

MINIMUM ELECTRICITY FEED-IN TARIFF TO APPLY FROM 1 JULY 2017

Decision (Final)

February 2017

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GLOSSARY

the Act	<i>Electricity Industry Act 2000 (Vic)</i>
Commission	Essential Services Commission (Victoria)
Inquiry	Commission's 2016 inquiry into the true value of distributed generation
Small renewable energy generator	A wind, solar, hydro, biomass energy facility (or other facility if specified by Order in Council) connected to a distribution system that generates electricity and has an installed or name-plate generating capacity of less than 100 kilowatts.
Relevant retailer	A person that holds a licence to sell electricity and sells to more than 5,000 customers.
Stochastic modelling	Modelling that incorporates variables that are stochastic (random), such as weather, the output of windfarms and unplanned generator outages.

ACRONYMS

AEMO	Australian Energy Market Operator
c/kWh	cents per kilowatt hour
DLF	Distribution loss factor
FiT	Feed-in tariff
kW	Kilowatts
kWh	Kilowatt hour
MLF	Marginal loss factor
MWh	Megawatt hour
NEM	National Electricity Market

CONTENTS

GLOSSARY	II
ACRONYMS	III
DECISION	V
1 LEGISLATIVE REQUIREMENTS	1
2 METHODOLOGY	3
2.1 WHOLESALE ELECTRICITY VALUE	3
2.2 AVOIDED SOCIAL COST OF CARBON AND AVOIDED HUMAN HEALTH IMPACTS	7
2.3 CONCLUSION	8
3 REFERENCES	11
APPENDIX A – ORDER IN COUNCIL	13

DECISION

Pursuant to section 40FBB(1) of the *Electricity Industry Act 2000* (Vic), the Commission determines that the minimum rate for purchases of small renewable energy generation electricity from 1 July 2017 is 11.3 c/kWh.

1 LEGISLATIVE REQUIREMENTS

The Essential Services Commission (the Commission) is required under section 40FBB of the *Electricity Industry Act 2000* (the Act) to determine the minimum rate or rates that an electricity retailer must pay to its customers, who are small renewable energy generators, for electricity they produce and export into the grid. This is referred to as the minimum feed-in tariff (FiT).

The small renewable energy generation facilities to which the minimum FiT applies have capacities of less than 100 kilowatts (kW), and produce electricity using renewable energy sources such as wind, solar, hydro or biomass.¹

The FiT refers to an amount credited by a relevant retailer to the generating customer per kilowatt hour (kWh) of electricity it exports to the grid.

Each year, the Commission determines the minimum FiT for the following year. While this has previously been done on a calendar year basis, following recent amendments to the Act the Commission is now required to set one or more rates (section 40FBB(2)) by 28 February in the financial year preceding the financial year in which it is to apply (section 40FBB(1)).² The new FiT applies from 1 July 2017.

The Act requires certain factors to be taken into account when determining the minimum FiT. The factors that the Commission must have regard to in determining the FiT that applies from 1 July 2017 are set out in section 40FBB(3) of the Act and include:

¹ An important exception is that a 'small renewable energy generation facility' does not include a generating facility that is under the premium solar feed-in tariff scheme (Electricity Industry Act section 40F(1)). 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 (Electricity Industry Act section 40F(2)).

² *Energy Legislation Amendment (Feed-in Tariffs and Improving Safety and Markets) Act 2017* (Vic), assent date 14 February 2017

- prices of electricity in the wholesale electricity market and
- any distribution and transmission losses avoided in Victoria by the supply of small renewable energy generation.

Following recent amendments to section 40FBB(3), the Commission must also have regard to:

- the avoided social cost of carbon and the avoided human health costs attributable to a reduction in air pollution.

Section 40FBB(3B) of the Act makes provision for the Governor in Council to issue an Order specifying a methodology or factors for the determination of the avoided social cost of carbon and the avoided human health costs attributable to a reduction in human health costs, to which the Commission must have regard.

An Order under this section was made on 21 February 2017 and published in the Victoria Government Gazette.³ The order 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) that is reduced per unit of exported electricity from a small renewable energy generator and
 - the monetary value for each of unit of CO₂e that is reduced because of the exports of a small renewable energy generator.

