

30 April 2019

FROM THE OFFICE OF THE
CHIEF EXECUTIVE OFFICER

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Dear Mr Pierce

Coordination of Generation and Transmission Investment Consultation Paper 2019

Thank you for the opportunity to submit to the COGATI consultation paper. AEMO agrees that there is a need to reconsider the coordination of generation and transmission access in the NEM. Access reform, which has long eluded policy makers, is now urgent as unprecedented quantities of new generation connects to the grid.

The attached submission provides comments on the issues raised in the consultation paper and outlines AEMO's view of the principles that should underpin access regime design.

We would welcome the opportunity to discuss the matters raised in this submission further. Should you have any questions, please contact Jess Hunt, Manager Network Regulation on (08) 8201 7315.

Yours sincerely



Peter Geers
Chief Strategy & Markets Officer

ATTACHMENT 1 AEMO SUBMISSION TO THE COGATI 2019 CONSULTATION PAPER

KEY POINTS

- The purpose of access reform is to help generators to manage the risk that they will be unable to access the wholesale market. The transmission access regime should be designed to promote accurate and transparent price signals and liquid markets.
- The AEMC should consider a broad range of market design options, taking into account the needs of variable renewable generators and a more responsive demand side. International experience of access reform can hold valuable lessons for Australia.
- Changes to the access regime should enhance, rather than replace, the planning regime. There is scant evidence that an access regime can deliver efficient market-led transmission development.
- It will take time to do access reform well. In the interim, it is necessary to develop short term solutions to address some of the immediate challenges facing the NEM.
- The transmission access regime should not limit AEMO's ability to manage system security.

1. Introduction

AEMO welcomes the opportunity to work with the AEMC to develop a modern transmission access regime that is fit for purpose to meet current and future challenges. Implemented well, access reform can be expected to help generators manage congestion risk and create a locational price signal, both of which could be expected to promote efficient investment and operational decisions. Comprehensive access reform could also help to address immediate challenges with respect to marginal loss factors, system strength and congestion.

This submission provides comments in relation to:

- The objectives & principles that should underpin the design of the access regime
- The impact of energy transition
- Interactions between the access regime and the planning regime
- The need for interim arrangements;
- Renewable Energy Zones
- The opportunity to align with Western Australian regulatory framework
- Specific aspects of the model put forward in the AEMC's consultation paper; and
- Transmission charging.

2. Objective & principles

We consider that the objective of access reform should be to create a mechanism that permits generators to hedge the risk that they will be unable to access the wholesale market. Given the complexity of access reform, it would be worthwhile to establish a set of overarching design principles to guide the development of a new market design. AEMO proposes the following key principles:

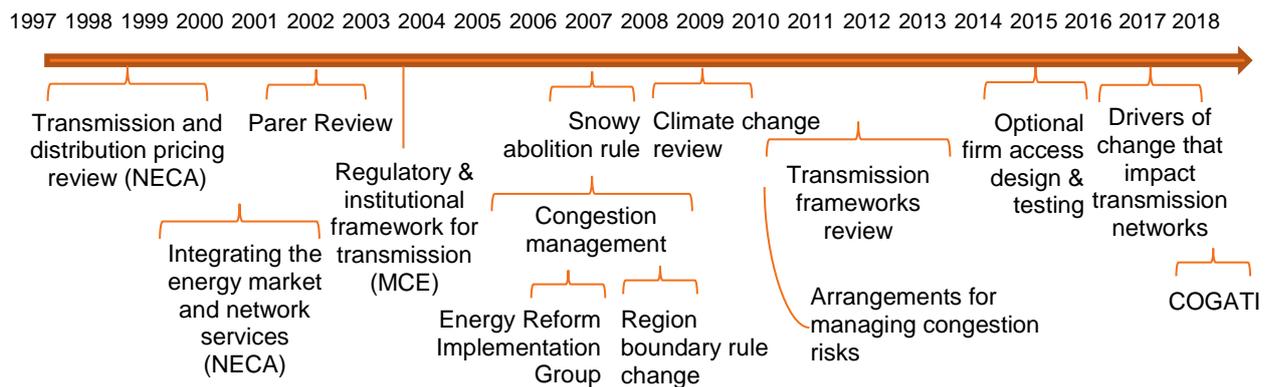
- Accuracy – The market design should create price signals that accurately reflect the costs of congestion at a given point on the network.

