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National Electricity Amendment (Transmission Loss Factors) Consultation Paper ERC0251

The Australian Energy Council (the AEC) welcomes the opportunity to make a submission to the Transmission Loss Factors Rule Change Consultation Paper.

The AEC is the industry body representing 21 electricity and downstream natural gas businesses operating in the competitive wholesale and retail energy markets. These businesses collectively generate the overwhelming majority of electricity in Australia and sell gas and electricity to over 10 million homes and businesses.

Introduction

Loss factors play key roles in the NEM, in each of:

- settlement adequacy;
- dispatch efficiency; and
- locational incentives.

At its core, the existing framework attempts to achieve all the above three, and, it largely achieves this, limited only by some inaccuracy introduced in the interest of simplicity, being:

- the static loss factor arrangements and
- the regional market design[1].

The current rule change consideration should not deviate from the objectives of the three roles, however it is appropriate to re-consider whether the current design achieves the appropriate balance between the accuracy in their achievement, and simplicity for participants. In order for participants to contribute to this decision, much more data on the inaccuracy of the current design is needed than was presented in the Consultation Paper.

Marginal Pricing – a fundamental feature of market design

The market requires all supply and demand be settled at a common clearing price set at their intersection. This means that a two sided price must reflect the cost of supply, or the elasticity of demand, *at the margin* at that location and time. These fundamental tenets are captured in Rule 3.9.2 (d)

[1] For more background on the loss factor design, please see https://www.energycouncil.com.au/analysis/marginal-loss-factors-will-someone-please-repeal-the-laws-of-physics/

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> "The dispatch price at a regional reference node represents the marginal value of supply at that location and time, this being determined as the price of meeting an incremental change in load at that location and time…";

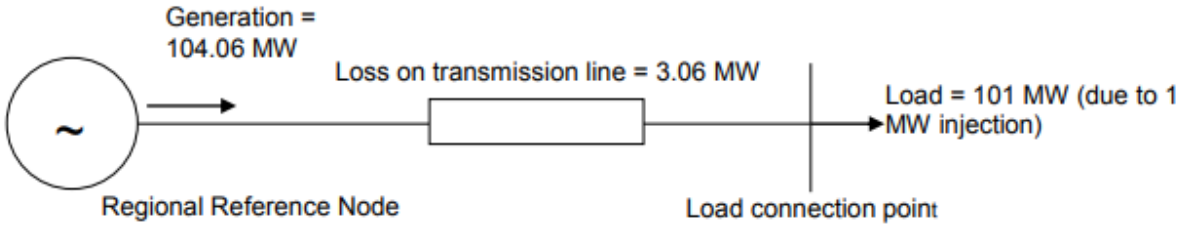
and Rule 3.9.1(a)(6)

> "when the spot price is determined, it applies to both sales and purchases of electricity at a particular location and time;".

Any consideration of the treatment of loss factors must be consistent with these tenets. The existing Marginal Loss Factor (MLF) methodology is conceptually consistent, although subject to simplifications that affect its accuracy. The trade-off between accuracy and simplicity in MLFs is worthy of regular reconsideration, but in doing so we should not depart from this common-clearing marginal price foundation of the NEM.

A marginal loss design also achieves settlement adequacy (i.e. pays for losses), which is essential; however this is not the only objective of the design. The primary objective, within the limitations of some simplifications, is to achieve an efficient dispatch and pricing of generation and demand. For example, in the diagram below, whilst a loss allowance of at least 3% is necessary to achieve settlement adequacy, a MLF of 6% is necessary to achieve dispatch efficiency. If there was a generator at the load connection point with a marginal cost 5% higher than the remote generator, it would in fact be cheaper and should be dispatched first. Only a marginal loss design achieves this.

Radial network prior to 1 MW load injection at load connection point



Source: AEMO[2]

The NEM is very sparse, with generators of relatively similar costs but great network resistances between them. For example, at extreme flows, the marginal loss factors on the Queensland-New South Wales and Victorian – South Australian interconnectors can each exceed 20%[3]. In some conditions the relative dispatch difference due to marginal losses for generators at extreme ends of the NEM could exceed 2:1, i.e. a 1MW increase in Port Lincoln load, if met by a marginal increase in Townsville generation, could require a 2MW increase in supply. Marginal loss pricing is clearly a necessity of NEM dispatch efficiency.

