Transmission access reform (COGATI) review – questions and answers

1 October 2020

On 7 September 2020, alongside the ESB's 2025 consultation paper, the AEMC published:

- A transmission access reform interim report that highlights the need for reform and how it relates to the ESB's 2025 market design work as well as a detailed update on the preferred design and decisions that have been taken in forming this design, as well as overview of the quantitative analysis that has been undertaken – on both the benefits and the costs.

- The NERA Economic Consulting report on the Cost Benefit Analysis of Access Reform providing an in depth analysis of NERA's bottom up modelling of the benefits of implementing the reform in the NEM.

- The Hard Software report providing preliminary indications of the implementation costs of the reform.

The interim report provides updated specifications, reflecting stakeholder feedback to make sure the core features of LMP and FTRs are fit for purpose for the NEM, and can be implemented in a way that is as manageable and straightforward for participants as possible, while also delivering the greatest potential benefit to the NEM and consumers. The proposed design and implementation has been shaped by extensive engagement with stakeholders.

Since the publication of the interim report, we have held two public forums, one technical working group meeting, and several bilateral meetings with a range of stakeholders. Throughout these forums, we have received numerous questions from stakeholders. Common questions & answers are summarised below. **Questions are highlighted in bold**.

A transcript of both forums and a video recording providing instructions, presented at the forum, for the operation of the simplified model will also be released shortly.

If stakeholders have any additional questions, that are not answered below, please reach out to Daniela Moraes at daniela.moraes@aemc.gov.au or Ben Davis at ben.davis@aemc.gov.au

- **NERA undertook a study on the international experience of LMP and FTR markets, which can be found on the AEMC website. Are there markets where LMP/FTRs were considered, but were not introduced? What do markets that don't have LMP/FTRs do to promote coordination of generation and transmission investment?**

NERA's study of overseas markets only looked at markets that had completed a cost-benefit analysis of introducing LMP and FTRs. The AEMC is not currently aware of any markets internationally where an LMP and FTR regime has been considered to the point of completing a cost-benefit analysis, and then subsequently not implemented.

As noted in the NERA report, the majority of markets (US, Singapore, New Zealand) do have a LMP/FTR regime. Some markets do not currently have LMP/FTR – most notably the European markets. In European markets, while they differ in the details of their market design, generally one price is paid to generators for their output no matter where they locate. Therefore, these regions either:

- don't send locational signals to participants about where to locate, meaning that the transmission network is not used effectively; or
- have arrangements where all generators are required to pay an administratively determined transmission use of system (TUOS) charge and/or deep connection charges, with these sending locational signals to generators about where to locate.

To the extent that stakeholders have other examples in mind, we encourage stakeholders to write that in their submissions.

- **What transmission from the ISP was included in NERA's modelling? Would building more transmission lead to lower congestion?**

NERA's nodal model reflects the current state of the transmission system i.e. all transmission elements that are currently in service and assumed to be operating in their normal configuration. NERA's modelling also assumes that Priority 1 and 2 projects in AEMO's draft 2020 ISP would go ahead, which include some REZ developments (including the Western Victoria transmission network project). Priority 1 and 2 projects are listed as "committed" or "actionable" by AEMO. Additionally, it assumed that the Marinus Link Line will go ahead from 2036. AEMO expects preparatory work for the Marinus Link project to begin by 2023, before the AEMC will have implemented Access Reform. Other priority 3 projects are currently listed as not actionable and insufficient data exists in AEMO's ISP to identify clearly to which nodes the projects would connect.

In general, additional transmission investment (including the group 3 ISP projects) leads to lower congestion (at least in the short term). However, this comes at the cost of the transmission investment. NERA's analysis demonstrates that such additional investment is not forecast to lead to materially lower system costs.

Further detail can be found in section 2.2 of the NERA report, found here:
https://www.aemc.gov.au/sites/default/files/2020-09/NERA%20report%20Cost%20Benefit%20of%20Access%20Reform%202020_09_07.pdf

- **How does NERA's modelling take into account the role of REZs in co-ordinating generation in both Reform and No-Reform scenarios?**

The NERA modelling reflects the existing access arrangements combined with the REZ transmission build in the ISP Priority 1 and 2 projects – our modelling assumes the central development scenario in the draft ISP (including REZs) for transmission. Therefore, to the extent that REZs are included in the draft ISP Priority 1 and 2 projects, then those REZs are modelled in the NERA modelling.

