31 March 2022

Congestion management Technical Working Group

Working paper – Model proponent's responses to stakeholder queries

1. Context

During the public seminar on 24 February, and previous TWG meetings, stakeholders and TWG members were given the opportunity to ask clarifying questions in respect of the alternative models.

Edify Energy and CS Energy have subsequently provided direct responses to the questions asked, which are set out in this paper. In addition, Shell Energy and the Clean Energy Investors Group have provided more detailed information with respect to their models. The Shell Energy supplementary submission is provided as a working group paper (attached) and the CEIG report is available here.

The ESB project team would like to express our deep thanks to all model proponents for their work to develop the alternative models. They are valuable contributions to the transmission access reform work program that will enhance the quality of the ESB's final recommendations to Ministers.

Congestion relief market – Edify Energy

No.	Stakeholder question	Edify Energy answer
1.	How does co-optimisation work?	Co-optimisation works by selecting the optimal combination of volumes from Energy, FCAS and congestion relief markets that minimises the total cost of energy supply for each trading interval.
2.	Why should I invest in a congestion relief market if the public has an interest in destroying that market by reducing congestion?	The CRM is an optional market, where proponents can opt not to participate in, if they do not see commercial value in doing so. However, the CRM provides locational signals for where generation is congested such that loads (or power system stability solutions) can be located efficiently to capture energy that would otherwise be wasted (thereby lower electricity costs).
3.	How does dispatch work? Are dispatch instructions for energy sent first and then if there is congestion the CRM dispatch instructions are sent in the subsequent dispatch interval?	Dispatch works by NEMDE sending all dispatch instructions including the net of Energy and CRM targets (as well as FCAS enablement volumes) each trading interval (noting a dispatch interval is now equivalent to a trading interval).
4.	Isn't the proposal really a rough form of LMP combined with grandfathered FTRs without the transparency and nodal price information	CRM was put forward as a methodology to achieve similar outcomes to COGATI, whilst minimising market disruption. With CRM prices published on the same day, and other market data published by the next trading day (with respect to bids, offers and dispatch, in line with current market practices), there should be an equivalent level of transparency between COGATI and CRM. CRM sends a clear signal for the efficient location of loads by recognising

		constraints as a root cause of congestion. Consequently, the CRM facilitates access to lower net energy costs for loads if they are located efficiently (areas where they can capture the maximum levels of curtailed energy).
5.	I understand it required two sets of bids. Have you gone through the bidding strategies likely to be used by traders when considering the outcome of both stages?	*Please note, none of the following constitutes financial advice or suggestions on actionable trading strategies. The following answer considers in a generic sense some of the data that a proponent may take into account when forming trading strategies, if the proposed CRM were to be implemented.* Yes, the CRM will require a separate set of bids – this is correct. It is possible for a proponent to consider developing spot trading strategies based on market data including but not limited to: • pre-dispatch forecast of energy price (already available via MMS) and CRM price (would be available via MMS in line with current market practices); • pre-dispatch forecast of DUID curtailment (already available via MMS); • pre-dispatch forecast of binding constraints at the relevant nodes; and • left hand side and right hand side details of relevant constraints (already available via MMS).
6.	IN the case of looped constraints, the resolved congestion will affect the broader network capacity (i.e. possibly more generation will get to RRN). Seems impossible to manage in sequential NEMDE runs.	The purpose of co-optimisation of CRM with Energy and FCAS markets is to ensure firstly supply equals demand, and that this is achieved at lowest total cost. The specific method for achieving this optimisation objective is most likely a linear program which does not require sequential NEMDE runs. However, please note the purpose of the proposal is to provide the operating philosophy of the CRM, not specify or design the method of optimisation, noting such considerations help to inform implementation, at the appropriate time.
7.	Shouldn't consumers and investors in congestion relief benefit from the fact that when a line is congested, at that point the value of the marginal MWh is zero, not some uncertain price?	For VRE, analysis of short run marginal costs can be misleading as there is no fuel cost. Analysis of long run marginal cost is more appropriate due to the higher CAPEX requirements, and reliance on debt financing which results in the fundamental

