CS Energy's fixed-shape time-of-day MLF

CS Energy believes there is scope to enhance the MLF settings to address the ESB's concerns with the existing market design. When the AEMC undertook quantitative analysis to compare marginal and average loss factors to inform Adani's Transmission Loss Factors rule change request, it determined that "*marginal loss factors provide and maintain the most efficient locational and dispatch signals to the market*".[40]

[40] Australian Energy Market Commission, *Transmission Loss Factors Final Rule Determination*, page 12

CS Energy proposes the ESB examine potential changes to the MLF methodology to further enhance the power of the locational and dispatch signals MLFs provide to potential and incumbent projects as an alternative to CMM. CS Energy believes annual fixed-shape time-of-day MLFs for generators and scheduled load address the ESB's assessment criteria.

(a) Summary of proposed MLF solution

The current MLF methodology weights the underlying physical losses by expected consumption or export to calculate a flat MLF that applies for a financial year. The divergence of the current flat MLF from actual losses is illustrated for a solar farm in Figure 2. This highlights the generation-weighted flat MLF is lower than actual losses in the shoulder periods and higher than actual losses over the middle of the day.

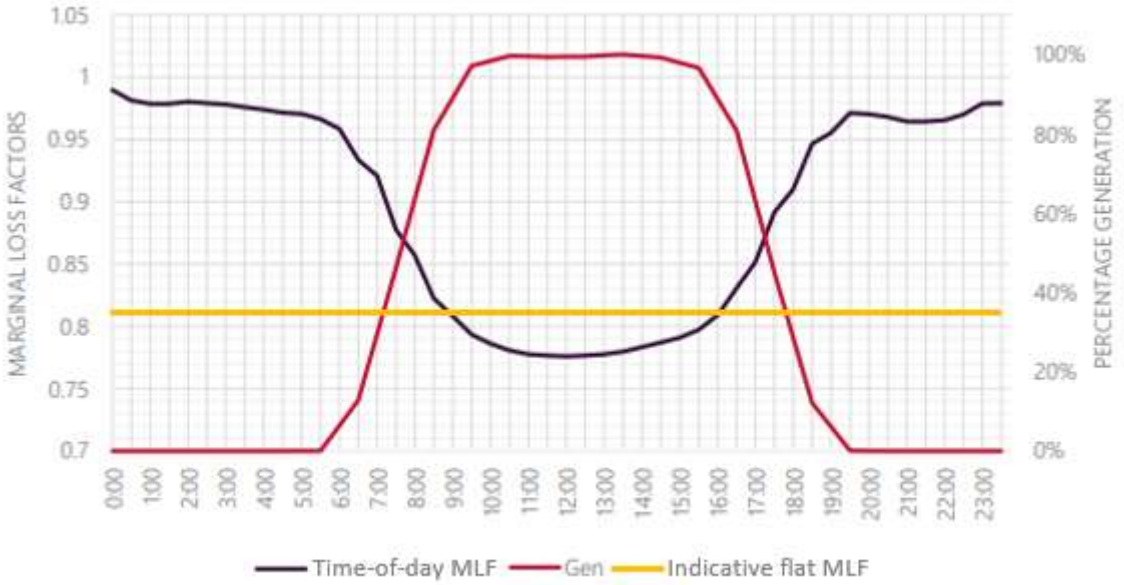
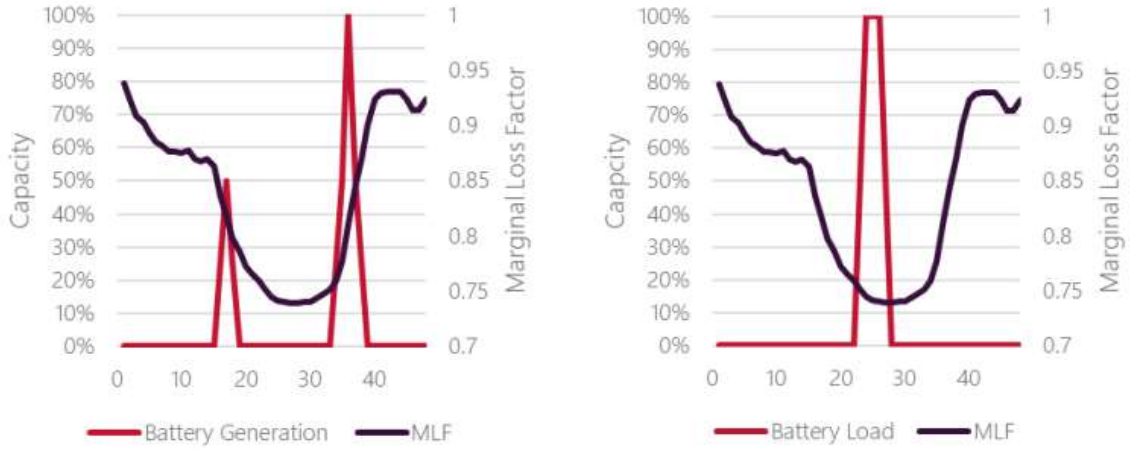