NERA's analysis demonstrates the proposed transmission access reform complements the proposed REZ transmission build. REZs are an important innovation, but the NERA analysis suggests that this needs to be combined with access reform to maximise the benefits. The introduction of LMP, which sends stronger locational signals to generators than the current arrangements, mean that generators will be better incentivised to locate in the network in such a way that maximises the utilisation of the network. In other words, this will prevent inefficient generation investment and operational decisions being made within the network.

Access reform will benefit all parts of the market whether they're part of a REZ or not because:
- New price signals will encourage generators to set up in more useful locations
- It will unlock more renewable energy and get it to consumers

It is also worth noting that international jurisdictions that have utilised REZ-type arrangements also typically utilise LMPs/FTRs to make sure that the benefits to customers are realised.

- **How does investment in NERA's modelling compare to that under the ISP outcomes?**

NERA uses the draft ISP assumptions for transmission investment in both the reform and no-reform world so these transmission investment outcomes are the same as the ISP, as described above. Our modelling assumes the central development scenario in the draft ISP (including REZs) for transmission.

In relation to the amount, location and type of generation that is projected to be built, NERA's 'reform' scenario is quite consistent with that of the draft ISP. However, the generation investment patterns under the 'no-reform' scenario diverges significantly from that that occurs through the draft ISP. This is because the ISP models a least cost generation build, and assumes generators locate in the least cost locations for the system. However, without the stronger locational signals that would be created from the introduction of LMPs, generators may not actually locate in those areas that are assumed. Therefore, the difference between the 'reform' and 'no reform' scenario represents the impacts of introducing stronger locational signals, through locational marginal pricing, into the NEM.

- **What is the main difference in generation investment in the 'no reform' world versus the 'reform world'?**

The key difference in generation investment between the reform world and the no reform world is that in the reform world, there is approximately 20GW less generation capacity that is built by 2040. Indeed, many of the benefits that NERA highlights in relation to the first line item of benefits 'capital and fuel cost savings from more efficient locational decisions' stem from having generators locate in more effective locations within the network. This comes from the stronger locational incentives from the introduction of LMP meaning that generators are more likely to locate in areas that aren't already constrained. Therefore, customers' demand for electricity can be met by less generation capacity.

For more detail, please see section 3.3 and 3.5 of the NERA report, at https://www.aemc.gov.au/sites/default/files/2020-09/NERA%20report%20Cost%20Benefit%20of%20Access%20Reform%202020_09_07.pdf

- **How have you considered changes to the cost of capital for investors because of the reform?**

We recognise that the proposed reforms are substantial reforms in their own right, and therefore there needs to be time for market participants and market bodies to make the necessary preparations for the changes, including system changes, contractual changes and training. Therefore, we are interested in stakeholder feedback on the impact that this may have on participants in the transition, including on the cost of capital.

We asked NERA to consider the potential for risks faced by generators as a result of the reforms post the transition period. Under the no-reform case, generators face the risk that they will be constrained off without compensation. The introduction of LMP with one-way FTRs allows generators to hedge downside constraint risk.

NERA also found that, where generators have hedged power in advance, LMP and FTRs lead to minimal change in the overall risk exposure faced by market participants. Whether measured by mean dispersion of cash-flows or by the number of periods with negative cash-flows, baseload generators' risk exposure fell on average following the introduction of access reform. The incentives to hedge typically remained stable or increased.

The previous report focussing on international markets conducted by NERA on the costs and benefits of transmission access reform did not find any evidence of increased risk premiums for investors in other markets that have introduced LMP and FTRs. More detail can be found in section 7 of NERA's report from March, at https://www.aemc.gov.au/sites/default/files/documents/nera_benchmarking_consultant_report_-_aemc_transmission_access_reform_-_march_update.pdf

In addition, stakeholders may be aware that the AEMC ran a cost of capital survey last year, in which participants said this reform would increase costs of capital. We have taken the results of the survey on board, but they do need to be put in their proper context. The response rate was low, and the small number of responses included estimates of the change in cost of capital rather than providing data. We also continued to refine the design in response to stakeholder feedback – so the information collected in the survey was in response to a previous iteration of the reform design. We continue to welcome data and evidence from stakeholders that would further shed light on the impacts on the cost of capital, or suggests different impacts from those that NERA have suggested.