Marginal loss pricing will tend, by design, to over-recover total settlements, which is the source of the Intra-regional settlement surplus and part of the inter-regional settlement surplus. There appears to be a misunderstanding in the proponent's justification that these surpluses arise purely due to the errors resulting from the simplifications described above. This is not the case – even with perfectly accurate marginal loss pricing these residues would accumulate. It is true that the simplification errors do affect the surplus, but if the simplifications are unbiased, the errors will net out over time.

[2] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Loss_Factors_and_Regional_Boundaries/2016/Treatment_of_Loss_Factors_in_the_NEM.pdf page 13

[3] See tangents to figures 9 and 11 https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Loss_Factors_and_Regional_Boundaries/2019/Marginal-Loss-Factors-for-the-2019-20-Financial-year.pdf

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Note also that the marginal pricing tenet must extend into actual settlement quantities. If, for example, the published prices reflect the marginal value of supply, but some kind of rebate is provided to specific participants, then the participant will behave in response to the incentives of both the price settlement *and* the rebate. For example, if the marginal cost of supply from a generator is $10, but the generator knows it will receive a $1 rebate for generating, then it will tend to bid $9 into the dispatch engine. As such, distributing the surplus to specific participants in order to offset the MLF would equally undermine marginal pricing.

Question 1 Identifying the problem

As discussed above, a distribution of settlement residues to parties in proportion to their MLFs would undermine the marginal pricing signals of the current loss factor regime.

Perfectly accurate marginal loss pricing occurs in markets with the dispatch engine operating upon a load flow network model – for example that employed in New Zealand. The NEM however deliberately chose a simplification - hub and spoke regions combined with annual static intra-regional loss factors. It was considered that the simplifications of such an approach, with its advantages in supporting the contract markets, justified the resulting inaccuracies.

This trade-off was analysed in detail by the National Electricity Market Management Company (NEMMCO) in the first years of the NEM. Their analysis quantified the error by comparing static loss factors to actual marginal losses. At the time, the error was considered acceptable, but this was in a market characterised by non-variable sources of generation and a reasonably predictable investment pipeline. These conditions have significantly changed, and it is appropriate to recalculate this error.

Quantification of the error is straightforward, as information can be generated out of AEMO's existing MLF calculation tool. Recent years' actual dispatch can be reassessed for actual losses, and their variances from the applied static MLFs derived. From this it is further possible to estimate the resource cost of the actual dispatch inefficiency by applying the errors to a market model.

Below is an example of this type of analysis that AEMO performed on one connection point for a recent briefing on MLFs. A methodical analysis of the variance of all points could be performed.

