighted by the number of low voltage customers in each distribution zone to develop a Victoria wide loss factor.

Table C.4: Inputs for calculating loss factors

Distribution business	Distribution loss factor	Average marginal loss factor	Total loss factor	Number of customers
CitiPower	1.0488	0.9946	1.0432	342,024
Powercor	1.0774	0.9942	1.0712	868,756
United Energy	1.0471	0.9968	1.0437	696,102
AusNet Services	1.0769	1.0021	1.0791	775,030
Jemena	1.0379	0.9998	1.0377	364,932
Customer share-weighted			1.0598	

⁵² Australian Energy Market Operator 2021, *Distribution loss factors for the 2021/22 Financial Year*, accessed 18 October 2021 https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/loss_factors_and_regional_boundaries/2021-22/distribution-lossfactors-for-the-2021-22-financial-year.pdf?la=en.

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.⁵³

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 2016.⁵⁴ We have also re-examined this matter a number of times since. However, due to a lack of sufficient evidence and data, we have not been able to reliably place a separate monetary value on the avoided human health costs.

We also note that there is some evidence that the avoided human health costs may already be accounted for through the avoided social cost of carbon and/or subsidies provided for solar installations. As a result, our decision is to set the stand-alone avoided human health costs at 0 cents per kWh.

⁵³ 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)

⁵⁴ Essential Services Commission 2016, *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>

Appendix D – 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 E: 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.

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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