06 July 2017

Mr John Pierce
Australian Energy Market Commission
PO Box A2449
SYDNEY SOUTH NSW 1235

Dear Mr Pierce

AEMC draft report — Distribution Market Model

SA Power Networks welcomes the opportunity to comment on the AEMC's draft report. The energy industry is facing unprecedented change from a one–way centralised supply chain to a decentralised industry, driven by rapid emergence of significant volumes of generation, storage and other smart technologies (Distributed Energy Resources, **DER**) being connected to distribution networks. The AEMC's study is an important opportunity to explore how the design of various market and distribution system models might:

1. Provide safeguards—by continuing to provide customers with a reliable, safe and secure supply of energy (an essential service), and a secure platform for customers to trade energy; and
2. Maximise value—by unlocking opportunities for customers to earn or save money with new technologies.

While the AEMC draft report focusses on item (2), exploring potential distribution market designs must entail a considered exercise of identifying and evaluating costs, benefits and steps required in market transformation. In our view:

- There is more urgency and primacy to ensuring appropriate safeguards to support and maintain system security given the challenges DER are now presenting for distribution networks and considering how these safeguards might evolve / interact with potential market–based approaches to DER optimisation.
- Network pricing is insufficient to optimise DER across network and wholesale market uses. Physical distribution network limits imply that network uses must be given primacy to enable customers to be supplied energy and access markets. Distribution Network Service Providers **(DNSPs)** must also rely on direct actions (e.g. investing on the network, direct third–party contracting, or incentives to customers) to manage constraints—this will not inhibit other DER uses when unrequired by networks nor prevent consideration of market–based approaches to DER optimisation.
- To facilitate consideration of safeguards for secure energy supply, including how these might be implemented and need to evolve, the AEMC should clearly distinguish between two key and likely to be required functions in a high DER penetration environment—(1) Distribution System Operation / Operator **(DSO)** and (2) Distribution Market Operation / Operator(s) **(DMO):**
  - The DSO is a necessary evolution of the DNSP model—evolving from providing secure one–way energy supply to customers, to securely hosting two–way energy flows to / from customers and to a platform to realise DER opportunities. DNSPs must invest now to better identify the location, and understand the use of, DER within their networks and to manage the technical challenges they present. Security of energy supply safeguards are a logical DSO function;
  - Other safeguards could be applied to the DMO function, in the same way that AEMO currently provides safeguards at the wholesale market level as network constraints arise; and
  - Consideration of potential DMO entities must be participant–neutral and not prematurely prohibit any party including DNSPs, taking on the role. Required DMO functions should be considered as well as whether these might only be practically and efficiently performed by a single party per distribution region, as is currently the case with the wholesale market.

DER penetration context

There are rapidly increasing volumes of DER and local generators (particularly roof–top solar) that are not 'smart' (i.e. cannot respond to price signals) now connected to distribution networks. The Energy Network Australia Electricity Network Transformation Roadmap (ENTR) presents a range of thorough analyses on key forecasts. With more specific regard to conditions in South Australia, we observe that:

- Over coming decades, the Australian energy market will transition from one in which most energy is sourced from large scale transmission connected generators, to one where 50 percent or more of energy is provided by DER. This scenario as set out in the ENTR is even more likely to be realised in South Australia;[1]
- The Australian Energy Market Operator (AEMO) forecasts that by as early as 2026, rooftop solar PV in South Australia will be sufficient to supply 100 percent of demand at minimum demand periods;[2]
- CSIRO analysis indicates that most of our zone substations have reached (or will by 2020 reach) a threshold penetration level of rooftop solar (40 percent) that is indicative of reverse power flows.[3]

While these technologies present opportunities for customers and the market, the challenges they present for maintaining distribution network security are significant:

- Excessive local generation and / or uncontrolled DER dispatch (driving reverse power flows) are the most significant risks to energy supply. If uncoordinated, large penetration of these technologies will create widespread overload and / or breach of distribution network technical constraints, leading to disconnection of generators and potentially sections of the distribution network; and
- Given the likely magnitude of volumes in question, breaches of distribution network constraints might also trigger constraints at the transmission level, presenting wider system security risks.

Technologies within scope of review

The AEMC limits its study to DER which it interprets as 'smart' devices capable of responding to price or other signals. Only 'smart' devices can be coordinated by market approaches / signals, the design of which are being considered in this study. However, our distribution network is being challenged by large volumes of generation which are not 'smart'. Managing these challenges might require us to:

- invest in reinforcing the network to support these volumes;
- invest in / contract for DER to stabilise / ensure network supply; and / or
- put incentives in place to encourage 'smart' services (including conversion of existing devices) or other incentives for customers.

A key theme of our submission is the need to consider not only maximising opportunities for parties to earn money from using new technologies but also the need for safeguards to energy supply.