The Order did not specify factors or methodologies for determining the avoided human health costs attributable to a reduction in air pollution.

³ Victorian Government 2017, *Victoria Government Gazette No. S 36*, Tuesday 21 February 2017

2 METHODOLOGY

The Commission has set a single FiT rate to apply from 1 July 2017. The methodology we have used to determine the FiT that applies from 1 July 2017 is based on the methodology established in our determinations of the 2014, 2015 and 2016 FiTs, with the inclusion of an additional component for the avoided social cost of carbon, in accordance with the new legislation and Order.

The methodology comprises the following components

- Wholesale value of electricity produced by small scale renewable generators, which is based on the cost of purchasing the same amounts of energy, at the same times, from central generators via the wholesale electricity pool (referred to as the 'avoided energy cost'). This includes:
 - Wholesale electricity price forecast (solar weighted)
 - Avoided distribution and transmission losses and
 - Avoided ancillary service charges and market fees,
- Avoided social costs of carbon and avoided human health costs.

2.1 WHOLESALE ELECTRICITY VALUE

The formula for determining the wholesale electricity value that has been used by the Commission in past feed-in tariff determinations is:

$$\text{Avoided energy cost} = LF \times \sum_{t=1}^n w_t p_t \quad (2.1)$$

where:

LF is the loss factor

w_t is the weighting that applies in time interval t

p_t is the wholesale electricity price that applies in time interval t

n is the 17,520 half hourly time intervals in the year.

2.1.1 WHOLESALE ELECTRICITY PRICE FORECAST

Consistent with previous determinations, we have determined the minimum FiT rates based on projected wholesale electricity prices using ACIL Allen Consulting's proprietary PowerMark model. The forecast average pool price for 2017–18 is \$77.22/MWh.

The projected wholesale electricity prices for 2017–18 are higher than the projected wholesale electricity price used to calculate the minimum FiT for 2016.¹ This increase is due to a tightening of the balance between the supply of energy and the demand for energy in Victoria, including a change in the generation mix resulting from the planned closure of Hazelwood Power Station in 2017. Further details on the projections can be found in the ACIL Allen report, *Wholesale Electricity Spot Price: 2017-18 Projections*, which is available on our website.

2.1.2 SOLAR WEIGHTING

The weighting that is applied in each time interval is based on a small scale solar photovoltaic (PV) system export profile. This reflects the fact the predominant form of small renewable energy generation system in Victoria is rooftop solar PV.

In previous years, the Commission calculated average profiles for solar PV exports based on sample data for the actual exports of approximately 1,000 solar PV customers in 2013.² When setting the FiT to apply from 1 July 2017, we have used an

¹ The wholesale electricity price used to calculate the minimum FiT for 2016 was \$40.19/MWh.

² Essential Services Commission 2013, *Minimum Electricity Feed-in Tariff to Apply from 1 January 2014 to 31 December 2014 – Final Decision*, August, pp. 26-29, Essential Services Commission 2014, *Minimum Electricity Feed-in Tariff to Apply from 1 January 2015 – Final Decision*, August, pp. 15-17, Essential Services Commission 2015, *Minimum Electricity Feed-in Tariff to Apply from 1 January 2016 to 31 December 2016 – Final Decision*, August, pp. 11-12.

updated sample based on information provided to the Commission by Victoria's network businesses in 2016..³ The export data is of a sample of Victorian electricity customers in approximately the three years leading up to early 2016.

The methodology for forecasting the wholesale prices and the approach to applying solar weighting accounts for and aligns the impact of weather variations.

The forecast solar weighted average pool price for 2017–18 is \$81.30/MWh.

2.1.3 AVOIDED DISTRIBUTION AND TRANSMISSION LOSSES

Line losses are taken into account when determining the FiT rates by applying a loss factor to the projected wholesale electricity prices, as shown in formula 2.1.