		cost base – not the marginal cost of fuel. Since the counterfactual to the CRM of curtailment is zero revenue for VRE, the CRM facilitates curtailed VRE to offer electricity at a rate discounted to the price at the regional reference node (which in some cases may be zero or even lower when LGC values and fixed contracted prices are taken into consideration). The CRM provides incentives for both loads and generators to participate, for improved commercial outcomes, from energy that would otherwise be wasted.
8.	Is this a market solved every 5 mins like the energy and FCAS market or is it solved in some other timeframe. Like daily, as the gas wholesale markets are?	This market is 'solved' every trading interval alongside Energy and FCAS.
9.	What type of market gaming behaviours should we expect? How can we guard against unintended consequences from gaming this market?	Publishing market data, in line with current market practices, helps market participants understand competitor and counterparty behaviours. This also allows the AER to monitor the behaviour of market participants, and take action against participants whose behaviour is not compliant with market rules.
10.	How does it integrate with CWO REZ access model?	The CRM and REZ access rights are complementary. REZ access rights improve investor certainty of transmission capacity within the REZ however do not provide risk mitigation for curtailed energy due to constraints between the REZ and the regional reference node. The CRM, through focus on constraints facilitates NEM wide relief of constraints, and is not limited to transmission within a REZ.
11.	Why is this better than allowing the LMP price signal to work when there is congestion, same result, received by BESS or flex load?	CRM was put forward as a methodology to achieve similar outcomes to COGATI, whilst minimising market disruption.

Shaped MLFs – CS Energy

As part of their response to the questions raised, CS Energy provided the following further context for their proposal, and their key concerns with the process:

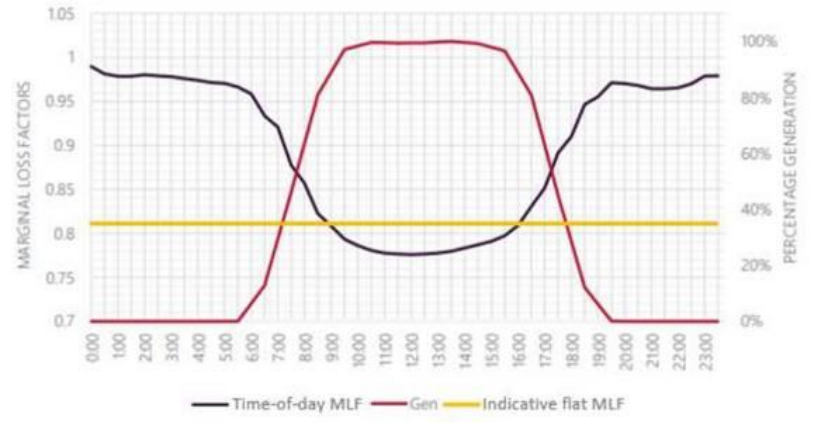
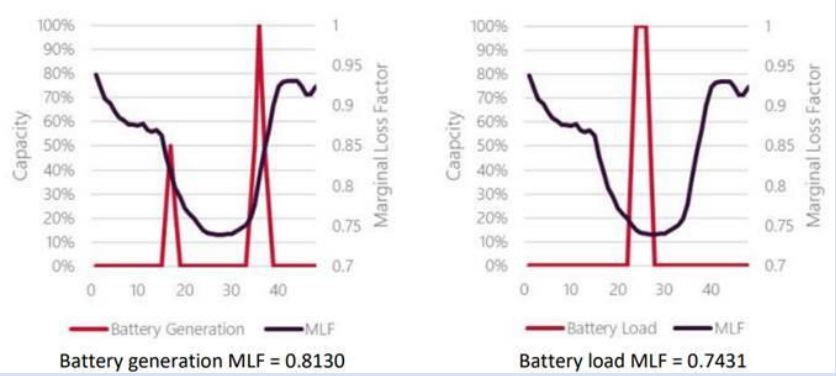
- The fixed-shape time-of-day MLF alternative to the CMM proposed by CS Energy was designed to meet the restrictions the ESB placed on potential alternatives (e.g. six assessment criteria, not considerig alternatives similar to models already dismissed by the ESB despite the assessment criteria changing) and in the absence of key inputs to inform the development of an alternative (e.g. clarification of what the issues are with the current market design and quantification of same, what the residual issues to be resolved are after other market reforms are implemented, clarification of the efficient level of congestion, etc).

CS Energy's proposal was not a "blank slate" alternative but an alternative designed to not fall foul of the restrictions and be commensurate with the magnitude of the impact of select issues the ESB is attempting to address.

