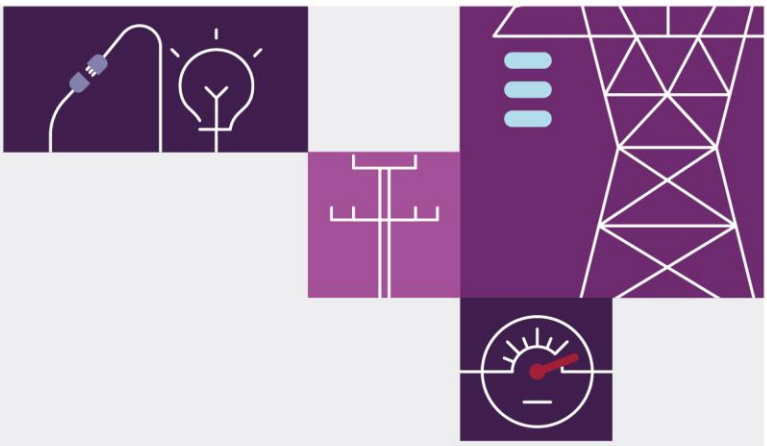
AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

# Marginal loss factor discussion points

## July 2024

A register of discussion items related to the regulatory framework for marginal loss factors (MLFs)



# Important notice

## Purpose

This document is linked to AEMO's 2024 consultation on the Forward-Looking Transmission Loss Factor (FLLF) methodology[1]. AEMO has discretion to modify this methodology within the scope allowed by the National Electricity Rules (NER)[2]. To make modifications, AEMO must follow the standard rules consultation procedures described in NER clause 8.9.2.

In preparation for its 2024 consultation, AEMO held a short series of workshops with industry to explain the scope of the consultation and describe some of the areas of improvement it could address. In these pre-consultation workshops, AEMO encouraged stakeholders to raise any items for discussion related to the calculation process, regardless of whether AEMO had discretion under the NER to address these items. Subject matter experts (SMEs) within AEMO were also encouraged to raise ideas for improvements to the MLF regulatory framework.

This document logs discussion items that are outside the scope of the methodology consultation and is provided for the visibility of industry. AEMO intends to use this document as the basis for further engagement with industry, and potentially further consultation on regulatory change proposals. AEMO invites stakeholders to provide further feedback on the regulatory framework by contacting mlf_feedback@aemo.com.au. AEMO will update the document from time to time to reflect this feedback.

## Copyright



### Version control

| Version | Release date | Changes |
|---|---|---|
| 1.0 | 05/07/2024 | First release |

[1] The FLLF methodology is commonly referred to as the marginal loss factor (MLF) methodology. 'MLF methodology' will be the terminology used in this document.

[2] Specifically clauses 3.6.2 and 3.6.2A.

AEMO acknowledges the Traditional Owners of country throughout Australia and recognises their continuing connection to land, waters and culture. We pay respect to Elders past and present.

# 1 Background material

This document assumes familiarity with the economic rationale for MLFs, their calculation process and their regulatory context in the National Electricity Market (NEM). Background information on these topics is contained in the following publicly available materials[3]:

- 'Loss factors and regional boundaries' webpage resources[4]:
  - Current Forward Looking Loss Factor Methodology.
  - Treatment of Loss Factors in the NEM.
- Masterclass – Marginal loss factors in the NEM[5].
- Transmission loss factor rule change proposals submitted by Adani Renewables[6].
- AEMO's enhanced locational information (ELI) reporting[7].
- AEMC coordination of generation and transmission investment (CoGaTI) review 1 and review 2[8].

[3] AEMO is not responsible for the accuracy of any third-party materials.

[4] At https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/market-operations/loss-factors-and-regional-boundaries.

[5] Julian Egglestone, AEMC, at https://www.aemc.gov.au/news-centre/videos/julian-eggleston-masterclass-marginal-loss-factors-nem.

[6] At https://www.aemc.gov.au/rule-changes/transmission-loss-factors#:~:text=On%2027%20November%202018%20Adani,between%20generators%20and%20networks%20users.