Figure 2: Time of day average MLF and percentage generation[41]

When the same underlying time-of-day MLF profile at a connection point is applied to all technologies connecting at that point, intertemporal differences in consumption and export result in different generation and load-weighted MLFs for different technologies. As illustrated by AEMO's example for storage (Figure 3), a battery exporting during morning and evening peaks when underlying half-hourly MLFs are high and loading across the middle of the day when underlying half-hourly MLFs are low will result in markedly different flat MLFs (0.8130 versus 0.7431). A fixed-shape time-of-day MLF would further enhance this differentiation between technologies, locations across the network and times of day.

[41] Adapted from Australian Energy Market Operator, *Regions and Marginal Loss Factors: FY 2020-21*, page 65



Battery generation MLF = 0.8130 Battery load MLF = 0.7431

Figure 3: Time-of-day impact of technology on MLF outcomes[42]

The proposed fixed-shape time-of-day MLFs would reflect the changes in physical losses of different generation units in different parts of the network over the course of the day, better aligning the incentives and signals faced by incumbent and potential participants over investment and operational timeframes.

The ESB has expressed concerns that "*some generators are connecting in locations where, a lot of the time, they are not adding new renewable energy to the power system; instead, they are displacing the renewable generators that were already there*".[43] CS Energy's proposed alternative would address this by calculating MLFs of new projects as the *true marginal* loss factor to reflect the marginal contribution of energy provided by the project beyond that of incumbent generation in that location on the network. Proponents of projects in heavily populated parts of the network would assess whether their project is commercial given its expected marginal energy contribution in that location. A low true marginal loss factor would dissuade new projects from connecting in heavily populated parts of the network, providing a robust locational signal for potential new projects. The time-of-day profile would also provide a signal of what technologies may be better suited to a particular location. This is akin to the current approach to system strength whereby new entrants are responsible for meeting the costs of addressing the impact of their locational decisions on system strength.

Having new plant bear the impact of their entry on transmission losses may also reduce year-to-year movements in MLFs for both incumbent generators and new entrants. As noted by AEMO:

> *The location of new generation projects and load developments on the transmission and distribution network has a significant impact on the MLFs in an area. As more generation is connected to electrically weak areas of the network that are remote from the RRN, MLFs in these areas will continue to decline*.[44]

True marginal loss factors for new entrants would be expected to reduce instances of plant connecting in electrically weak areas of the network as the new project alone would bear the impact of their entry on MLFs in that area of the network, as opposed to the impact smeared across all participants in the area as per the current methodology. This impact would then flow through to the operational timescale, with less capacity added to electrically

[42] Australian Energy Market Operator, *Regional and Marginal Loss Factors: FY 2021-22* . page 76
[43] Energy Security Board, *Transmission Access Reform Project Initiation Paper*, page 5
[44] Australian Energy Market Operator, *Regions and Marginal Loss Factors: FY 2021-22*, November 2021, page 38

weak parts of the network meaning typically lower congestion than would otherwise have been the case.