- In the project initiation paper, the ESB asked stakeholders to submit alternatives. 19 of the 20 submissions provided and/or supported at least one alternative. It is incumbent on the ESB to adequately assess all of the alternatives proposed.
- CS Energy is concerned that the true marginal loss factor model is the only MLF-based model being examined. EnergyAustralia also suggested a time-of-day MLF (https://www.energy.gov.au/sites/default/files/2022-02/EnergyAustralia_Response%20to%20Project%20Initiation%20Paper%20on%20Congestion%20Management%20Model.pdf, page 5) and Snowy Hydro noted "MLFs play a significant role in incentivis[i]ng investment away from congested areas of the network. As it stands, the ESB's non-asse[ss]ment of MLF's is a convenient means of justifying a reform proposal which has been roundly rejected by stakeholders." (https://www.energy.gov.au/sites/default/files/2022-02/SnowyHydro%20Response%20to%20Project%20Initiation%20Paper%20on%20Congestion%20Management%20Model.pdf, page 1). EnergyAustralia's alternative may capture the bulk of the benefits of CS Energy's proposal while avoiding some of the thornier issues with a true marginal loss factor (but the question of whether EnergyAustralia's proposal sufficiently addresses the ESB's concern about preserving access of incumbents remains). EnergyAustralia's MLF model should also be examined along with a broader examination of the potential role MLFs can play in addressing the purported issues with the current market design as part of an assessment of all alternatives proposed to date (both in response to the project initiation paper and through previous consultations).
- It appears alternatives to the CMM proposed in submissions to the December 2021 project initiation paper are expected to be more developed than the CMM. The issues raised in the questions posed by public forum participants appear largely on par with the issues still to be resolved with the CMM (not least the list of "key issues requiring further consideration" on page 25 of the project initiation paper).

	Stakeholder question	CS Energy answer
1.	Thanks for the presentation. Is the intent that the MLF calculations would be adjusted to also take into account congestion?	The true marginal time-of-day MLFs would reflect typical marginal losses over the course of the day. A time-of-day MLF does not manage congestion at the operational timescale, but would be expected to guide investment locational decisions in such a way as to reduce the incidents of congestion beyond the efficient level (which is yet to be determined).
2.	What happens to fixed-shape MLFs when a generator retires?	One of the key issues requiring further consideration is how "new" transmission capacity (whether that arises from generation retirements or network augmentation) is allocated to incumbent generators and new projects (if at all). Both increasing MLFs of incumbent generators (who haven't paid for access) and increasing MLFs of newer entrants (who have banked projects on their pre-augmentation true marginal loss factor) would erode the impact of augmentations on increasing network hosting capacity. A balance will need to be struck between incumbent, newer entrants and new investment.
3.	Would this motivate generators to be connected on the	I am unsure how a time-of-day MLF would incentivise generators to connect on the outskirts of the network relative to the status quo. If the time-of-day MLF at a location (that happens to be on the outskirts

	outskirts of the NEM?	of the NEM) is a good fit for their proposed project, they may choose to invest there. As per CS Energy's submission to the project initiation paper (available here), "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."
4.	How would this align with jurisdiction REZ models, like the non-firm capacity. Do the MLFs change for latter entrants but remain the same for the initial generators? If so, how would network investment to reduce congestion (across all generators) fit with this model?	Unable to determine as jurisdictional REZ models are still under development, but I expect time-of-day MLFs would be easier to align with jurisdictional REZ models than the CMM. Jurisdictions are free to adopt time-of-day MLFs or retain flat MLFs (and accept the possible consequences of doing so e.g., would neighbouring jurisdictions with different MLF methodologies have an impact on the treatment of interconnector flows?).
5.	How does this proposal differ from the dynamic loss factor proposal in COGATI (which is a feature of many other markets) – is it a step along that path?	Time-of-day MLFs are a compromise between the current flat MLF methodology and dynamic loss factors, moving MLFs closer to actual losses but avoiding the issue of participants not knowing their MLF at the time they place their bids (and the impact of this uncertainty on generation and contracting activities)
6.	Do you think this can be combined with other models suggested?	Yes. A fixed-shape time-of-day MLF does not address all of the ESB's stated goals. As stated in its submission to the project initiation paper (available here), "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."
7.	Does the daily profile just work out to be the same as the annual average?	It may work out the same on average (as the flat MLF is the generation-weighted time-of-day MLF), but differences would be expected at the dispatch interval level. As stated in CS Energy's response to the project initiation paper (available here), "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 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.  Figure 3: Time-of-day impact of technology on MLF outcomes 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."
8.	Do the MLFs change for later entrants but remain the same for	That is one of the live issues to be determined. As discussed in CS Energy's submission to the project initiation paper (available here), "This is not to say that a new project's true marginal loss factor could