The wholesale electricity price published by the Australian Energy Market Operator (AEMO) is determined at the Regional Reference Node (RRN), and this price includes transmission losses between generators and the RRN.⁴

The loss factor used in formula 2.1 takes into account the cost of line losses that occur between the RRN and the end-customer meters. This has two parts:

- transmission line losses between the RRN and each bulk supply connection point (or terminal station) are measured by marginal loss factors (MLFs) published by AEMO⁵
- distribution line losses are measured by distribution loss factors (DLFs), which are estimated by each distribution network service provider and published by AEMO.⁶

The combined loss factor for a particular locality and voltage class can be calculated as:

³ During the Commission's True Value of Distributed Generation Inquiry.

⁴ In Victoria the RRN is at Thomastown.

⁵ The MLF measures the amount of additional generation that would be required at the RRN to deliver 1 kW of electricity to the transmission network connection point (or terminal station).

⁶ The DLF represents the average quantity of electricity that needs to be transported across a distribution network in order to provide for one unit of consumption at the customer's premises. DLFs are generally greater than one.

$$\text{Loss factor} = \text{MLF} \times \text{DLF} \quad (2.2)$$

Formula 2.2 has been quantified as follows.

AEMO estimates the MLF for every transmission network connection point.⁷ DLFs are estimated by the distribution network service providers in each zone for each line voltage class and published by AEMO.⁸ Using this data, we estimate the weighted average loss factor for Victorian mass-market customers at 1.074 in 2017-18. This implies that, on average, 6.9 per cent of electricity is lost as heat between the RRN and the customer.⁹ We then apply the loss factor of 1.074 to the forecast solar weighted average pool price of \$81.30/MWh to produce the loss adjusted amount of \$87.32/MWh, an increase of \$6.02/MWh.

2.1.4 AVOIDED ANCILLARY SERVICE CHARGES AND MARKET FEES

Retailers pay market fees and ancillary service charges to AEMO to support its role of managing the wholesale electricity market and we include these as avoided costs associated with electricity that is exported to the grid. Retailers pay these fees based on the amount of their purchases from the wholesale electricity market and avoid these fees to the extent that they source electricity from small renewable generators. Consideration of these fees is therefore considered a component of the Commission's consideration of prices in the electricity wholesale market pursuant to section 40FBB(3) of the Act.

The market fees that are levied by AEMO are set in advance through its budgeting process. AEMO has estimated its 2017-18 market fees¹⁰ to be \$0.48614 per MWh or 0.05c/kWh.

The cost of ancillary services is recovered from market participants. On a weekly basis, AEMO publishes data showing the cost recovery rate for ancillary services. In 2016 (to

⁷ Australian Energy Market Operator 2016, *Regions and Marginal Loss Factors: FY 2016-17, National Electricity Market*, July

⁸ Australian Energy Market Operator 2016, *Distribution Loss Factors for the 2016/2017 Financial Year*, July

⁹ $1/1.074 = 1.069$, or 6.9 per cent

¹⁰ Australian Energy Market Operator 2016, *Consolidated Final Budget and Fees 2016-17*, May, pp 11-12 (National Electricity Market, Full Retail Contestability Electricity and National Transmission Planner fees)

mid-November), that recovery rate ranged from \$0.07 per MWh to \$0.46 per MWh, with an average of \$0.14 per MWh or 0.014c/kWh.

For the purpose of determining a FiT that applies from 1 July 2017, we assume that the average cost of ancillary services in 2017–18 will be consistent with the year to date average to mid-November 2016. When this is added to the relevant market fees, the value of ancillary services charges and market fees avoided when a retailer obtains electricity from a small scale renewable generator is 0.062 c/kWh. When incorporated in the FiT rates this is rounded to a single decimal place.

2.2 AVOIDED SOCIAL COST OF CARBON AND AVOIDED HUMAN HEALTH IMPACTS

This section describes the methodology by which we have had regard to the avoided social cost of carbon and the avoided human health costs associated with air pollution, pursuant to section 40FBB(3)(c) of the Act.

2.2.1 SOCIAL COST OF CARBON

An Order in Council published on 21 February 2017 specifies the factors and methodologies for determination of the avoided social cost of carbon to which the Commission must have regard when setting the FiT that applies from 1 July 2017.

The Order specifies that the avoided social cost of carbon for 2017–18 is calculated in terms of the avoided social cost of carbon per unit of exported electricity from a small renewable energy generator, and is to be determined in accordance with the following methodology.

$$\textit{Avoided social cost of carbon} = \textit{Volume factor} \times \textit{Price factor} \quad (2.3)$$

The Order specifies the factors the Commission must use when applying this methodology.