- Transparency – The market design should be transparent and respond predictably to changing market conditions.
- Liquidity– Transmission rights should be designed to support liquid markets and efficient network and market outcomes. Transmission rights should provide project proponents and operators with a way to manage risks associated with changes in access levels and price separation over time.
- Security & reliability – Transmission access reforms should not impede and where possible should complement AEMO & TNSP’s ability to manage system security.

3. Need to re-examine model in light of changing market conditions

AEMO recognises the considerable effort and thought underpinning the access model set out in the consultation paper. Whilst the proposed dynamic regional pricing (DRP) model is a major reform, it has nonetheless been designed upon the platform of the existing fundamental NEM regional design. Transmission access reform has been subject of ongoing debate since the establishment of the NEM in 1998.

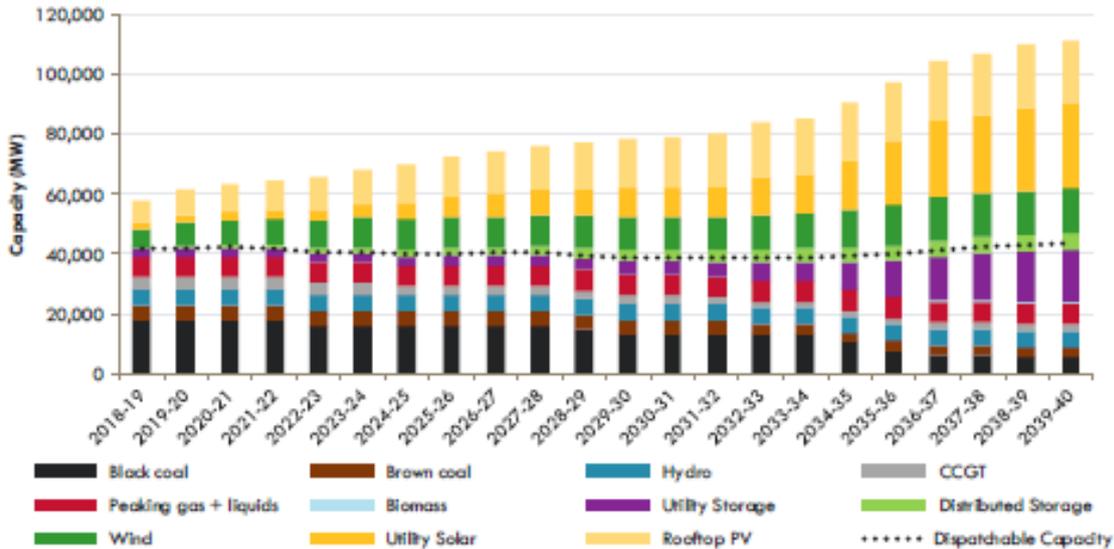
Figure 1 20 years of NEM transmission access reviews



The NEM is transitioning at a rapid pace and the market dynamics present in 2015 are not likely to be the dynamics in 5-10 years. The market design options provided by the Transmission Frameworks Review and the Optional Firm Access model may not be appropriate for an energy system with a growing proportion of demand side, variable renewable generation and storage.

Modern access regimes need to recognise the needs of emerging forms of generation and an environment where the costs of energy production accounts for a diminishing proportion of the value in electricity markets. Figure 2 below shows that investment in generation will predominantly come from variable renewable energy and storage in the coming decades.

Figure 2 Forecast NEM generation capacity in the neutral case¹



The COGATI review should explore the consequences of moving to a market design that features more granular local prices in an environment where the marginal cost of generation at many nodes is likely to be close to zero. As the NEM’s generation mix shifts towards a greater prevalence of variable renewable energy and distributed energy resources, generator business models are becoming more diverse.

The COGATI review should also consider the role of customers and the increasing prevalence of distributed energy resources in a revised access regime. In a two-sided market characterised by high levels of DER, it may not be sufficient to continue to settle load at a zonal level. Demand response is well placed to play a role in efficient congestion management. As customers become more responsive and more active participants in the wholesale market, it is worth considering whether they too should have the ability to receive the nodal price. This includes load created by energy storage systems.

The overall market design should establish both what needs to be built, how system security will be supported and how the associated costs should be recovered. The future NEM might involve a range of service providers that specialise in (for instance) bulk energy, firming, ramping, and frequency control. The access reforms should consider the needs of each type of service provider. To promote liquid markets and enable risk management, any access products should be designed to be both tradeable and scalable.