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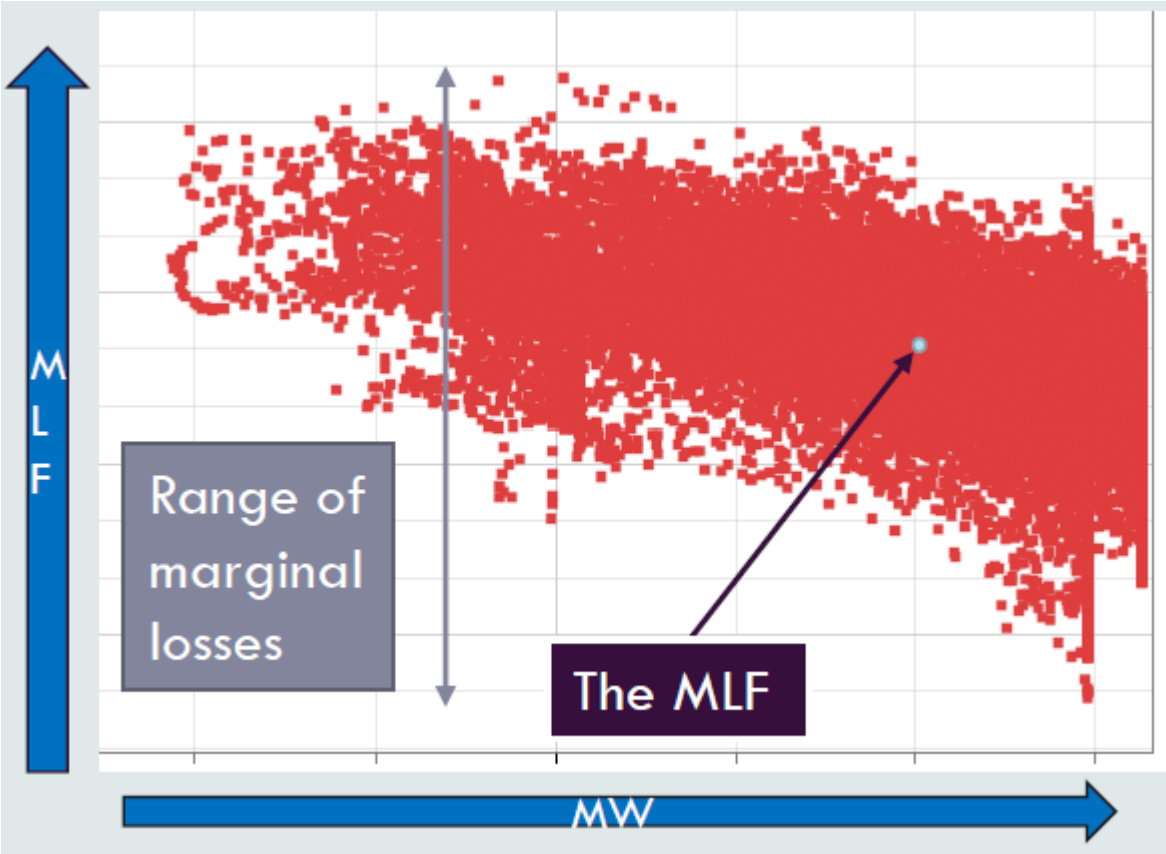

Source: AEMO

If these errors are shown to be material, the AEMC could propose more accurate MLF methodologies. This could include, for example:

- Recalculating static loss factors more frequently, e.g. quarterly;
- Time-varying static loss factors, e.g. a peak/off peak or a daylight/non-daylight MLF; or, in *extremis*
- Dynamic MLFs, calculated continuously from a network model, which would remove all error.

Having identified several options, the AEMC should re-engage AEMO to quantify exactly how much these would reduce the error (i.e. the benefit of change) and assess the AEMO implementation costs. The AEMC would then consult on participant impacts.

For example, the following is from a recent AEMO forum where this type of analysis evaluated the accuracy advantages of the use of time-varying over static MLFs for one connection point.

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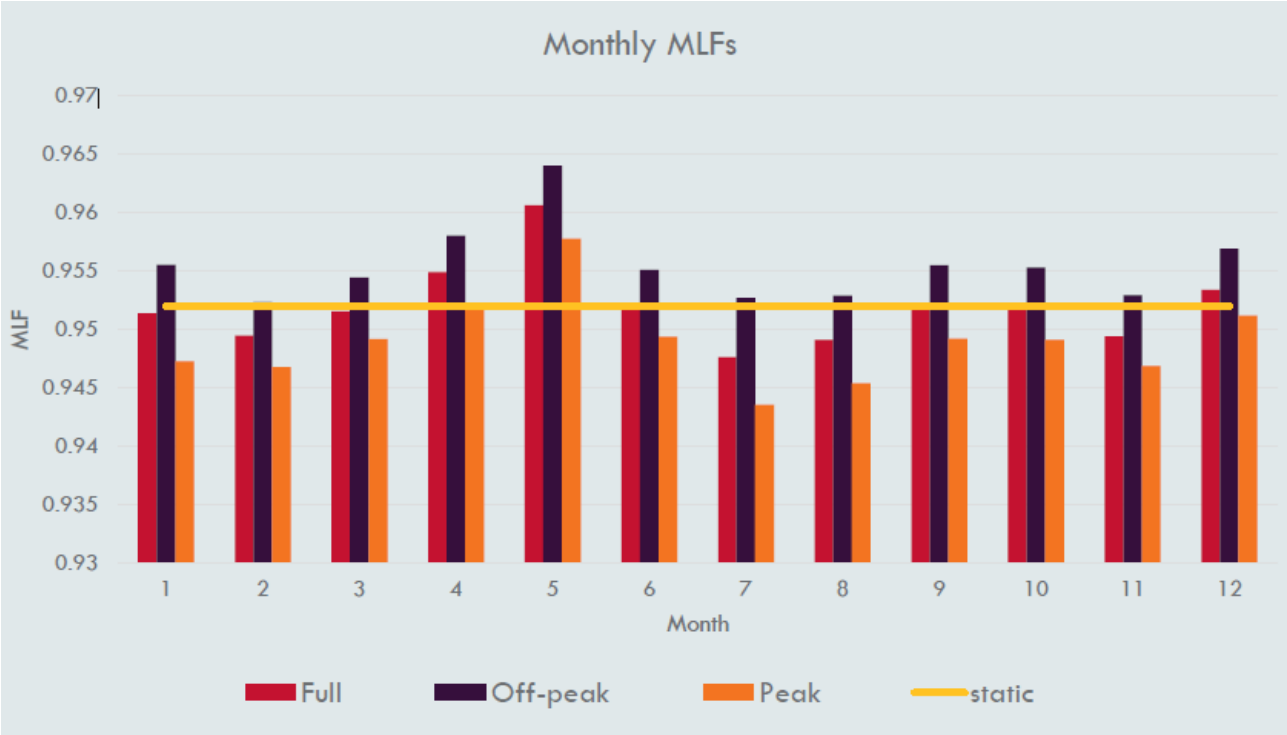

