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Mr Andrew Splatt
Advisor
Australian Energy Market Commission
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Re: Transmission loss factors Consultation Paper ERC0251

Dear Andrew,

First Solar Australia is pleased to provide the AEMC with our submission in response to the consultation paper (ERC0251) on the two rule change requests submitted by Adani Renewables on the 27 November 2018 and 5 February 2019, pertaining respectively to the allocation of intra-regional settlement residue (IRSR) and the marginal loss factor (MLF) calculation methodology.

First Solar is an international leader in sustainable energy, who aim to accelerate the renewable energy transition through provision of cost-advantaged solar technology and services. We are a Tier 1 supplier of photo-voltaic (PV) modules, with a total of >6 GW of manufacturing capacity and are the largest provider globally of solar energy services with a fleet of over 12 GW of utility scale solar plants presently under operation.

First Solar was responsible for delivering, as EPC contractor, some of the earliest utility scale solar farms in Australia, including the Greenough River Solar Farm (10MW), the Nyngan (100MW) and Broken Hill (52MW) Solar Farms through our engineering, procurement and construction (EPC) business. Since then First Solar has been responsible for the development and construction of the Manildra Solar Farm (47MW) and most recently the Beryl Solar Farm (87MW) in NSW - both of which are in commercial operation with ongoing, long term operations and maintenance being performed by First Solar's Energy Services division. First Solar also has several projects under development, including the Bulli Creek and Chinchilla Solar Farms in Queensland which have post construction 2021 forecast MLFs of 0.97 and 0.96 respectively.

First Solar does not own any operating generation assets within Australia - we are motivated to ensure that the National Electricity Rules (NER) enable the most efficient outcomes for investment in new generation and deliver the lowest cost energy to Australian consumers.

Recently MLFs have changed significantly in certain areas of the network, primarily as a result of rapid deployment of new solar and wind generation in clusters where the renewable resources are strong and existing grid connection points were readily available. In the most extreme cases such as far-west NSW and far-north Queensland, MLFs have fallen considerably in recent years due to changes in electricity flows mostly caused by new generation. The negative impact that this has had on the revenue line of some generators has raised the question of whether the existing MLF regime is fit for purpose, with Adani and some other proponents calling for changes that would limit the risk from MLF that is borne by generators and their investors.

It is First Solar's position that the current MLF methodology provides an important signal for efficient investment in both generation and load and that any change to the MLF methodology which materially distorts or mutes this signal should not be supported. Rather than shifting risk of transmission losses away from generators, who we feel can most effectively manage and price this risk, we believe improved transparency in calculation and rate of publication of MLFs will help reduce the present volatility and associated risk to investors, without muting the important signal to site generators in the parts of the grid with lowest losses that the MLF provides. The remainder of this submission explains First Solar's position.

Problem Statement

The principle behind MLFs as generally agreed, is to allocate the cost of transmission losses to market participants in an equitable manner that reflects their relative contribution to those losses, in order to promote efficient dispatch and provide locational signals for efficient investment providing lowest cost electricity to consumers. An effective argument for change to the present MLF regime should therefore demonstrate how this principle is not being achieved.

Response to proposed Rule Changes

First Solar's submission in response to the two proposed changes to the National Electricity Rules are set out below:

- 1. It is proposed to reallocate the intra-regional settlement residue (IRSR) such that it is shared equally between generators and network users who are subject to non-locational prescribed transmission use of system (TUOS) charges.*

The primary rationale for the first rule change proposal is that as a result of forecasting inaccuracies in the NEM, some generators are being given artificially low MLFs which result in them bidding less

competitively, thereby reducing the efficiency of dispatch. Through recovery of some of the lost revenue, Adani argues that generators will be able to bid more competitively. Whilst the AEMO backcast results between 2013 and 2016 suggests that errors between forecast and actual MLF are in fact very low, Adani has pointed to the IRSRs received by Powerlink more than doubling between the 2015/2016 and 2016/2017 financial years as evidence that the MLF forecast is decreasing in accuracy as a result of the rapid deployment of new renewable generation in the NEM, North-Queensland being a prime example of this.