DER value optimisation—Distribution Market Operation

Limits to trading off potential uses

DER can be directed to various uses, including:

- Providing services into wholesale markets (e.g. energy arbitrage or ancillary services);
- Allowing customers to alter or backup their energy use; or
- Allowing Transmission Network Service Providers (TNSPs) or DNSPs to alleviate constraints (peak and non–peak demand driven)[4] and other network issues.

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1 ENA, *Electricity Network Transformation Roadmap: Final Report*, April 2017, p.i.

2 AEMO, *South Australian Electricity Report – South Australian Advisory Functions*, August 2016. p.23.

3 ENA, *Electricity Network Transformation Roadmap: Final Report*, April 2017, p.103.

4 This could include any peak demand, minimum or negative demand occurrence that affects a distribution network's reliability, quality and security of supply.

It is appropriate for the AEMC to consider how best to optimise DER so it is directed to highest value uses. However, there are limits to the ability to trade off some uses against each other:

- Non–simultaneous uses / needs: over a given year, a battery or generator for example, can be directed to multiple potential uses and real examples of this are already occurring:
  - These devices might only be required by networks at relatively infrequent times of constraint during a year. Outside of these times the devices could be used to provide, say, a wholesale market ancillary service. This is irrespective of who owns the device. Even if an asset is owned or co–funded by a regulated DNSP to be utilised at relatively infrequent network constraint times, there is nothing preventing agreements with third parties who might use the device at other times to provide services into wholesale markets; and
  - SA Power Networks is undertaking a trial of batteries within residential premises in Salisbury which is already unlocking value for customers across both network and wholesale / retail uses of DER. In this trial, the batteries prioritise network support during hot days, but at other times optimise across other uses for customers. The trial is providing learnings on how various parties might interact to maximise benefits to customers while maintaining energy security.
- Simultaneous uses / needs: at relatively few given points in time when DNSPs need to call on DER, there are hard limits to trading–off various DER uses, so network requirements must be prioritised over other DER uses. DNSPs will typically only call on DER to alleviate a network constraint, so if this need is not met first, a customer's energy supply and wholesale market access will be cut. Any DER optimisation resulting in a DNSP's need not being met is a lose / lose situation that cannot deliver value for the market and customers. Consideration is therefore needed on whether network prices can sufficiently signal physical network limits, and if not, what safeguards / controls are required.

Given there are physical limits on networks, the focus of the AEMC's study should be refined and focus instead on optimising DER investment / operation while maintaining the reliability, quality and security of supply of distribution networks.

Co–optimising DER across network and wholesale uses

In examining the potential market based approaches to DER optimisation, consideration is needed as to whether prices alone will be sufficient for optimisation to guarantee reliability, quality and security of supply, or if other controls / safeguards are required.

In the wholesale market, while generators bid supply against demand identified by AEMO, prices alone are insufficient to maintain a secure operating state and controls. That is, constraint equations ensure that bidding generators can be dispatched given constraints on the transmission system.[5] The same model might be applicable to the distribution level, where the inability to rely solely on price signals to guarantee supply is even greater:

- For network prices to signal physical limits and optimise DER across network and wholesale use, they must (as per wholesale spot prices), dynamically respond in close to real–time, based on bids. Regulatory barriers inhibit regulated network prices fully and in an unfettered manner, responding to dynamic network conditions, as opposed to wholesale spot prices which can rise rapidly and significantly based on market conditions;
- We support ongoing network tariff reform to signal costs of using networks at different times and to drive customer benefits. However, even if jurisdictional restrictions on locational pricing were removed under the current framework network prices will only reflect costs of physical network investment and not congestion. The current tariff reforms do not intend to derive prices to optimise DER across network and wholesale uses—prices would need to dynamically signal network congestion given technical limits of networks; and

[5] See for example, AER, *State of the Energy Market*, May 2017, p.24.

- While we support examining approaches to pricing network congestion, these approaches have not yet been implemented anywhere. It is also unclear how network congestion pricing would interact with regulatory revenue determinations and price setting, as network congestion prices cannot be set far in advance in the way revenue determinations are made and prices are currently set.

Other price and non–price approaches to managing DER challenges

Without congestion pricing as a means of optimising DER across network and wholesale uses, or as a precursor to it, a conceivable alternative / additional price signal to help DNSPs mitigate the potential for DER to affect reliable, quality and secure supply could be a tariff charged on energy exported to the network. We support the AEMC considering the merit of removing clause 6.1.4 of the National Electricity Rules, currently preventing DNSPs developing export tariffs. An approach to export pricing would need to be considered carefully but in principle it might:

- Involve an approach similar to the peak demand tariffs most DNSPs are currently implementing, but would instead signal (in an averaged manner across locations) periods of peak exports only; and
- Be an appropriate alternative to the AEMC altering our current open access regime (requiring DNSPs to make offers to connect) into a firm access regime (where parties pay to guarantee access). An export tariff might for example, signal periods when high export volumes might drive long run marginal costs of augmenting the low voltage network, and thereby encourage customers to alter their behaviour to times when the network can host DER export volumes. In this way, customers would more likely be able to 'access' the ability to export energy.