Source: AEMO

Question 3 Changing the Framework

Questions (a) – (b): Marginal loss pricing and residue allocation must not change from the current arrangements for the reasons explained above.

Question (c) – (e): The AEMC, supported by AEMO, should prepare analysis on the errors of the existing method as discussed above before developing options on notice periods, frequency of recalculation and calculation approach. Only after this research has been completed should the industry be asked to indicate its preferences.

Question (f)-(g): Glide paths and grandfathering. These suggestions imply a move away from the current "open-access" approach to transmission, where loss factors and transmission access are determined purely from the current dispatch conditions. Instead they imply different treatment and transfers between participants depending on the circumstances of the network at the historic times of their connections.

These matters therefore naturally open the much wider considerations of generator transmission access: both in terms of congestion as well as losses. They have been considered at length many times in the NEM and continue to be discussed in other forums. The implications of a departure from the open access model seem well beyond the scope of a technical rule change on loss factors and should be dealt with holistically, along with congestion risk, in reviews engaging with that question. The current COGATI Access and Frameworks review, or even the Energy Security Board's NEM2025 review seem the appropriate places for such fundamental considerations.

Transparency

The AEC notes and supports two broad areas of current work referred to in section 5.1 of the Paper relating to transparency.

Firstly there are efforts to improve and expedite the provision of information about connecting parties to the NEM, including through three rule changes. This should allow better forecasting of MLF impacts of new entrants, at least in the short-term horizon, say under two years.

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Secondly there are stated commitments from AEMO to prepare centralised long-term MLF forecasts, as part of Integrated System Plan (ISP) or other planning information. It is acknowledged AEMO would also be subject to uncertainties about the connection rates of future generators, however:

- they have a unique position in being amongst the first to become aware of connection proposals;
- have sophisticated economic models supporting the ISP which predict long-term future generator commitments;
- have the engineering expertise to understand and assess the loss implications of proposed new network investment; and
- own the MLF calculation software that can be adjusted to operate on a forecast power system.

Furthermore, if AEMO's forecasts are published with sufficient supporting data, expert engineering consultants can use such forecasts to standardise their own hypothetical analyses for clients.

Such forecasts should help reduce the chance of negative surprise to investors when MLFs decline, but more importantly, enable the marginal loss construct to achieve its objective of efficient siting decisions.

Conclusion

The fundamentals of marginal loss factor methodology have a very strong basis in economics and remain an essential part of the market. This does not need reconsideration. The implicit trade-off between the accuracy of the methodology and the simplifications of its applications are worthy of reconsideration, but they require much more data on the accuracy before participants can deliberate them.

Questions of stabilising loss factors in some way move into the field of generator access and should be dealt with in that context.

Developments in transparency, particularly MLF forecasts from AEMO, should help resolve many of the negative surprises experienced by generators whilst also more fully leveraging the efficient siting driver marginal loss factor pricing is intended to achieve.

Any questions about our submission should be addressed to me by email to ben.skinnerl@energycouncil.com.au by telephone on (03) 9205 3116.

Yours sincerely,

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