- **Apart from the solar and wind farm projects which are currently in the AEMO generator data base, have you assumed that all additional renewable generation occurs within the REZs?**

All new wind plant that is not currently in AEMO's draft ISP generator database is constrained to be built inside REZs. Building of new wind plants outside of REZs is not allowed. This decision was primarily taken because of a lack of reliable data relating to wind resources outside of prospective REZs. Solar and large-scale batteries, however, can be built both within and outside REZs. Construction of new pumped hydro is constrained to areas with existing hydro generation.
Details can be found in section 2 of the most recent report published by NERA, at
https://www.aemc.gov.au/sites/default/files/2020-09/NERA%20report%20Cost%20Benefit%20of%20Access%20Reform%202020_09_07.pdf

- **How are marginal losses calculated and incorporated in the modelling?**

NERA's analysis of the long-term investment signals depends on a network that abstracts from physical losses. NERA assumed that the same static marginal loss factors would apply in both the "reform" and "no-reform" worlds for settlement. NERA sourced MLF data from AEMO. Its modelling therefore abstracts from any differences in the locational signals sent by the treatment of losses that might occur between "reform" and "no-reform".

However, NERA included static marginal loss factors in its modelling to model incentives to race to the floor and assess the benefits of introducing dynamic marginal losses. NERA sourced MLF data from AEMO.

NERA also modelled dynamic losses as a comparison to estimate the benefits that introducing dynamic losses into the NEM would entail. Dynamic losses were calculated endogenously in PLEXOS.

- **Does the modelling take into account behavioural changes once 5-minute settlement commences and would 5MS impact the estimate benefit?**

NERA's model has half-hourly granularity for dispatch. Some stakeholders have suggested that concerns about disorderly bidding will be resolved by the introduction of five minute settlement.
It is important to note that there are several types of disorderly bidding behaviour that can occur in the NEM. These disorderly bidding behaviours have arisen in response to different incentives resulting from market design, and therefore require tailored solutions to address the varying incentives they represent.

Five minute settlement will help to remove the anomaly that currently exists between the five-minute dispatch and 30-minute settlement periods, which has been identified as a contributing factor to disorderly bidding. Under the current market arrangements, generators which observe a high five-minute price at the start of a settlement period may attempt to disorderly bid in subsequent five-minute dispatch intervals periods within the 30-minute settlement period. They may do this in order to take advantage of the settlement price, in the knowledge that the average of the six five-minute dispatch intervals is likely to be high. Five minute settlement should resolve this incentive, by aligning the dispatch and settlement periods

However, disorderly bidding can also arise when generators know that the offers they make will not affect the settlement price they receive because there is transmission congestion between them and the rest of the market. When a transmission constraint binds, the NEM dispatch engine (NEMDE) dispatches constrained generators out of merit order, which results in an elevated regional reference price. AEMO publishes information in pre-dispatch systems that enable generators to identify the likely impact of transmission constraints on their generation assets. If a generator forecasts that they are likely to be constrained off due to congestion, it may have an incentive to rebid in at the market floor price to maximise its dispatch quantity - remembering that currently, physical dispatch and financial access are linked. This can result in inefficient dispatch; that is, higher cost generation resources behind the constraint being dispatched instead of lower cost resources that are available. This occurs because NEMDE does not know the underlying costs of the two generators, and so pro rates the dispatch.

Five minute settlement will not solve this particular type of disorderly bidding. However, dynamic regional pricing should. Exposing generators to the dynamic regional price removes the incentives to disorderly bid when transmission constraints arise. This is because doing so would expose the higher cost generator to a low dynamic regional price instead of the higher regional reference price. Under these circumstances, the higher cost generator may lose further revenue if it places a disorderly bid, as it likely will not be able to cover the operating costs of dispatching electricity. In addition, a disorderly bid is likely to further depress the local price, resulting in a poor outcome for generators behind the transmission constraint.

