ESSENTIAL SERVICES COMMISSION

MINIMUM ELECTRICITY FEED-IN TARIFF TO APPLY FROM 1 JANUARY 2016

Draft decision

June 2015

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EXECUTIVE SUMMARY

The Essential Services Commission (Commission) is responsible for determining the minimum rate 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 feed-in tariff (FiT).

The *Electricity Industry Act 2000 (Vic.)* (EIA) section 40FBB(1) requires certain factors to be taken into account when determining the FiT.

The factors that are relevant to the value of electricity supplied by small renewable energy generators include:

- the marginal cost of the equivalent amount of electricity that would otherwise need to be purchased from central generators
- the locational value of electricity produced close to the final consumers compared to relatively distant central generators.

In determining the 2016 FiT, the Commission has evaluated these factors using the principles and methodology established in the in the 2014 and 2015 FiT determinations. The Commission has not revised these to determine the 2016 FiT.

By applying the established methodology, the Commission has determined the minimum energy value of embedded generation for 2016 to be 5.0 c/kWh. The proposed FiT of 5.0 c/kWh reflects the forecast wholesale market value of photovoltaic (PV) electricity for 2016. The proposed rate is lower than the 2015 FiT rate of 6.2 c/kWh, this is due to a lower forecast wholesale market price of electricity, particularly during daylight hours when PV electricity is generating.

This report sets out the calculations made to determine a FiT of 5.0 c/kWh for energy supplied into the grid, and invites comment on the application of the methodology.

GLOSSARY

Relevant generator (small renewable energy generators)	A generation company or person engaged in the generation of electricity for the supply or sale that has been exempted from the requirement to hold a license in respect to that activity. (PV customer).
Relevant licensee (retailer)	A person that holds a license to sell electricity and sells to more than 5 000 customers.
Small renewable energy generation facility	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.

ACRONYMS

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
c/kWh	cents per kilowatt hour
COAG	Council of Australian Governments
Commission	Essential Services Commission (Victoria)
DLF	Distribution loss factor
EIA	*Electricity Industry Act 2000* (Vic)
ESC Act	*Essential Services Commission Act 2001 (Vic.)*
ESCOSA	Essential Services Commission of South Australia
FiT	Feed-in tariff
IPART	Independent Pricing and Regulatory Tribunal, (NSW)
kW	kilowatts
kWh	kilowatt hour
MLF	Marginal loss factor
NEM	National electricity market
NSLP	Net system load profile
PC	Productivity Commission
POE	Probability of exceedance
PV	photovoltaic

QCA	Queensland Competition Authority
RET	Renewable Energy Target
RRN	Regional Reference Node
SRES	Small-scale Renewable Energy Scheme
TUOS	Transmission Use of System
VCEC	Victorian Competition and Efficiency Commission

CONTENTS

DRAFT DECISION

Pursuant to section 40FBB(1) of the *Electricity Industry Act 2000* (Vic.), the Commission's draft decision is that the minimum rate for purchases of small renewable energy generation electricity for the calendar year commencing 1 January 2016 is 5.0 cents per kilowatt hour.

1 INTRODUCTION

The Essential Services Commission (Commission) is responsible for determining the minimum rate that a relevant retailer must pay to its customers, who are small renewable energy generators, for electricity they produce and export into the electricity distribution system. The feed-in tariff (FiT) refers to an amount credited to the generating customer per kilowatt hour (kWh) of electricity it exports to the grid. The purpose of the minimum FiT is to ensure that small renewable energy generators receive a fair and reasonable rate for the electricity they supply for use by others.

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] At present most small renewable energy generation in Victoria is from rooftop solar photovoltaic (PV) systems. Small-scale wind powered generation is a potential source of small scale electricity generation in future, but has not achieved wide-scale application at present. For this reason we focus on solar PV in this report, and the value of feed-in electricity will be based on the time-profile of PV exports.