There are a range of reasons why a market participant might be subject to a constraint including thermal overloading, dynamic instability, system strength, voltage management and network outages or ramping constraints. An access regime that is focussed on thermal constraints will not deliver investment certainty if generators are constrained off for other

¹ Page 37: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/ISP/2018/Integrated-System-Plan-2018_final.pdf

reasons. A holistic view of all system limits is required in order for a generator's investment and operational decisions to be efficient. At the same time, it is essential that AEMO retains the ability to operate the power system securely and reliably. Some essential power system requirements – such as system strength and inertia – are unable to be easily accommodated within traditional optimisation algorithms due to the technical characteristics of the service.

While reform in the NEM has proved intractable, many international jurisdictions have well established access regimes that could provide valuable learnings for Australia. Other jurisdictions are also looking to update their access regimes to reflect the challenges presented by the energy transformation – for instance Great Britain's Charging Futures initiative.² AEMO would welcome the opportunity to work with the AEMC to examine international experience of transmission access.

Finally, we agree that there is scope for overlap between the AEMC's COGATI review and the post 2025 market design review which is currently being undertaken by the ESB.³ These projects should be aligned and co-ordinated to avoid duplication and/or wasted effort.

4. Interactions between the access regime and the planning regime

The COGATI review is occurring with the context of a clear policy shift towards system planning. The Finkel Review concluded that system planning was one of the three core pillars required to deliver secure, reliable and affordable energy to consumers,⁴ and the COAG Energy Council has subsequently acted to implement Finkel's recommendations by directing the ESB to convert the ISP into an actionable strategic plan.

AEMO would like to work with the AEMC to better understand the AEMC's views on interaction between the access regime and the planning regime. Section 3.3 of the AEMC's supplementary information paper suggests that "a primary aim of access reform is to introduce more commercial drivers into transmission investment, in order to shift investment risk away from everyday consumers" and "generators would collectively underwrite the transmission investment that is required to provide them with the level of access they want to the transmission network".⁵

AEMO notes that even in jurisdictions that have moved to full nodal pricing models, including markets in North America and New Zealand, generator access rights have primarily been used to manage congestion rather than to direct market-led transmission investment. International experience suggests that due to the episodic and lumpy nature of transmission investment, the cumulative decisions of disparate commercial investors have not delivered

² See www.chargingfutures.com

³ <http://www.coagenerycouncil.gov.au/publications/post-2025-market-design-national-electricity-market-nem>

⁴ Finkel et al., Independent Review into the future security of the National Electricity Market. Available at: <https://www.energy.gov.au/publications/independent-review-future-security-national-electricity-market-blueprint-future>.

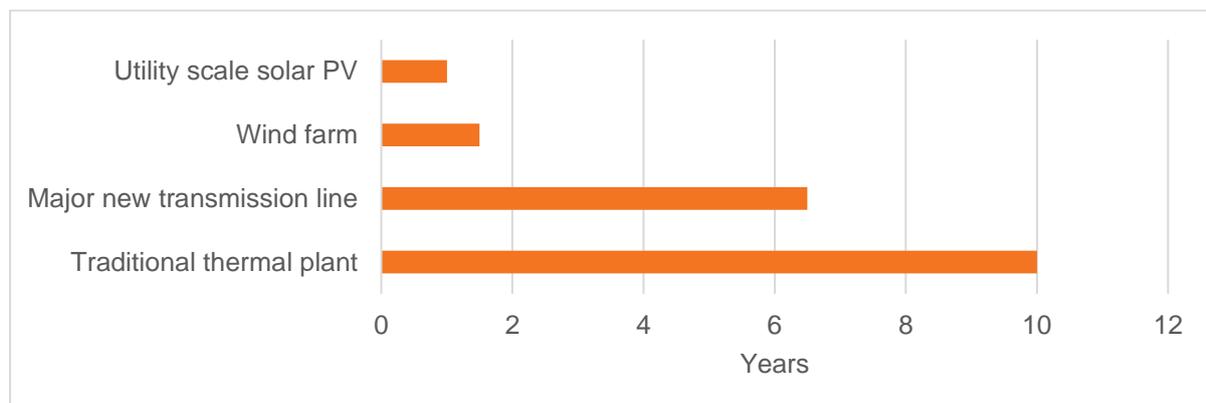
⁵ AEMC, *Supplementary Information Paper – COGATI Implementation – Access and Charging*, 4 April 2019, pg 23-24.

optimal transmission investment.⁶ As a result, transmission investment is typically delivered by regulated monopolies in accordance with a planning framework.