At times of transmission congestion, locational marginal pricing should therefore disincentivise disorderly bidding caused by transmission constraints, in order to improve the prospect of the lowest cost combination of generation being dispatched.

- **Could you please provide more details of how the model was adjusted to find the no reform outcome?**

In the no-reform case, NERA modelled the impact of implicit subsidies under the status quo on the pattern of investment and subsequent dispatch. This implied subsidy arises because the LMPs, inclusive of the marginal cost of congestion, are prices which drive efficient levels of investment. Differences between the RRP and the LMP are therefore represented as an implicit subsidy versus efficient outcomes.

More specifically, this subsidy is implemented in the modelling by re-running PLEXOS after reducing the fixed costs of entrant plant to reflect the entry subsidies offered by market arrangements under the status quo. Each generation technology receives a separate implied subsidy in the form of reduced fixed costs for each node depending on the difference between revenues under reform (i.e. LMP) and no-reform (i.e. RRP). To quantify this difference by location on the network, NERA calculated the difference in price received by a probe generator of each technology type assuming settlement at LMP and settlement at RRP by year.

More details can be found in sections 3.1 and 3.4 of the most recent report published by NERA, at https://www.aemc.gov.au/sites/default/files/2020-09/NERA%20report%20Cost%20Benefit%20of%20Access%20Reform%202020_09_07.pdf

- **What assumptions around gas prices did you make? How would different gas prices change the outcomes?**

The NERA model uses the ISP 2020 assumptions on fuel prices in real 2020 $/GJ. In the 2020 ISP, AEMO forecasts that gas prices will rise in real terms until the early 2030s before plateauing until the end of the modelling horizon. The gas prices are the same in the ‘reform’ and ‘no reform’ case.

It is not clear from the modelling results that the value of locational signals is greatly sensitive to changes in the gas price. However, all else being equal, lower gas prices would lead to more gas generation being built under both scenarios. Higher gas prices would lead to less gas generation being built under both scenarios.

More information about assumptions made in the model can be found in section 2 of the most recent report published by NERA, at https://www.aemc.gov.au/sites/default/files/2020-09/NERA%20report%20Cost%20Benefit%20of%20Access%20Reform%202020_09_07.pdf

- **On the costs of implementation – the AEMC have calculated that legal costs of re-opening PPAs would be $5.4m. Does this take into account the impacts on generators of the re-negotiated commercial position (i.e. there will be basis risk associated with settling PPAs at RRPs vs what generators get which is LMP)? Or will this be dealt with through grandfathering arrangements?**

The $5.4 million figure is a high-level preliminary assessment of the legal costs of reopening PPA contracts that expire after the implementation period ends. Publicly available information suggests there are 273 PPA contracts in total that might potentially need to be reopened. The actual number of PPAs that would need to be opened would likely be different to this, as some of the PPAs which the AEMC included in this figure would expire prior to the commencement of LMPs. It should be noted that the list of 273 PPAs may omit some for which information was not publicly available. An estimate of an average of $20k per PPA was assumed.

The AEMC recognises that this is a preliminary estimate and would welcome stakeholder feedback and input in order to refine this figure further. In addition, we will be consulting closely with stakeholders on the particular costs to their business over coming months as part of more detailed cost work and consultation.

It is also worth noting that transitional FTRs will help to mitigate sudden changes to wholesale margins for market participants whose PPAs will expire after the four year implementation period.

- **To understand the competition benefits has NERA considered the initial disruption on the contract market which is more relevant for investment in the NEM? The impact on the existing contracts and complexity across the market will be a barrier. More generally, have you considered the impacts on the wholesale contract market?**

NERA addressed the impact of the reform on contract market liquidity in both the initial benchmarking study published in March and the recent report. NERA found that generators' risk exposure fell on average following Reform and incentives to hedge typically remained stable or increased. NERA concluded based on their analysis, and reviews of markets overseas, that there is no evidence that liquidity of hedging products is likely to fall following the implementation of LMP/FTRs. As a consequence, NERA did not explicitly take into account any impact on competition, of any perceived impact on contract market liquidity.