This is not to say that a new project's true marginal loss factor could not increase over time (e.g., as the network is augmented or incumbent plant withdraws), but that the relativity between incumbent MLFs and newer plant MLFs is maintained over time.

A fixed-shape time-of-day MLF could provide a stronger locational and operational signal than the current annual flat MLF without incurring the expense, disruption and uncertainty of more-invasive market reforms such as CMM.

(b) Assessment against the ESB's assessment criteria

An assessment of CS Energy's proposed MLF solution against the ESB's assessment criteria indicates this option warrants further investigation.

- *Efficient market outcomes – investment*

  An MLF that more-closely aligns with actual physical losses on the network over the course of the day will provide a strong locational signal for potential new projects. For example, the continued addition of solar PV is expected to further increase transmission losses over the middle of the day. The impact of time-of-day MLFs on expected revenue will influence investors' locational decisions.

  By assigning a true marginal loss factor to new projects, the locational signal of this proposed MLF solution will be considerably strengthened compared to both the status quo flat MLF and a time-of-day MLF. The cost of the new entrant's impact on transmission losses would be borne by the causer in perpetuity. The MLF could increase in response to changes in generation capacity, generation, load or network capacity in relevant parts of the network, but the relativity between incumbent generation and the newer entrant would be maintained so as not to adversely affect incumbents' transmission losses.

  Given projects are currently banked on an estimated MLF and proceed with annual MLF revisions, it is not envisaged that an annual fixed-shape time-of-day MLF would adversely affect investment certainty or investment efficiency.

- *Efficient market outcomes - dispatch*

  The MLF solution sends a transparent operational signal to participants and the broader market about the value of at-node generation over the course of the day. A time-of-day MLF would reduce both the incentive and the ability of plant to increase generation at times of typically high coincident generation and/or congestion. Further, it may also incentivise storage to time-shift energy from low-value to high-value trading intervals and provide non-energy services to the market.

  It is envisaged that the charge and discharge functions of storage would have fixed-shape time-of-day MLFs that reflect the relative contribution of each over the course of the day. Given the typical operation of storage, it may be that storage load would have an MLF profile akin to solar generation profile and storage generation would have an MLF profile akin to thermal generation profile.

  High coincident generation in a local area relative to load should would normally be expected to result in low MLFs for storage in that area, which will enable it to charge for

less than the RRP, then discharge at times when firm generation is required by the network and be compensated accordingly.[45]

As under the current methodology, generating units will know the applicable MLF for every Trading Interval at the time bids are entered, so there is no uncertainty about the prices at which the plant has been offered to the market and the price plant will receive when it is dispatched.

- *Appropriate allocation of risk*

  Any project that attempts to locate in a congested part of the network will wear an amount of risk (reflected in their marginal fixed-shape time-of-day MLF) commensurate to the additional congestion their locational decision and operation has caused on incumbent generation.

- *Appropriate allocation of the cost of transmission investment*

  The MLF alternative would maintain relativities between generation plant as available transmission capacity changes over time, either through network augmentation or existing generation withdrawing from the market.

  One potential area of investigation would be to determine whether there is scope for generators who contribute to network augmentation to have this contribution reflected in their MLF or if this would encroach on the Dedicated Connection Asset or Market Network Service Provider provisions. If possible, this would go some way to addressing the "free rider" issue that dissuades participants from currently contributing to network augmentation.

- *Implementation considerations*

  Consultation with AEMO would need to be undertaken to determine whether time-of-day MLFs are currently calculated under the current methodology and if not, how much additional work would be required to do so, as well as any other potential impediments to the implementation of the MLF alternative to CMM.

  Implementation would be expected to be relatively low cost and low intrusion, as it modifies an existing process rather than creating new mechanisms and processes.

- *Flexibility to enable consideration of jurisdictional differences*

  As time-of-day MLFs reflect the physics of transmission losses, it is not envisaged that they would impede or be impeded by different jurisdictional initiatives and policies (e.g., REZ schemes currently under development in some jurisdictions).

