IES
Intelligent Energy Systems

26 June 2019

Mr Andrew Splatt
Project Leader
Australian Energy Market Commission

Dear Mr Splat

AEMC Ref: ERC0251: Transmission Loss Factors

Intelligent Energy Systems (IES) wishes to respond to the Consultation Paper issued by the AEMC on the above proposed rule change.

IES is an Australian consulting and software company that has supported market reform in Australia since the mid-1980s. IES staff have advised on various aspects of market design in Australia and internationally. For example, IES designed the current ancillary service market arrangements and payment mechanisms in 1999.

While the Adani proposals are flawed and should not be pursued, in this submission we argue that the current MLF arrangement do need to be upgraded. The analytical issues that constrained the market design when it was developed in the 1990s no longer apply. For this and other reasons, IES argues that the best way forward is to calculate and apply MLFs in real time. In this submission we outline how this can be done.

A key recommendation in his submission is that AEMO be required to prototype options for implementing real time MLFs.

I would be pleased to answer any further questions you may have.

Yours sincerely

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1 Formal Response to AEMC Questions

QUESTION 1: IDENTIFYING THE PROBLEM

(a) Do you agree with the problems identified by Adani Renewables in relation to:

- the current distribution of the IRSR to market customers only
- that the current marginal loss factor methodology produces "inaccurate" results

(b) Do these problems have a material impact on the long-term interest of consumers?

(c) Do you have other concerns (not identified by Adani Renewables) about the operation and impact of the transmission loss factor framework?

QUESTION 1: RESPONSE

(a) The current distribution of the ISSR recognises that the IRSR is the outcome of marginal pricing methodology used to account for losses in the network. It aims to reduce the mount to be recovered in network charges generally without destroying the Individual MLF signal. This logic is appropriate for good efficiency. How network charges are distributed is another matter and is one of the subjects of the COGATI review.

While the current MLF implementation does indeed produce inaccurate results, that inaccuracy is due to the method of implementation, not the concept. Generation of a financial surplus is implicit in the efficient pricing of losses using MLFs.

(b) In recent years, large step changes in MLFs have caught some project proponents off-guard and undermined the value of their investments. While not all of this can be ascribed to MLF methodology, it does prompt a search for ways to do things better. Current AEMO thinking is simply to reduce the time between MLF reviews, which addresses only the issue of new facilities connecting. Consideration of daily load and generation patterns, seasonal variations and the impact of local flows in the more remote parts of the network suggest that constant factors are a long way from realistic, and are likely little better than some form of average in terms of efficiency.

Realistic MLFs would sharpen operational and investment signals by lowering off peak prices and increasing peak prices. Battery operations and investment, for example, would benefit from this change, even more so if distribution pricing could also have some time-of-use elements.

For these reasons the issue is material and some reform is required, in DLFs as well as MLFs

(c) The consultation paper did not dwell on whether it is appropriate for AEMO to be doing projections which directly affect the market. Network planning aside, to the

greatest extent possible AEMO should operate the market, not participate in it. This rule is broken with the current forward looking, annual MLF review methodology.

QUESTION 2: PROPOSED ASSESSMENT FRAMEWORK

(a) Do stakeholders agree with the proposed assessment framework?

(b) Are there any additional considerations that the Commission should take into account?

QUESTION 2: RESPONSE

(a) An assessment based on the impact on operations, investment and risk is appropriate.

(b) The assessment should also include a presumption that arrangements that require AEMO to form a market view which itself impacts the market are to be avoided.

QUESTION 3: CHANGING THE TRANSMISSION LOSS FACTOR FRAMEWORK

What improvements do you suggest could be made to elements of the transmission loss factor framework and why? In particular with reference to:

(a) calculating transmission loss factors on a marginal or average basis

(b) allocating intra-regional settlements residues

(c) the frequency of calculating MLFs

(d) the notice period provided to market participants

(e) whether a forward-looking or backward-looking methodology should be used

(f) if a collar and cap should be applied to transmission loss factors

(g) if grandfathering MLFs should occur.

QUESTION 3: RESPONSE

(a) Calculation on a marginal basis is appropriate on efficiency grounds, but avoiding the gross distortions of the current single factor, year ahead methodology. It is difficult to imagine how an average loss factor approach would work.

(b) The current arrangements for allocating the IRSR are appropriate, pending any modifications that may emerge for the COGATI review.

(c) There are suggestions that MLFs could be made to vary seasonally (essentially as proposed by AEMO), on a daily basis (e.g. peak, shoulder and off-peak, or in real time or very close to it. All except the real time option involve AEMO human judgement. All

involve uncertainties ranging from large uncertain changes at relative long intervals to small uncertain changes at short intervals down to dispatch interval level (close to real time). The options that requires least AEMO judgement and manageable uncertainty is the real time option i.e. recalculation each dispatch interval. This will be discussed in more detail following.