[7] At https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/enhanced-locational-information.

[8] At https://www.aemc.gov.au/markets-reviews-advice/reporting-on-drivers-of-change-that-impact-transmi and https://www.aemc.gov.au/market-reviews-advice/coordination-generation-and-transmission-investment-implementation-access-and.

# 2 Marginal loss factor (MLF) framework discussion points register

For readability, the following table groups discussion points under topics, and describes discrete alternatives to the current framework. The table does not generally contemplate how the description of certain topics would change if multiple elements of the framework were changed together. For example, there are many combinations of the various timing items in the table, but the table does not attempt to describe them all.

| # | Item | Description |
|---|---|---|
| 1 | Calculation frequency and publishing horizon | Currently, AEMO produces MLFs through an annual calculation cycle based on financial years. The calculation is based on data from the previous financial year (called the 'reference year') and applies the resultant MLFs to the following financial year.<br>AEMO could use a three-year calculation cycle (for example) and publish MLFs three years into the future. This would promote stability for investors but reduce accuracy. Assuming each year in the three-year horizon has its own MLF (that is, time-slicing remains yearly), and the previous financial year continues to be used for calculations, this would create lags between reference data and MLF application periods of up to four years (between the reference year and the final year of the horizon).<br>Alternatively, a shorter calculation cycle (for example, quarterly) could also be used. This could be done in conjunction with finer time-slicing or a shorter lag between reference data and MLF application (later table items explore these concepts), either of which would increase the accuracy of MLFs whilst reducing stability. |
| 2 | Time-slicing of MLF application and reference data | Currently, AEMO applies a single MLF to the whole of the next financial year.<br>Alternatively, AEMO could divide reference data from the previous financial year into (for example) quarters and apply quarterly MLFs to the corresponding period in the next financial year. MLFs would be expected to capture differences in market dynamics between quarters and therefore more accurately reflect actual system losses.<br>For similar reasons, MLFs could also be allowed to vary by time of day (for example, diurnally).<br>Conversely, more coarse time-slicing could be used and MLFs could apply over the whole of a three-year (for example) period based on the volume-weighted average of the last three years of reference data. This option would likely be more stable than the status quo, but risks being less accurate given the long lag between the start of the sample period and the end of the application period.<br>More sophisticated time-slicing options, like using the volume-weighted average of the last three years of data at a quarterly resolution, may also warrant consideration. |
| 3 | Rolling reference years | Table item 2 considers options where the time slices for reference data and MLF application are the same length. This item considers an example where this is not the case.<br>Suppose reference data is based on the previous three years, but a yearly calculation and application cycle is retained. To illustrate the effect of this, suppose calculations occur in $t_0$. In each year's calculation, the oldest sample year from the previous calculation ($t_{-4}$) is removed from the sample, and a new year is added to the sample ($t_{-1}$). This means that two out of three years are common to the samples used for subsequent calculations. Longer, rolling sampling like this has the effect of smoothing out some of the volatility of MLFs and providing a forward signal of future MLFs. The latter outcome could also be supported by publishing indicative MLFs for years beyond the next financial year. The benefits of longer sampling periods would need to be traded-off against the potential for reduced accuracy. |
| 4 | Reference and application time lag | Currently, the MLF calculation is based on data from the previous financial year and is applied to the following financial year, resulting in a two-year lag between the reference year and year to which MLFs apply.<br>If time-slicing were made finer and calculations were carried out more frequently, then it may be possible to reduce the reference-application lag to one year. For example, data from Q1 2026 could be used to calculate MLFs for Q1 2027 if the calculation was carried out in Q2-Q4 of 2026. |