[45] Australian Energy Market Operator, *Treatment of loss factors in the National Electricity Market*, July 2012

(c) Assessment against recommended additional selection criteria

CS Energy has also considered this proposal against the additional selection criteria suggested earlier.

- *Interaction with other energy markets*

  The MLF solution does not adversely affect co-optimisation of energy and non-energy services by either AEMO or market participants.

- *Interaction with contract markets*

  The MLF solution does not adversely affect written contracts as it will not drive additional change in the future MLFs of incumbent plant beyond potential future MLF changes under the existing MLF methodology.

  If anything, insulating incumbent generators from adverse MLF impacts arising from new entrants should increase contract liquidity.

(d) Evaluation of select alternatives

An initial assessment of these select alternatives is given in Table 1 below which indicates they each address at least some aspects of the ESB's assessment criteria and CS Energy's recommended additional assessment criteria.

As part of the evaluation of alternative options, potential modifications to each alternative may be identified that enhance each option's alignment with and ability to address the assessment criteria.

Potential hybrid solution

As detailed above, CS Energy believes the ESB's current range of objectives for transmission access reform may be too broad to be adequately addressed by a single mechanism. CS Energy implores the ESB to rigorously assess all alternatives proposed by participants to date and as part of this consultation process, both as stand-alone reforms and in combinations, and the CMM against an expanded range of assessment criteria to choose the best solution or solutions that remain fit-for-purpose over the course of the energy transition.

Table 2: Assessment of alternatives against ESB's assessment criteria (based on available information of each option as proposed)

	Congestion Relief Market	Transmission cost sharing	Dual floor price	Fixed shape MLFs
Locational signals	All market outcomes from CRM to be made public.	Uncertain how proposal treats plant that chooses to locate outside REZs (if allowed under this proposal)	NEMDE's locational prices would reflect changes to Market Floor Price.	Time-of-day MLFs across the network visible to the market and potential investors. Ex-ante signal.
Efficient dispatch	Congestion relief occurs when a price for congestion relief is agreed.	No change to market design in operational timeframes.	Brings negative bid prices of semi-scheduled generators closer to short-run marginal cost.	Reduces ability to increase generation during typical periods of high concurrent generation
Congestion risk allocation	Allows participants to individually value congestion relief, leading to the true marginal cost of congestion.	Efficient REZ capacity would address congestion within REZ, but not shared network congestion.	Raising MFP for semi-scheduled generation may reduce instances and severity of congestion.	True marginal loss factor of new entrants means they bear 100% of their impact on transmission losses.
Transmission cost allocation	No explicit mechanism to allocate transmission costs.	Recovery of transmission capital expenditure split between generators and consumers.	No explicit mechanism to allocate transmission costs.	Further work to determine is network augmentation funded by participants can be reflected in their MLF.
Implementation considerations	New mechanism needed, but proposal utilises existing market design as much as practically possible.	New mechanism needed; many factors required to establish capex split, connection fee.	Utilises existing market mechanisms. Easy to implement in NEMDE	Utilises existing market mechanisms. Need to consult AEMO to determine implementation costs
Jurisdictional differences	Appears to accommodate jurisdictional differences.	Detailed design stage of prospective REZs accounts for government energy and planning policy.	Market Price Floor could be modified to account for jurisdictional differences.	No impediment to jurisdictions choosing MLFs that don't reflect network losses.
Interaction with non-energy markets	CRM participants can co-optimise congestion relief, energy and non-energy service provision	Does not appear to adversely affect non-energy service provision.	Incentivises investment in dispatchable capacity.	No adverse effects on current or future non-energy markets foreseen.
Interaction with contractual arrangements	Ability to price and manage congestion expected to support contracting activity.	Uncertain impact on contracting and contract markets.	Reduce the cost of contracting and increase contract liquidity.	May increase contracting activity as new entrants will have less impact incumbents' future MLFs.