	the initial generators? If so, how would network investment to reduce congestion (across all generators) fit with this model?	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." Also refer to the answer to Q2.
9.	Could this model promote scheduled generators over semi scheduled generators due to their ability to align generation with demand…which results in higher MLF values	Unsure if this question means promote scheduled over semi-scheduled at investment or operational timescales. If the former, while MLF forecasting would typically be expected to inform the business case and investment decision, it is only one of a wide range of inputs to the investment decision. CS Energy would be keen to hear of any examples where a proponent was open to investing in either a scheduled or semi-scheduled generation unit and the decision between the two hinged on expected MLFs. Or does this question refer to promotion of scheduled over semi-scheduled in a dispatch interval i.e. for a specific DI, would a scheduled unit have a higher MLF than a semi-scheduled unit at the same connection point with the same underlying time-of-day MLF shape? Part of the challenge for the ESB is to define the objective of this workstream, to quantify the magnitude of the issues to be solved, and to ensure the solution addresses expected future issues (and the solution is commensurate with the magnitude of the issue).
10.	I assume there is an expectation that they will be adjusted up to reflect augmentations but never down – magic pudding?	Both how network augmentations are distributed amongst incumbents, newer projects and new investment and whether MLFs can fall are live issues. Also refer to the answers to Q2 and Q8.
11.	How will investors forecast these values for the life of their project? Will the inputs to MLF start to include weather, climate, usage patterns by time of day?	Similar to, if not the same, as they do it currently. The current flat MLF methodology appears to incorporate weather (expected generation from VRE) and usage patterns by time of day (load) currently.
12.	MLF forecasting is only somewhat accurate today; wouldn't this model make it much harder?	MLF forecasting for existing generators or new projects? Forecasting the MLF for existing generators should be easier, as their MLFs will not be affected by new entrants. Forecasting MLFs for new projects will still be affected by not knowing what other projects are under development in the area of the network they are examining, but the true marginal loss factor itself may be easier to forecast as new projects are not making assumptions about their impact on incumbents.

13.	Would it be a fixed MLF profile for a year? Or change in response to changes in behaviour?	Fixed MLF profile for a year.
14.	Re efficient congestion: who gets this? And how?	Arguably both CMM and fixed-shape time-of-day MLF models rely on potential exposure to an operational timescale signals (LMP and MLF, respectively) to guide investment decisions. Exposure to LMP manages congestion on an operational timescale, but as efficient level of congestion is yet to be defined stakeholders are unable to assess whether the CMM will deliver an efficient level of congestion. Time-of-day will attempt to head congestion off by guiding investment to locations on the network that have hosting capacity.
15.	Why not just go for fully dynamic MLFs?	As noted in Stanwell's November 2019 response to the AEMC's Coordination of Generation and Transmission Infrastructure Discussion Paper (available here), "Generators currently submit offer prices before 12:30pm on the day preceding the trading day which are then fixed for the trading day. The prices are submitted at the generators connection point but must fall within the reliability settings (Market Price Floor and Market Price Cap) once Marginal Loss Factors are applied. That is, the offer price at the node must fall within the allowable market price range. Offers that do not conform are deemed corrupt and rejected entirely by AEMO's systems. The introduction of dynamic loss factors will mean generators are no longer able to ensure their day-ahead bids are within the Market Price Cap (MPC) and Market Floor Price (MFP) (i.e. not a corrupt bid). Typically a discussion of dynamic loss factors includes consideration of allowing bids to be priced "at the node" in order to avoid this issue, however it is unclear whether this approach would remain relevant under the VWAP proposal. Ex-ante loss factors set for at least one trading day would overcome the issue of bid conformance. Dynamic loss factors or ex-ante loss factors published close to real time also appear likely to increase the volume of "late rebidding" as participants adjust their bids to incorporate new information."
16.	Would the MLFs continue to be updated on an annual basis?	Yes. The Public Interest Advocacy Centre's MLF-based proposed (as discussed in their October 2020 response to the Post-2025 Market Design Consultation Paper, available here) that connecting parties "could have their MLF 'locked in' by AEMO for a standard period of time – allowing the party greater certainty of its future revenue. If a new party were to connect nearby and affect the local MLF, this change would be borne by the second party alone rather than being spread across both parties." While CS Energy supported the outcomes of this proposed alternative in addressing investor certainty and dissuading new projects from displacing incumbent generators, a key concern was how a fixed (for more than one year) MLF could diverge from actual physical losses on the network, potentially affecting efficiency and revenue sufficiency.
17.	Is there a way to present this model in a way that is a bit	The background reading provides a more fulsome explanation of the proposed model.

	more accessible to non-engineers?	
18.	Could you have shaped ALFs, to provide signals for more efficient use of the network, but less volatility for investors?	As discussed in CS Energy's submission to the project initiation paper (available here), "[w]hen 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"."