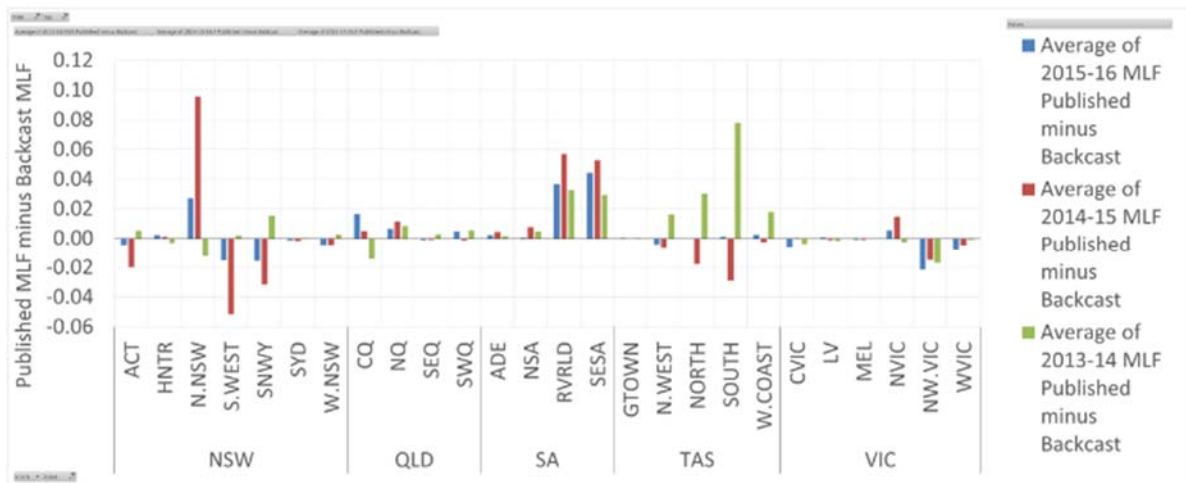


Figure 1 - AEMO Backcast results for 2015-16, 2014-15 and 2013-14
 (source: AEMO Loss Factor Methodology Review, Sept. 2016)

First Solar is cautious with respect to the veracity of this claim, as the increased settlement residue may fully or partially be a result of increased total losses in the network, which are an obvious consequence of the significant influx of new generation at inefficient locations. Nevertheless, we support the first rule-change proposal on the grounds that it aligns with the principle that the MLF should be a fair reflection of a generator's contribution to transmission losses. As Adani suggests, to properly address the argued inefficiency the redistributed IRRS should be delivered only to generators who have received a published MLF lower than actual MLF.

With new technology such as battery storage entering the electricity market and with large amounts of relatively stable thermal generation set to be replaced by variable renewables and storage over the next

decade, correctly forecasting MLFs is likely to become increasingly difficult and therefore additional measures to help ensure MLFs remains equitable and provides an accurate reflection of a generator's relative contribution to marginal losses is justified.

It is important to clarify that First Solar's support pertains to addressing potential inaccuracy of the forecast MLF vs actual MLF only, not the difference between marginal and actual losses – this is an important distinction for the other rule change proposal.

2. *It is proposed that the MLF calculation methodology should be changed to the "average loss factor (ALF) methodology".*

Even if it was possible to achieve perfect accuracy in MLF forecasts or perfectly compensate generators for inaccuracies through redistribution of the IRSR, in First Solar's view this would do little to address the primary concern of most proponents with respect to MLFs that is presently being debated in the public sphere, namely that MLFs are increasingly volatile (especially in the downward direction), and pose a risk to future generation investment as a result of the associated uncertainty in future revenues.

Rather than attribute this volatility and the reductions in MLFs experienced by some generators in recent years as the motivation for the rule change, Adani's proposal states that the MLF methodology is inherently inaccurate and overestimates total losses as it considers the losses from a volume-weighted marginal increase in generation as opposed to the average losses.

In the 2012 report "*Treatment of Loss Factors in the National Electricity Market*", AEMO explains that marginal network losses are charged for transmission of power because the NEM is dispatched optimally based on marginal costing. The view that marginal costing is the most efficient method of dispatch is not under dispute so far as we can ascertain, however should the proposal to move to average loss factors be tied in with a proposal to move to average cost electricity *pricing*, support for the proposal among generators would likely evaporate in short order.

AEMO also states that "*It is important to note that the fact that there exists a settlements residue is not an accident, oversight or afterthought. It is an inherent feature of a market designed on the basis of marginal pricing principles*", meaning that the difference between actual losses and those determined under the MLF calculation regime, which Adani claims leads to inefficient investment, is in the view of AEMO a feature not a bug.