The supplementary information paper suggests that the risk of inefficient under-investment under a market-led model can be resolved through “careful consideration and design of the firm access procurement process and its associated pricing methodology”.⁷ We are not convinced that this outcome is achievable, both for theoretical and practical reasons. In 2018, AEMO commissioned FTI-CL Energy to prepare a report⁸ on how transmission planning is conducted in other jurisdictions and highlight learnings for Australia’s National Electricity Market (attached). Chapter 2 of this report explains why a model that relies purely on market funding is unlikely to deliver an efficient level of transmission investment.

There is also an inherent mismatch between the investment lead times associated with different types of electricity infrastructure which gives rise to a need for planning.

Figure 3 Indicative lead times associated with major electricity infrastructure



The NEM is now faced with a situation where generation can be built much more quickly than the transmission it requires to gain access to market. We also face risk associated with uncertain timing of generator closures.⁹ Assuming that coal-fired generators will retire as per public announcements and by their 50th year of operational life, it is expected that generation capacity which currently meets approximately 35% of NEM scheduled demand will have retired by 2035. The retired generation is broadly equivalent to the scheduled demand of NSW. Therefore, it is important that a framework is in place that enables implementation of a longer-term strategic plan.

A further issue is that going forward, it will be necessary to balance any new access regime with the realities of changing government policy and direct government investment. The design of the NEM needs a way to account for external drivers which may not consistent with

⁶ See Hogan (2017) “A Primer on Transmission Benefits and Cost Allocation”, *Economics of Energy & Environmental Policy*, 6(2), and Joskow & Tirole, (2005) “Merchant Transmission Investment” *Journal of Industrial Economics*, 53(2), 233-264.

⁷ AEMC, *Supplementary Information Paper – COGATI Implementation – Access and Charging*, 4 April 2019, pg 22.

⁸ [FINAL FTI-CL Report - Full - Transmission network planning in the NEM - 13 December 2018](#)

⁹ While the Rule change requiring generators to provide at least 3 years’ notice of closure is helpful, there is a limit as to how far in advance investors can be reasonably expected to know what will happen in the future.

a market driven access regime. For instance, a framework to support the efficient development of renewable energy zones (REZs) could give priority to REZs which are financed by generator purchases of access rights, but there could also be other triggers for the development of a REZ, such as government policy, or the need to replace ageing generation assets.

The NEM should be designed to incorporate the commercial decisions of market players so far as possible, but it should also use other sources of information to determine the optimal development of the power system. Changes to the access regime should enhance, rather than replace, the planning regime through the provision of clearer locational signals and the ability of generators to invest in transmission access.

FTI's report outlines a number of recommendations that could help create a NEM-wide model of transmission planning. These recommendations are broadly consistent with the transmission planning model being developed by the ESB as part of its ISP Action Plan.¹⁰

5. Need for interim arrangements

Timing is a critical issue. While AEMO agrees that successful access reform will take time, we also consider that four years is too long to wait to resolve some of the challenges facing the NEM. Given the complexity of the potential reforms and necessity of long lead times, interim solutions may be required.

In the short term, reforms to the Rules provisions on confidentiality are required to improve transparency as per the Rule change proposals submitted to the AEMC by several proponents (including AEMO).

AEMO is also working with market participants to explore measures to address several other issues that could ultimately be affected by the outcomes of COGATI, including system strength, voltage management and marginal loss factors. As part of this work, we are commissioning a review of the connections process to obtain an in depth understanding of the issues faced by connection applicants.

The ESB's ISP Action Plan outlines a potential interim solution. It recommends the creation of fund to support the efficient development of renewable energy zones (REZs). This fund could potentially provide an interim solution to fix current problems associated with congestion and security-related challenges using a government-sponsored fund. This fund need not preclude future reforms to deliver a robust, resilient long-term framework that does not rely on government action.

6. Renewable Energy Zones

As outlined in previous submissions to the COGATI review, AEMO does not agree that the sole way to efficiently fund the transmission infrastructure required to connect REZs is through generator funding. The Commission's focus on the risk of asset stranding ignores the significant inefficiencies associated with the current incremental approach.