(d) The notice period to be provided in the real time case is the normal short period ahead of each dispatch interval. AEMO could also produce indicative year-ahead figures as part of the SOO.

(e) Look-ahead is no issue in real time case.

(f) A collar and cap distorts the intent of the MLF methodology. Risk can be managed in other ways.

(g) Grandfathering of MLFs is not relevant in the real time case.

2 Discussion of Preferred Option

2.1 Historical background to MLFs

The original NEM concept in the mid-1990s was for a single; lossless market based on the British model. A "paper trial" to test the concept unambiguously demonstrated the unworkability of that model in Australia's strung-out system. This lead to the current regional design, focussed on locally strong regional networks with relatively weak network connections between them. While the regional market design was largely driven by the need to manage network constraints, the market design working group of the National Grid Management Council quickly realised that inter-regional losses of a tidal nature (with flow going in both directions) could not be ignored and that intra-regional losses should at least be approximated. Intra-regional flows were considered to be relatively static and so static loss factors were considered adequate.

The final design with dynamic inter-regional marginal loss factors and static intra-regional marginal loss factors was based on two main considerations. First, it was believed that constant intra-regional loss factors would support contract trading better than variable ones. Second, it was not clear at the time whether existing computer processing power and algorithms would support a more dynamic treatment.

While there was debate on MLFs v average factors, the efficiency and ease of implementation of MLFs was recognised and the marginal logic won the day, at least in principle.

Within regions, it was felt appropriate to maintain static factors, but to revise them every year based on historical data. It was soon realised that looking forward was preferable and this change was made. Apart for this change, the treatment of losses has largely remained unchanged for the life of the NEM.

2.2 Why the current MLF treatment is outdated

Recent years have seen significant changes in MLFs year on year. On the face of it, the objective of using constant factors to reduce risk is not being met under current arrangements.

Risk is present and cannot be avoided; it can only be re-allocated in time and space. Worse, that risk is to a large extent driven by judgements made by AEMO.

The analytical capability to support dynamic MLFs has also increased by orders of magnitude in the intervening 20 years., to the extent where it is no barrier to change.

A more real barrier to change is the understandable conservatism of the market operator who may be concerned not to disturb a system that has run satisfactorily for a long time. There are several dimensions to this concern which can be addressed with careful design.

It is useful to ask the following question: If the market were being designed today, would we implement real time marginal loss factors or constant (intra-regional) marginal loss factors? Would we think the trading risks of real time factors to be unacceptable, outweighing all the other risks that must be managed? Would we feel restrained by a lack of analytical capability? The answer in both cases is likely NO!

2.3 Options for real time MLFs

To consider a strategy for implementing real time dynamic MLFs, we first assume our focus will be each region separately. That is, we assume the current dynamic inter-regional MLFs remain in place.

Do we build a network model into the dispatch engine, or do we apply dynamic MLFs externally? AEMO has indicated it is not comfortable with having to maintain an internal network model as sometimes the network solution can go wrong and interfere with the whole dispatch process. This is understandable, at least in the short term.

One approach is to leave the dispatch engine untouched and to calculate MLFs just prior to the dispatch schedule optimisation run, based on a DC or AC power flow model that can deliver MLF results in the short time available. Certainly, a DC power flow model can be developed that directly produces MLFs almost instantaneously, even for networks with thousands of nodes and branches. Such models can be can be further improved by using recently measured flows and voltages.

Alternatively, one could retain the current dispatch engine structure but simply add an internal loss model, a relatively small addition. This model would not be a full power flow, but the results of such a model directly expressing losses as a function of injections and offtakes. In other words, the risks of non-solves would be removed.

Finally, with intra-regional losses modelled dynamically, some of inter and intra-regional distinctions disappear. It may turn out to be simpler to treat the whole of the NEM network as a fully integrated system and wok s out real time MLFs accordingly. Regional reference nodes and the inter-regional and intra-regional surpluses would remain as currently defined. Such an approach would resolve a lot of potential anomalies at regional boundaries and with negative prices driving non-physical losses.

2.4 Recommendations

IES recommends that the NEM move towards implementing dynamic marginal losses in real time. Such a move better reflects the NEO and, specifically, removes AEMO from direct involvement in the market. We believe the risks faced by participants will either be unchanged or manageable. In many cases effective MLFs may vary with time of day, season and weather conditions, but be reasonably predictable in the short term. In the longer term MLFs remain a risk element that has to be managed already.

We also recommend that the AEMC not overlook such a change based on arguments around unproven implementation difficulties. IES has prototyped many of the ideas discussed above and AEMO should also be required to prototype them on its own systems to inform a final AEMC decision.