Our proposed approximately four-year implementation period should allow all pre-existing ASX and SRA contracts to expire prior to the commencement of the LMP/FTR regime. We recognise, however, that existing contracts that would still be in place upon commencement of reforms (most likely, longer term PPAs) may also need to be renegotiated.

We understand that whether a contract reopener will be triggered will depend on a range of factors, including the terms and conditions of the contract and the approach ultimately taken in drafting the changes to the Rules. We have undertaken a high-level estimate of the contract reopening costs – see section 4.3.3 of the interim report. We are interested in stakeholder feedback on any other information in relation to the costs of renegotiating contracts, as well as what other effects the proposed reforms may have on the contract market.

- **What are the different components of an LMP?**

LMPs are the sum or three components; an energy component, a congestion component and a loss component. A more detailed explanation can be found in section 3.8.1 of the AEMC Interim Report on transmission access reform, on pages 28-29.

- **How will losses be calculated under these reforms?**

The AEMC is proposing to introduce dynamic marginal losses to replace static intra-regional marginal loss factors. Analysis conducted by NERA has identified significant efficiency gains associated with the introduction of dynamic marginal losses. Generally, LMPs dynamically reflect losses in international markets.

If in the fullness of time, related system changes are not required and more detailed cost estimates imply the cost of dynamic marginal losses is greater than the expected benefit, then this design feature could be reconsidered. At least initially, FTRs would not hedge price differences that arise due to marginal losses.

- **Can the AEMC provide some clarification on limiting the number of nodes between which FTRs can be bought?**

At the request of stakeholders for more simplicity in the model, the AEMC has proposed that it will reduce the combination of FTRs available to between a relatively small number of pre-defined nodes in the early phase of access reform. These nodes would be determined based on a number of factors, including the prevalence of congestion on the transmission network. This would provide FTRs to cover the majority of participant risk and the majority of capacity across key transmission lines on the network.

The AEMC has not established if this proposal was to be adopted, what nodes would be available for purchase of FTRs. This would occur through the detailed implementation.

The AEMC is conducting some empirical analysis on the existing state of the network to help provide further guidance to stakeholders as to how many nodes there would be in each region, and where they may be located.

This reduction in nodes between which FTRs are available is not related to the number of nodes in the network overall. All scheduled and semi-scheduled market participants will still face their LMP for dispatch and settlement, however FTRs will only be available for purchase to and from a small number of pre-defined nodes.

The number of pre-defined nodes and where they will be located will be determined in such a way as to minimise the differences in prices between the full set of LMPs and the available pre-defined nodes in each region or sub region of the NEM on which FTRs will be auctioned. As such, generators would be able to hedge most or all of the risk of prices at their LMP being different to the regional VWAP on which contract prices would be based. This means the impact on contract market liquidity, reported in the NERA report would hold. The full benefits would still accrue, as LMP price signals are maintained.

What are the impacts on generators from transferring wealth from generators to consumers by moving to LMPs, and making generators face implementation costs?

We recognise that the arrangements will be different to the current ones – and that there will be winners and losers. The generators that will likely face a larger impact will be those located in congested parts of the network. All existing generators will get assistance to help them through the transition period, in the form of free financial transmission rights for a period of time. This translates into a relatively long implementation period (so they don't face the full set of reforms for ten years). Furthermore, our initial work on implementation costs shows that these costs are smaller in magnitude compared to the benefits and that most of the implementation costs rest with AEMO, not generators.

We welcome feedback on these proposed arrangements.

Existing generators in unconstrained areas and new generators (who are now better incentivised to locate in the right places of the network) will be affected less.

- **In some of the modelled benefits, the range begins at zero – so are you saying that there is a chance that there will be no benefit at all in those categories?**

A range of zero at the low end is given in the case of competition benefits only. Competition benefits depend on two key factors: 1) how much the reforms promote competition in regions of the NEM where this is currently not much generation 2) how much of a problem competition currently is in some areas of the NEM. To the extent that neither of these factors are the case, then the benefits may be negligible. But the report is deliberately conservative in providing a low end of the range of $0.