In the absence of a decision to establish a REZ, it is not clear how access reform will transcend the difficulties of co-ordinating competing generators. The developers of new generation projects are still competing with each for transmission access, each with their own

¹⁰ <http://www.coagenenergycouncil.gov.au/publications/integrated-system-plan-action-plan>

timeframes. If access prices are designed to signal areas of surplus network capacity, then generator location decisions should influence the prices faced by competing generators.

Consistent with the findings of the Finkel Review, AEMO supports more ordered development and connection in key REZs. This could go beyond losses and congestion and include consideration of how we deliver efficient connections and a secure, operable power system in the longer term.

7. Opportunity to align with Western Australian regulatory framework

The Western Australian government is also considering whether changes are required to the WEM access regime. There would be merit in considering models that promote convergence between the WEM and the NEM.

While not having an explicit generator-transmission investment framework, the WEM does allow generators to invest in the shared transmission network. However, this has not occurred in the past decade, in part, due to the high cost of incremental transmission investment. The WEM has a framework to coordinate groups of generators to fund transmission investment but this has not eventuated because of the realisation on the part of generation proponents that the bulk connection of many generators at once would have a depressive effect on wholesale prices, particularly in a context of already high levels of generation capacity. The WEM is currently considering approaches to balance the transmission access needs of incumbents and new entrants.¹¹

8. Comments on dynamic regional pricing (DRP)

As outlined above, AEMO considers that there would be merit in undertaking a more wide-ranging review taking into account changing market conditions. Setting this aside to examine the proposal at hand, Section 8 of this submission sets out our comments on the DRP model.

8.1. Phasing of access reforms

Previous work undertaken as part of the Optional Firm Access (OFA) Design & Testing process¹² identified few benefits associated with the interim phase. OFA's benefits arose mainly in transmission planning and generator investment decisions and only minor dispatch efficiency gains were identified from more cost reflective generator bidding due to access settlement incentives.

The scope and complexity of comprehensive access reforms may mean that it is appropriate to adopt a phased approach to implementation. An information-only phase will enable market participants to familiarise themselves with the new framework. However, the benefits of an information-only stage are primarily as a stepping stone to full access reform rather than providing benefits in its own right.

The timing of any reforms arising as a result of COGATI should take into account other initiatives already underway, in particular the five-minute settlement (5MS) reforms. It will be necessary to explore the impact of 5MS on bidding strategies, as well as network flows. DRP

¹¹ <https://www.treasury.wa.gov.au/Public-Utilities-Office/Industry-reform/Constrained-Network-Access-Reform/>

¹² AEMO, *Optional Firm Access AEMO Final Report*, March 2015. Available at: <http://www.aemo.com.au/-/media/Files/PDF/ofa-final-report.pdf>

in 5MS and 30MS could have significantly different market outcomes. Given the significant workload associated with each project, it is also necessary to ensure that the change process is orderly and manageable for market participants.

8.2. Metrics for allocating settlement residues

Interim DRP arrangements which repay based on a simple metric such as capacity reduces the cost impact on generators but creates some complex incentives.¹³ If settlement residues are allocated based on nameplate, generators may receive congestion rents when they may not have even been available, or in proportion to a capacity they could not generate under current conditions.

In the case of the OFA Design & Testing process, AEMO concluded that it would be preferable to adopt an approach where the early phase is consistent with the final design. AEMO's preference is that any interim framework arising from the COGATI process is aligned with the long-term market design and is in place no longer than is necessary to ensure an orderly implementation of the new framework.

8.3. Implementation of dynamic regional pricing

The OFA Design & Testing process showed that the application of DRP to actual network conditions gives rise to complex challenges in practice, particularly in the presence of meshed networks.