We will monitor the number of wind and hydro renewable energy generation numbers and will consider including them in future reviews if required. For now, the Commission considers it sufficient to treat solar PV as the representative type of small renewable generation facility.

[1] An important exception is that a 'small renewable energy generation facility' does not include a generating facility that is under either the premium solar or transitional feed-in schemes (Electricity Industry Act (EIA) s 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 (EIA s 40F(2)).

Each year before the end of August, the Commission determines the minimum FiT for the following calendar year. In August 2014, the Commission determined the minimum FiT of 6.2 c/kWh that has applied since 1 January 2015. This Draft decision presents the Commission's preliminary conclusions on the minimum FiT that should apply in Victoria from 1 January 2016. The Commission invites comment from interested parties.

1.1 COMMISSION'S FEED-IN TARIFF ROLES

Since January 2008, each licensed electricity retailer in Victoria with more than 5,000 electricity customers (relevant retailer) is required to publish and offer generally available renewable energy feed-in terms and conditions. These terms and conditions include the FiT and any other associated terms and conditions. Following amendments in mid-2013, the *Electricity Industry Act 2000* (EIA) requires that the FiT which forms part of the general renewable energy feed-in terms and conditions offered by relevant retailers must not be lower than the minimum FiT determined by the Commission.

The factors that the Commission consider relevant to the value of electricity supplied by small renewable energy generators include:

- The marginal cost of the equivalent amount of electricity that would otherwise need to be purchased from central generators.
- The locational value of electricity produced close to the final consumers compared to relatively distant central generators.

The Commission has another regulatory role in relation to general renewable energy feed-in terms and conditions. The Minister administering the EIA can direct the Commission to investigate whether a retailer's general renewable energy feed-in terms and conditions, including prices or other terms and conditions, are fair and reasonable. If they are found not to be fair and reasonable, the Commission must recommend prices, terms and conditions that it considers to be fair and reasonable, and the Minister can impose those prices, terms and conditions on that retailer.

The Commission's regulatory functions relating to FiTs are confined to the generally available renewable energy feed-in terms and conditions. The premium and transitional FiT schemes are outside the scope of the Commission's functions and of this report.[2]

1.2 PURPOSE OF THIS CONSULTATION

The Commission has made a draft determination of the minimum FiT for the period 1 January 2016 to 31 December 2016 and invites comments on the approach it has taken. The Commission must make and publish its decision on the minimum FiT by 31 August 2015. Otherwise, the prevailing rate continues.

The key milestones and planned dates for the consultation and implementation process for the 2015 minimum FiT review are set out in table 1.1.

TABLE 1.1 INDICATIVE REVIEW TIMETABLE

Milestone	Date
Submissions to Draft decision paper close	28 July 2015
Final decision released	25 August 2015
Gazette Notice	26 August 2015
Date of effect	1 January 2016

[2] These schemes are now closed to new members but will continue to provide beneficial FiT rates for some time to those who are already scheme members.

1.3 HOW TO MAKE SUBMISSIONS

Submissions to this Draft Decision are invited to address any matters that are relevant to the review and within the scope. Written submissions in response to this Draft Decision will assist the Commission to understand the issues relating to determining the minimum FiT for 2016 and will be used by the Commission to inform its final decision.

Submissions should address the matters to which the Commission should have regard when determining the generally available minimum FiT to apply from 1 January 2016. These are set out in section 2.1, legal requirements.

Written submissions should be provided by 5pm on Tuesday 28July 2015.

All submissions will be published on the Commission's website as per the Commission's Charter of Consultation and Regulatory Practice, with the exception of any commercially sensitive or confidential information which is identified as such in the submission.