What AEMO does not clearly explain, is *why* marginal cost pricing must by definition use marginal factors for transmission losses. Adani's proposal therefore asks the question - rather than set spot prices based on the marginal cost to deliver the next unit of electricity to the end consumer, why not set prices at the marginal cost of the next unit of production, minus the *average* cost of its transmission?

The marginal cost pricing doctrine originates from Professor Alfred E. Kahn's work, *The Economics of Regulation (1970 and 1971)*, although proponents of this idea with respect to electricity pricing date back to the late 19th century. The doctrine states that in purely competitive markets, price will be set at the marginal cost. A price based on marginal costs is presumed to convey "price signals" of sufficient accuracy so that consumers can evaluate the appropriate economic level and timing of their use of utility services, leading to the efficient allocation of resources (*Greer, Electricity Marginal Cost Pricing, 2012*). By changing the MLF regime such that it no longer delivers a signal based on the marginal cost of delivering energy to the consumer but rather the marginal cost of generation, we would be damping the portion of the price signal designed to utilise the transmission network as efficiently as possible.

It is critical to keep in mind that the losses on the last MW delivered are significantly worse than the first (a consequence Ohm's Law) and therefore a network in which the price signal of the marginal cost of transmission is damped is one that is less efficient in responding to increases in demand, because at the margin where supply and demand are balanced it favours cheaper generation at the source over cheaper generation at the customer's meter.

Given that electrification of transport and heavy industry is a critical strategy to reduce greenhouse gas emissions, we suggest that it will be increasingly important for the NEM transmission system to be efficient in how it responds to increases in demand. First Solar therefore does not agree with the proposal to change to the ALF calculation methodology, on the grounds that it will undermine an important and intentional locational signal designed to deliver electricity to the end consumer in the most cost-effective manner.

Adani's proposal argues that by increasing generator's MLF's using the ALF methodology, generators will be able to bid at prices closer to their marginal cost of production and that this will result in greater dispatch efficiency. We disagree with this.

Firstly, on the grounds that generators who stand to benefit most from this change (wind and solar projects on the fringe of the grid where there is congestion) generally have a marginal cost of production which is effectively zero. These generators will therefore not change their bidding behaviour at all.

Secondly, whilst generators that are bidding above zero may indeed bid at lower prices as a result of their increased MLF, wholesale consumers will also pay higher prices due to a corresponding compression (increase) to their MLF.

Furthermore, generators with marginal production costs in the range that typically set the electricity price (gas and other thermal generation) tend to have much higher MLFs as they are generally located in areas of good transmission or close to load. Gas and other thermal generation generally have less correlated production profiles compared with technologies such as solar, so the benefit they receive from the proposed change will be comparatively small and as a result the flow-on effect to their bidding behavior will be minimal.

As such we are not convinced by arguments that ALF will increase dispatch efficiency. Rather, in First Solar's view the ALF methodology will primarily act as a transfer of revenue from more efficiently located generation to less efficiently located generation. First Solar views the following arguments as primary reasons why the ALF methodology should be rejected:

- More generation will be enabled in areas of the network where it is least needed. As such, a network utilising ALFs is likely to experience greater total transmission losses than one using MLFs, resulting in lower network efficiency and higher costs.
- Muting the locational price signal will reduce the incentive to invest in additional transmission (via the RIT-T process) or loads (which would bring further economic benefit to remote communities who are hosting renewable energy projects), where such investments would provide the greatest benefits to network efficiency and simultaneously help alleviate the low MLFs in those areas. Although some market participants claim that the signals have been too slow, the current MLFs have provided a strong locational signal to the market and as a result proponents and investors are more carefully reviewing the potential MLF impacts on their projects in far more detail.

Alternative Solutions

As evidenced by First Solar's development pipeline, which has shown (intentional) resilience against the worst drops in MLF, the locational signals were there to be understood and priced. This does not, however, mean that the current system is working as effectively as it could be. There are a number of changes currently under consideration by AEMO and the AEMC that in our view can substantially reduce

MLF volatility and ensure the market remains fit for purpose in the dynamic and diverse grid of the future, without sacrificing efficiency in the transmission network to provide improved understanding for investors.

In our view, the fundamental problems with the MLF price signal are transparency and delay.

New entrants are facing a transparency challenge when it comes to the following areas:

- Information about other generators currently proposed in the network which may affect the MLF and their progress towards commitment.
- Getting consistent results from consultants who prepare MLF forecasts.
- Having a consistent framework and congestion scenarios for which project MLF should be assessed prior to investment.