With regard to the volume factor, the Commission must use 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 of

CO₂e is assumed to be avoided for each kWh exported by a small renewable energy generator (or 0.00127 tonne of CO₂e avoided per kWh exported).

With regard to the price factor, the Order requires the Commission to adopt a factor equal to a value per tonne of CO₂e of \$19.63.

The resulting avoided social cost of carbon is \$0.025 per kWh of electricity exported by a small renewable energy generator.

2.2.2 AVOIDED HUMAN HEALTH COSTS

During our recent Inquiry into the True Value of Distributed Generation, we acknowledged that distributed generation provides environmental and social benefits through reductions in air pollution.¹¹ However, we concluded that the necessary data to quantify those benefits with sufficient reliability to include them in a FiT are not available at present. We remain of the view, therefore, that the Commission is not able to determine the avoided human health costs attributable to a reduction in air pollution caused by small renewable energy generation. As noted above, the Order made on 21 February 2017 did not specify factors or methodologies for determining the avoided human health costs attributable to a reduction in air pollution.

2.3 CONCLUSION

2.3.1 SUMMARY OF RESULTS

The result of estimating each of the elements of the energy value of small renewable generation using the methodologies described above is summarised in Table 2.1.

¹¹ In September 2015, the Commission received a terms of reference under section 41 of the *Essential Services Commission Act 2001* to carry out an inquiry into the value of distributed generation. The inquiry was subsequently split into two parts. The first part concerned the energy value of distributed generation and included reviewing the way the FiT was determined. The second part, which is ongoing, concerns the network value of distributed generation.

This decision does not relate to the network value of distributed generation, which we are continuing to address through a separate series of reports. Our consideration of the network value of distributed generation started with a Discussion Paper at the end of June 2016 and continued with a draft report in October 2016. We will publish our final report on that issue in February 2017.

TABLE 2.1 FORECAST VALUE OF FEED-IN ELECTRICITY, 2015, 2016 AND FROM 1 JULY 2017

Feed-in Tariff Component	2015	2016	from 1 July 2017
	(c/kWh)	(c/kWh)	(c/kWh)
Forecast solar-weighted average wholesale electricity pool price	5.7	4.6	8.1
Value of avoided distribution and transmission losses	0.4	0.3	0.6
Avoided market fees and ancillary service charges	0.05	0.1	0.1
Value of avoided social cost of carbon	n/a	n/a	2.5
FIT Rate	6.2	5.0	11.3

2.3.2 FEED-IN TARIFF RATE TO APPLY FROM 1 JULY 2017

The Commission’s decision is to set a minimum FiT of 11.3 c/kWh to apply from 1 July 2017.

3 REFERENCES

Australian Energy Market Operator 2016, *Consolidated Final Budget and Fees 2016-17*, May

Australian Energy Market Operator 2016, *Distribution Loss Factors for the 2016/2017 Financial Year*, July

Australian Energy Market Operator 2016, *Regions and Marginal Loss Factors: FY 2016-17, National Electricity Market*, July

Electricity Industry Act 2000 (Vic)

Energy Legislation Amendment (Feed-in Tariffs and Improving Safety and Markets) Act 2017 (Vic), assent date 14 February 2017

Essential Services Commission Act 2001 (Vic)

Essential Services Commission 2013, *Minimum Electricity Feed-in Tariff to Apply from 1 January 2014 to 31 December 2014 – Final Decision*, August

Essential Services Commission 2014, *Minimum Electricity Feed-in Tariff to Apply from 1 January 2015 – Final Decision*, August

Essential Services Commission 2015, *Minimum Electricity Feed-in Tariff to Apply from 1 January 2016 to 31 December 2016 – Final Decision*, August

Essential Services Commission 2016, *The Energy Value of Distributed Generation – Distributed Generation Inquiry Stage 1 Final Report*, August

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

APPENDIX A – ORDER IN COUNCIL



Victoria Government Gazette

No. S 36 Tuesday 21 February 2017
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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 –

Avoided social cost of carbon = Volume factor × 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

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