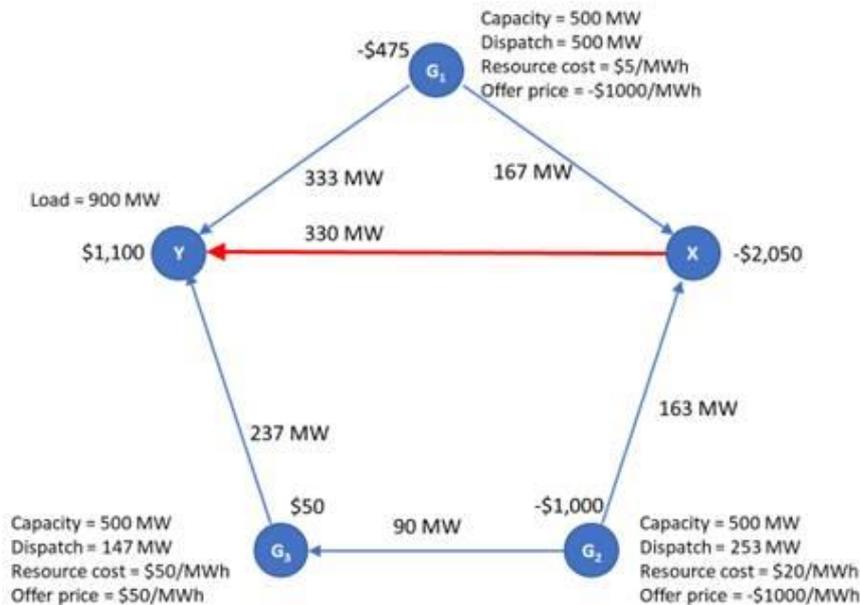
A standalone DRP environment gives rise to a range of issues, include dealing with loop flows or situations where the limiting line is not connected to any of the generation being constrained such as in Figure 4 (next page).

In this example, there is a loop flow on the network and a constraint between X and Y, which means the marginal 1 MW at Y is supplied by backing off 1 MW of generation at G2 and supplying two megawatts from G3 making the marginal price at Y is \$1100 despite effectively being supplied by low or negative priced generation.

It is unclear how DRP would deal with loop flows and negative prices. Further, the constraint between X and Y is not directly connected to the constrained off generator meaning that the settlement residue to be paid back to generators behind the DRP would require a bespoke approach leading to complexity in implementing DRP across many and varied network outcomes.

¹³ There is also a question as to how a simple metric might apply to energy storage.

Figure 4 Application of DRP in a loop flow



Another question requiring further consideration under a phased approach is how to allocate real time access to interconnectors among generators. This issue proved complex during the OFA Design & Testing process and was not resolved.

The design of the DRP mechanism will also need to account for reverse flows at the transmission/distribution interface. AEMO’s experience is that that is already starting to occur, and recent analysis completed by the CSIRO suggests this will be widespread across the NEM in the next 5 years given the rapid uptake of solar PV and age in the distribution network.

While AEMO already produces nodal prices, under DRP this information would be used for a new purpose. If these nodal prices have more direct impact on participant commercial position, they would require more transparency and auditability in their formulation.

It would be necessary to design systems and procedures to give effect to agreed processes for how to formulate DRP zones, which will require trade-offs between:

- allowing flexibility to manage system security moment to moment,
- to having regard to maintaining a consistent approach to DRP formulation.

There is a risk that under the nodal pricing regime required for DRP, the process for developing and applying constraints would become less flexible. AEMO would like to better understand how different types of constraints feed into DRP, and if these constraints affect local price outcomes, what this means for access rights. As discussed above, a key design principle should be that transmission access reforms should not impede and where possible should complement AEMO and TNSP’s ability to maintain a secure power system.

The interplay between DRP and MLF also requires consideration. A key manifestation of the uncertainty associated with the current open access regime is volatile MLFs. While the underlying power system dynamics that drives losses cannot be changed, a key potential benefit of the reforms should be to help generators manage the risk associated with MLFs.

The eventual market design should allocate the cost of losses in a way avoids double counting and/or misalignment. These risks arise because losses are a component of intra-regional settlement residues (the other component is congestion). Indeed, in examining the current approach to connections and international approaches to transmission pricing and access, it may be that alternative approaches to assist participants to manage connection, access and price risk become apparent. For these reasons, while phases 1 and 2 are less complicated than full access reform, they are still substantial initiatives in their own right.

8.4. Competitively neutral transitional arrangements

Transitional arrangements are likely to be a critical issue. Previous attempts at access reform suggest that the method of allocation of rights to the existing transmission network is a key challenge. It will be important to develop an approach that balances the interests of incumbents and new entrants in a way that does not confer an unfair competitive advantage on any participant (or group of participants). The staged approach outlined in the supplementary information paper has the potential to achieve this outcome, so long as the right balance is struck.

Separating and prioritising the role that access rights play (e.g. a price and access risk management tool versus a tool to underpin market-led transmission investment) may lead to a more transparent market design which might reduce contention in the way access rights are allocated.