| # | Item | Description |
|---|---|---|
| | | Conversely, less frequent calculations or coarser time-slices would, all else equal, tend to result in a greater lag between reference data and MLF application. |
| **5** | Forward market modelling of supply and demand profiles rather than using 'minimal extrapolation' from historical outputs | Currently, the MLF calculation process starts from baselines of supply and demand in every historical interval in the reference year, and then adjusts generation until it equals load for each interval. The details of this adjustment process are a key topic of the MLF methodology consultation.<br>Instead of starting from historical baselines, novel supply and demand profiles could be determined using a market model. This would make the MLF process more like other AEMO processes such as the Integrated System Plan (ISP) and Electricity Statement of Opportunities (ESOO). It may also make the process more compatible with off-the-shelf market modelling software. |
| **6** | Use average loss factors (ALFs) instead of MLFs | The MLFs at points in the network used in National Electricity Market (NEM) dispatch and settlement are derived from the losses associated with incremental changes in electrical power from the predicted load or generation. In contrast, ALFs represent the average losses across all load or generation.<br>The proposal to use the square root of MLFs as a proxy for ALFs in the NEM (and the related proposal of sharing intra-regional settlement residues between generators and customers) was examined by the Australian Energy Market Commission (AEMC) in its consideration of two rule changes on the topic of transmission loss factors between 2018 and 2020 (these rule changes are referenced in the 'background material' section of this document). |
| **7** | Introduce an investment stability or low-volatility principle | The current National Electricity Rules (NER) principles that must be implemented in the methodology emphasise that MLF calculations should reflect the losses expected on the system as accurately as possible[9]. The most accurate process may not be the most transparent, predictable and hence supportive of investment. Therefore, though accuracy is strongly linked to operational dispatch efficiency, it may not lead to the lowest costs for consumers over the long term (which is required to be considered under the National Electricity Objective (NEO)). An investment stability principle (or similar) introduced or reflected in the NER could allow AEMO to consider pragmatic trade-offs in having regard to this element of the NEO. |
| **8** | Applying real-time losses rather than forward-looking loss factors | If NEM dispatch were transitioned from the current hub and spoke representation to a full network model, this could facilitate the calculation of real-time losses (and loss-adjusted prices) around the whole network[10]. Real-time losses are used in conjunction with nodal markets found in jurisdictions outside Australia. Transitioning to a network model would be a substantial change for the NEM with many implications beyond the treatment of network losses. Topics of further investigation to support assessment of this proposal could include:<br>• Publication of loss factors, as year-ahead loss factors would no longer be needed.<br>• Renewable energy certificate discounting based on loss factors, and whether this should continue[11].<br>• The overall impact on market efficiency of accounting for losses more accurately but having greater uncertainty that could be priced into bids.<br>• The feasibility of options where the NEM retains its hub and spoke dispatch representation but calculates real-time losses. |
| **9** | Mechanisms to hedge the variability of MLFs, separate from marginal pricing | Under current frameworks, MLFs are accounted for in dispatch, pricing and payments to suppliers (or from customers). This leaves investors in new generation exposed to variability in MLFs. In principle, opt-in mechanisms could be introduced to hedge this variability for investors and aim to make MLF calculations as accurate and dynamic as possible without undermining investment certainty. Any reform in this space would be substantial for the NEM, and its mechanics and ownership are key design questions.<br>For information, a key objective of the AEMC's Coordination of Generation and Transmission Investment (CoGaTI) review 2018-2020 was to consider ways to hedge loss factor and congestion risk in the regional model. The review found that hedging loss factors was highly challenging. This review is referenced in the 'background material' section of this document. |

[9] Particularly clauses 3.6.2(e)(2) and (2A).

[10] Note that the current dispatch approach does calculate interconnector losses in close to real time.

[11] Certificates created under the Australian Government's Large-scale Renewable Energy Target scheme are currently scaled by MLFs. This is outside the NEM.

| # | Item | Description |
|---|---|---|
| | | This topic has links to timing items (1-3) and the investment stability proposal (6). |
| **10** | WEM alignment of any reform | The Wholesale Electricity Market of Western Australia (WEM) applies fundamentally the same annual MLF approach as applied in the NEM, although its governance is different as it is calculated by Western Power (WP) rather than AEMO (WP being the only TNSP). WP's South West Interconnected System (SWIS) is technically simpler than the NEM as it is a single region without interconnectors nor DC links.<br>The proposals above have equal application and presumably benefits in the WEM as the NEM. Hence any reforms investigation should be undertaken for both markets. |