Submissions in response to this Draft decision can be emailed to:
fitreview@esc.vic.gov.au

Alternatively, submissions can be mailed to:

Feed-in Tariff Review 2016
Essential Services Commission
Level 37 / 2 Lonsdale Street
Melbourne VIC 3000

Questions relating to this consultation can be directed to:

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1.4 STRUCTURE OF THIS DRAFT DECISION

The topics covered in the remainder of this Draft decision are as follows:

- chapter 2 outlines the statutory requirements and the guiding policy and economic principles applicable to the Commission's function of determining the minimum FiT
- chapter 3 discusses the methodologies relevant to calculating the value of the power fed into the electricity grid from small renewable energy generators
- chapter 4 applies the methodologies discussed in chapter 3 to determine the draft minimum FiT for 2016.

2 REQUIREMENTS & PRINCIPLES

The scope of this review and the Commission's approach to carrying out its task are governed by a number of specific statutory requirements and several established principles. The purpose of this chapter is to briefly outline these important requirements and principles.

2.1 LEGAL REQUIREMENTS

The Commission is required under s 40FBB of the Electricity Industry Act 2000 (Vic.)(EIA) to determine a rate for the purposes of section 40FBA(b)(i) — this rate being the minimum FiT rate for relevant retailers within their general renewable energy feed-in terms and conditions.

The principal statutory requirement that the Commission must address when determining the minimum FiT, is that it must have regard to:

(a) prices of electricity in the wholesale electricity market

(b) any distribution and transmission losses avoided in Victoria by the supply of small renewable energy generation electricity.

2.2 RELEVANT PRICING PRINCIPLES

The general principle that the Commission adopted in its determination of the minimum FiT for 2014 and 2015 is that small renewable energy sources should receive full credit for the benefits of the electricity they supply to the market.

This principle is consistent with the views of the Australian Energy Market Commission (AEMC 2012) and the Victorian Competition and Efficiency Commission (VCEC) in its 2012 inquiry into distributed generation. VCEC concluded that under an 'efficient and fair' FiT,

> *"distributed generators should receive a price that reflects the value of the electricity exported to the grid" (VCEC 2012 p.147).*

The Commission will continue to adopt this principle for the 2016 FiT Draft decision.

2.3 ISSUES OUTSIDE THE SCOPE OF THE REVIEW

The principles and methodology used in this draft decision to calculate minimum FiT for 2016 is based on the methodology established in the *Minimum electricity feed-in tariff to apply from 1 January 2015 – final decision*. The Commission recognises there is a range of methodologies that could be used to calculate the FiT, however the Commission has not revisited the methodology for the purposes of this 2016 FiT Draft decision. The Commission may re-evaluate the methodology in the future,

Some of the issues previously raised by stakeholders, such as consideration of a time varying FiT, or inclusion of avoided Transmission Use of System (TUOS) charges, are outside the scope of the review and are not addressed in this Draft decision. These issues have been discussed and evaluated in the 2014 and 2015 final decision papers.

3 THE ECONOMIC VALUE OF SMALL SCALE PV ELECTRICITY

This section provides a forecast of the value of the electricity produced by small-scale renewable electricity installations and delivered into the grid, and discusses other avoided costs included in determining the 2016 calendar year FiT.

3.1 OVERVIEW

Factors that are relevant to the value of power supplied by small renewable energy generators include:

- the marginal cost of the equivalent amount of electricity that would otherwise need to be purchased from central generators
- the locational value of electricity produced close to the final consumers compared to relatively distant central generators.

The marginal cost of obtaining the same amount of energy for the same market from alternative sources, is referred to as the avoided energy cost of small-scale generation. It is based on the cost of purchasing the same amounts of energy, at the same times, from central generators via the electricity pool.

The formula used by the Commission in past feed-in tariff determinations, and used here, is:

Formula 3.1 $$\text{Avoided energy cost} = LF' \sum_{t=1}^{n} w_t p_t$$

Where: *LF* is the average loss factor (which is greater than 1); *n* is the number of half-hourly or hourly periods in a year; the w_t*'s* are the weights that represent the time-profile of small-scale solar PV exports over the year, with: $\sum_t w_t = 1$; and p_t is the series of forecast wholesale electricity prices for each period of the year.