8.5. Information from dynamic regional pricing

The DRP regime will create market signals that can inform the planning process, but only once access rights are reformed in a way that incentivises TNSPs and generators to change their behaviour.

ISP modelling is currently based on constraint information rather than local price outcomes. AEMO would not expect to change this approach unless there are changes to the NER framework for investment tests, which seeks to maximise the present value of the net economic benefit to all those who produce, consume and transport electricity in the market.

AEMO's ISP modelling process is a whole-of-system, least cost optimisation taking into account identified system needs including the reliability standard. Consistent with the methodology required as part of the regulatory investment test, AEMO models the fuel costs associated with different supply outcomes, but not market prices (as these are considered to be a wealth transfer between generators and customers).

However, if generators were to have the ability to invest in access rights, generators' investments would constitute a new source of information that could be incorporated into the ISP modelling.

8.6. Treatment of storage

Utility scale storage should receive treatment that is consistent with other forms of electricity supply. They should purchase at the local price, and also sell at that price and share in congestion rents. As discussed above, there is also a question as to whether loads – especially loads that provide wholesale demand response (potentially including aggregated loads) – should receive the local price.

8.7. Liquidity and competition

With reference to the supplementary information paper sections on liquidity 3.1.1. and 3.1.2, AEMO notes that DRP may disrupt liquidity in RRP referenced products. Contracts struck at the RRP will no longer cover risk in the same way, as DRP effectively changes the settlement methodology of retail and wholesale prices in the NEM. This disruption may reduce liquidity in current RRP referenced products and require new approaches and products for risk management.

Regarding competition (section 3.1.4), the introduction of DRP may create some transient market power as the relative strengths of participants may change under DRP and participants will be seeking to manage positions in the new environment. The added complexity in physical and contract markets may lend itself to participants with a greater capacity for regulatory and market analysis.

8.8. Impact on inter-regional settlement residue auctions

The supplementary information paper comments that “DRP will likely not change the existing process of inter-regional settlement, with settlement residues continuing to be allocated via auction”.¹⁴

With regards to SRAs, while in theory this process can continue alongside DRP, confidence in SRA products and auction will depend on the extent to which confidence and stability in RRP is maintained. If the perception of RRP changes or there is expected to be a step change in value, this might impact on the SRA market. Further, once access and charging elements are added to DRP, this will likely negate the need for SRAs.

This issue is discussed further in AEMO’s OFA Final Report.¹⁵

8.9. Competitively neutral transitional arrangements

Transitional arrangements are likely to be a critical issue. Previous attempts at access reform suggest that the method of allocation of rights to the existing transmission network is a key challenge. It will be important to develop an approach that balances the interests of incumbents and new entrants in a way that does not confer an unfair competitive advantage on any participant (or group of participants). The staged approach outlined in the supplementary information paper has the potential to achieve this outcome, so long as the right balance is struck.

Separating and prioritising the role that access rights play (e.g. a price and access risk management tool versus a tool to underpin market-led transmission investment) may lead to

¹⁴ See section 3.2.1.

¹⁵ AEMO, *Optional Firm Access AEMO Final Report*, March 2015. Available at: <http://www.aemo.com.au/-/media/Files/PDF/ofa-final-report.pdf>

a more transparent market design which might reduce contention in the way access rights are allocated.

9. Transmission charging

AEMO agrees that there is a need to review the inter-regional transmission use of service (IR-TUOS) charges. The current focus on peak demand is not reflective of the changing drivers of transmission investment, which include system security, flexibility and diversifying sources of supply.

The AEMC should undertake a broader review of the transmission charging framework, which is overly rigid and complex. Broader questions for discussion include whether transmission charges should be:

- *Determined on a NEM-wide basis* – the current IR-TUOS framework involves a complex methodology where each TNSP levies charges on each other;
- *Transparent* – at present, charges are backward-looking and changes are influenced by interconnector flows during peak demand periods in the previous year. This approach does not provide certainty to parties who may be required to fund new interconnectors;
- *Simplified* – in order to provide a more transparent beneficiary pays calculation. Rather than a use of service charge, the AEMC should consider whether to move to a capital allocation approach based on beneficiaries who drove the investment decision in the first place.

AEMO agrees that broader developments associated with changes to the way generators interface with the transmission network will also necessitate a review of load-facing TUOS. The nature of these changes will depend on the access reform model.