Under the current system, developers find themselves in a race to get their projects approved and built at their maximum possible capacities, in the hope that successful progression along these milestones will send a signal to other potential generators in the area that the new network conditions, resulting from the completion of their project, will reduce the economic rationale for further development. The hitherto unseen pace of new generator commitments in the last few years has resulted in a concurrency and transparency problem, whereby multiple generators at similar stages of progress have committed their projects within very short time-frames without properly considering the impacts of their competitors' projects. Coordination between these developers to adjust the size of their projects so that all could be successful or the least feasible projects abandoned would have enabled a positive outcome for the majority of players. Unfortunately we have seen a number of regions where too many projects have committed concurrently at the maximum possible capacity, and all are suffering as a result.

A solution to the transparency and delay dilemma would be to:

- Provide either developers and investors or their consultants with clear information on the state of competing projects which may impact their assumptions with respect to MLF;
- Ensure different consultants are able to provide repeatable and consistent MLF forecasts to their clients within a broadly understood framework for inclusion/exclusion of new potential entrants; and

- Provide signal feedback at a speed that keeps pace with the rate of development being observed for new generator commitments.

Successful achievement of these outcomes would:

- Ensure more economically rational behaviour from new entrants, and will protect incumbents from declining MLFs caused by new generation that should not have been committed if the MLF impact had been properly accounted for; and
- Prevent overshoots in optimal decision making by ensuring that the signal is updated with sufficient regularity.

Potential solutions to deliver these outcomes for which First Solar is supportive of further investigation include:

- Open-sourcing AEMO's MLF model to approved consultants;
- Publishing more information about proposed projects in the NEM and their stage of progress as AEMO has proposed and is currently being assessed under the '*Transparency of new projects*' rule change currently under review by AEMC;
- Establishing a risk-based framework for assessing the impact of multiple new projects on MLFs; and
- Increasing the frequency with which MLFs are published to either quarterly or monthly.

A potential solution to this dilemma of which First Solar is **not** supportive is the idea of grandfathering or MLF floors, which would limit the decline in MLFs that incumbents are able to experience. Whilst we acknowledge that such a policy would be very valuable to reduce the risk posed by MLFs to investors, it amounts to a kind of firm access and would inhibit the transition of the NEM to low-emission technology by making new entrants pay for the additional losses of existing generators. This would almost certainly lead to reduced supply (versus optimal) and higher relative prices.

Based on our own experience, generators (and by extension their technical consultants and investors) are the party best placed to understand and price the risk of the impact on MLF of new generation as they do for all other project variables. Furthermore, we argue that if the transparency and delay issues are properly addressed and rational decision-making around new generation is restored, the necessity of such policies should decline significantly.

Finally, there is a critical role for transmission investment to play in reducing MLF volatility. AEMO's Integrated System Plan has demonstrated the opportunity presented by new low-cost and low-emission variable generation, and outlined the investment in transmission and storage that is needed to unlock it. MLF can and should provide an important price signal to show Network Service Providers where transmission investment can unlock additional value for electricity consumers in the most cost-effective manner (after all, a low MLF is an indication of lots of electricity being wasted as heat), and we are supportive of additional efforts to incorporate these benefits into the RIT-T process.

Importantly, formalizing thresholds and conditions that should trigger consideration for transmission investment would help to establish an artificial floor on MLFs, without creating a disincentive for new generation by grandfathering incumbent projects. The current COGATI framework review is an important opportunity to discuss this proposal, and whilst it is outside the scope of this proposal we would like to highlight the critical role that central planning has to play in enabling a strong investment environment for new low-cost and low-emissions electricity generation in Australia.

Conclusion

In summary:

- First Solar supports efforts to reallocate a portion of the IRSR to compensate generators who have suffered from forecast MLFs that are worse than their actual MLFs.
- First Solar rejects the idea that the ALF methodology will lead to more efficient dispatch, and argues that there is insufficient evidence to demonstrate that the marginal pricing doctrine does not or should not apply at the point of consumption.
- First Solar is supportive of a number of measures presently being developed to improve the transparency of new projects and MLF calculations, and has provided some additional suggestions of our own.

First Solar would like to thank the AEMC for the opportunity to provide input on this important topic, and for the consideration and contribution of ideas from our industry peers.

Yours sincerely,

Nick Morley

Nick Morley – Project Development Engineer - APAC