Further details of the methodologies used in this 2016 FiT determination can be found in the 2014 and 2015 draft and final decision papers.

3.2 FORECAST WHOLESALE ELECTRICITY PRICES

An important element of setting the minimum FiT is the forecast value of electricity in the wholesale market in each period of each day of the forecast year. Forecasts based on market models have been used widely by Australian regulators. They have the benefit that they can take into account up-to-date information about significant changes in demand or supply conditions likely to affect the electricity market in 2015 and 2016. This method was used by the Commission in its previous two determinations of minimum feed-in tariffs.

The Commission engaged ACIL Allen to prepare a forecast for electricity prices for 2016 using its *Powermark* electricity market model, building on similar forecasts completed for 2014 and 2015. For its 2016 decision, the Commission has used the mean of the forecast range compiled by ACIL Allen in its calculation. The forecast for 2016 is $40.19/MWh

The ACIL Allen forecast reduction can be attributed to lower demand, both peak and annual energy. This reduction in demand reflects the revised Australian Energy Market Operator (AEMO) outlook for national electricity market demand forecasts, and assumptions relating to a reduced Renewable Energy Target (RET), although ACIL Allen observes that the latter assumption has only a minor effect on electricity prices in the forecast period.

A similar pattern of downward revisions is also seen in futures prices, this reflects a shift in market expectations.

Further details on the projections can be found in the ACIL Allen report on *Wholesale Electricity Spot Prices, 2015 and 2016 projections*, which is available on our website.

3.3 SOLAR EXPORT PROFILES

The second element required to establish the value of solar PV energy is an appropriate set of weights to apply to the forecast average wholesale electricity price established in section 3.1.

For determining the 2014 minimum FiT, the Commission based its calculations on the typical electricity production profile of a 1 kW north-facing PV unit in Melbourne (ESC 2013, p.28). When determining the 2015 minimum FiT the ESC calculated average profiles for PV exports based on sample data for the actual PV export patterns of 1163 PV customers in 2013. The Commission compared both methods and they were found to produce similar results (ESC 2014 p.23).

We also considered applying a 10 year average of historic solar premiums to the forecast price; however, the Commission considers this methodology did not sufficiently take into account recent changes in supply and demand in the electricity market. The Commission has continued to use the 2013 actual PV export data to calculate the PV energy value.

3.4 LOCATIONAL VALUE

Line losses are taken into account when determining the FiT by applying a loss factor to the weighted average wholesale price of electricity, as shown in formula 3.1. The wholesale electricity price published by the AEMO is determined at the Regional Reference Node (RRN), and this price includes transmission losses between generators and the RRN.[3] The loss factor used in formula 3.1 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 AEMO[4]
- distribution line losses are measured by distribution loss factors (DLFs), which are estimated by each distribution network service provider and published by AEMO.[5]

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

Formula 3.2 $\quad$ Loss factor = MLF $\times$ DLF

Formula 3.2 has been quantified as follows.

AEMO estimates the MLF for every transmission network connection point (AEMO 2015b). Using this data, we estimate the weighted average MLF in 2015-16 for Victorian mass-market customers at 1.0091.[6] DLFs are estimated by the distribution network service providers in each zone for each line voltage class and published by AEMO (2015a). Using these published DLFs, we estimate that for a low voltage customer on Victoria's short sub-transmission systems, the weighted average DLF for

[3] In Victoria the RRN is at Thomastown.

[4] 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).

[5] 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.

[6] The weights used in this calculation are the total billing units (MW) of mass market customers at each terminal station used for the levying the Transmission Use of System (TUOS) location charge. This data was provided by AEMO to the Commission on a confidential basis. Only MLFs for voltage classes 66 kV and lower are used.

2015-16 is 1.0557.[7] That is, around five and a half per cent of the electricity supplied into the distribution system is lost before it reaches the customer.

The overall loss factor is therefore (1.0091 × 1.0557) = 1.0653. For the reasons already given, the Commission considers this to be the appropriate loss factor to apply in formula 3.1.

3.5 SUMMARY

Table 3.1 presents summary results for the value of PV-produced electricity derived using the methods discussed in this section.

TABLE 3.1 FORECAST AVOIDED ENERGY COSTS OF PV
Victoria, 2016

	2016 FiT $/MWh
Forecast average pool price	40.19
PV energy value (value at RRN)	**45.69**
Locational value (line losses)	2.98
PV energy value at generation source	**48.67**

To calculate the value of PV electricity at its generation source, we take the forecast price of electricity at each half hour period for the year and apply the profile of PV electricity generated in each half hour period (the 2013 actual solar profile). This forecasts the price the PV energy could have received if it was directly sold to the wholesale market when it was generated. This is then calculated as an average forecast price for the PV energy in $/MWh for the year.

[7] The weights used in this calculation were the numbers of customers in each distribution zone.

Using the ACIL Allen forecast and the 2013 actual solar export profile, the value of solar PV electricity is forecast to be $5.50/MWh higher than the forecast average pool price. This equates to a 14 per cent premium for PV electricity (this is the percentage difference between $45.69/MWh and $40.19/MWh).

The locational value of associated line losses is calculated by applying the loss factor to the PV energy value ($45.69 x 1.0653 = $2.98/MWh). The PV energy value and the line losses is equal to PV energy value at the generation source.

Table 3.1 shows the PV energy value at the generation source for 2016 is $48.67/MWh.

3.6 AVOIDED MARKET FEES AND NETWORK COSTS

Retailers pay market fees and ancillary charges to the AEMO to support its role of managing the wholesale electricity market and we include these as avoided costs associated with feed-in electricity. Retailers pay these fees based on the amount of their electricity purchases from the wholesale market and avoid these fees to the extent that they source electricity from small embedded generators.

A retailer that has a higher proportion of solar power generating customers will avoid more of these fees than a retailer with a smaller proportion of such customers. Therefore this can result in an avoided cost to the retailer due to feed-in electricity.

In 2015 the Commission calculated the avoided market fees as 0.05 c/kWh. A relatively current and reliable estimate is 0.1 c/kWh (IPART 2014 p.22). The Commission considers 0.1c/kWh to be an appropriate estimate for the 2016 FiT.

4 CONCLUSIONS

4.1 SUMMARY OF METHODOLOGY

The results of quantifying each of the elements of the avoided cost of small-scale renewable energy supplied into the grid is summarised in table 4.1. The results are based on the ACIL Allen market model half hourly average electricity price forecast and the actual solar PV export profile in 2013.

TABLE 4.1 FORECAST VALUE OF FEED-IN ELECTRICITY
Victoria, 2016

	$/MWh	c/kWh
Forecast average pool price	40.19	4.02
PV Energy Value (value at RNN)	45.69	4.57
Locational value (line losses)	2.98	0.30
PV energy value at source	**48.67**	**4.87**
Avoided market and ancillary fees	1.00	0.10
TOTAL AVOIDED COST OF PV	**49.67**	**4.97**

Note: Based on the ACIL Allen forecast hourly average electricity price and the 2013 actual small-scale solar PV export profile.

The method used to estimate the value of feed-in electricity, as presented in table 4.1, is consistent with the method adopted by the Commission in previous years. The results can be summarised as;

- the forecast average wholesale price of electricity in 2016 is approximately 4.02 c/kWh
- given the actual time-profile of PV exports, the energy value of solar PV exports (valued at the RRN) is forecast to be approximately 4.6 c/kWh in 2016
- the locational value of solar PV exports is 0.3 c/kWh
- the avoided cost of market fees is estimated to be 0.1 c/kWh
- this brings the value of feed-in electricity to about 5.0 c/kWh.

4.2 FEED-IN TARIFF RATE FOR 2016

The Commission's draft decision is to set a minimum FiT of 5.0 c/kWh to apply from 1 January 2016.

REFERENCES

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