In the absence of the ability to rely on pricing, DNSPs must continue to rely on direct actions to manage network issues within defined limits despite the AEMC suggesting these are inefficient. Direct actions might involve either investments such as reinforcing networks to enable hosting of two–way energy flows, investments to own DER assets[6], or direct contracting with third parties to utilise their DER asset capacity. Suggesting that in–house DER ownership and direct contracting for DER is inefficient as only one DER value / use is unlocked, ignores important considerations, including that:

- DER can only be directed to a single use at a given point in time. Further, if a third party agrees to direct DER to a network use then this agreement must be firm to avoid network constraints;
- Over the course of a year, there is no reason why other DER uses could not be realised. There is no barrier to allowing an asset owned or co–owned by a DNSP to be shared with third parties;
- There is greater urgency to safeguarding secure supply of energy than exploring market based approaches to DER optimisation and currently there are no alternatives to using direct actions to prevent network constraints; and
- Direct actions do not prevent structured / designed market–based approaches to DER optimisation from evolving.

Market design and roles

Over time, various parties might seek to provide the role of optimising DER across different uses—the Distribution Market Operator (DMO). There is also potential for optimisation to occur as part of a structured or designed market. On these issues we consider that:

- While a market could be effective, the complexity and cost of its establishment should be considered. Trials will be fundamental in informing these decisions. A starting point might be to consider the potential for extending the wholesale market model to the distribution level.
- While the AEMC prefers organic evolution in the DMO role and in terms of how many parties end up taking on this role, efficient market design is likely to require a single operator per distribution region as the functions required of the DMO can only be undertaken by a single party, including:

[6] For example, a battery / generator connected directly to a distribution network.

- Being responsible for accepting bids from multiple aggregators, customers, or other parties subject to constraints signalled by DNSPs—this will be complex, varying dynamically in time and over potentially tens of thousands of network nodes in South Australia alone; and
- Mediating which party should be provided access, given the limited physical capacity of the distribution network, and potential further constraints imposed by AEMO and / or the transmission network at distribution–transmission connection points.

- The AEMC should be neutral and not exclude any party taking on the DMO role, including DNSPs. Decisions here require thorough investigation of costs and benefits, noting:
  - There could be significant efficiencies in DNSPs undertaking the DMO role given the existing relationship with customers, deep knowledge of distribution networks, and experience in operating (in customers' long term interests) within a transparent regulatory framework;
  - Physical network limits must be maintained before any optimising of DER can occur. The need to guarantee reliable, quality and secure supply of energy is paramount and therefore there is in effect, no conflict of interest in question. Not directing DER first to alleviate a network constraint will risk wider energy supply security and loss of access to wholesale markets;
  - There is no reason why DNSPs could not act independently and in customers' long term interests to optimise DER use when the network is not constrained. While the AEMC suggests the DMO should be exposed to financial incentives to profit from DMO service provision, we note that AEMO acts in customers' long term interests without exposure to financial incentives; and
  - While the AEMC suggests DNSPs should be banned from the DMO role as this should be performed by a party with no specific interest in one or more DER uses, the same rationale applies to retailers or other service providers who might have a niche business model (e.g. providing ancillary services into the wholesale market).

Platform security—Distribution System Operation

It is unclear how the AEMC envisages that ongoing energy market transformation will safeguard reliable, quality and safe supply of energy to customers, the combination of safeguards required and how they are implemented. This appears somewhat driven by an unbalanced focus on the potential DMO function. In our view there is another function required in a high DER penetration environment, that of Distribution System Operation / Operator (DSO). In our view the DSO function:

- Will be required regardless of the potential for, and design of, any DMO function;
- Is the logical home for ultimate controls to safeguard the ability to supply energy and wholesale market access to customers;
- Is a required evolution in the DNSP model, best performed by DNSPs. DNSPs will need to invest in new ways to perform a range of functions. The DSO could be responsible for functions such as:
  - Planning of long-term network investment needs and operating and maintaining networks to reliability, safety, quality and security expectations / standards;
  - Registration of DER, potentially electronically and dynamically, to understand DER locations, capabilities and capacity across the network;
  - Monitoring and forecasting the dynamic condition of the distribution network, including into the low voltage network where most DER will be connected, and rolling this information up for provision to the transmission system operator (TSO) and AEMO; and
  - Potentially, identifying network constraints in real time to determine if curtailment of DER dispatch may be required. Such constraints may be within the distribution network, or advised by the TSO or AEMO at bulk supply points. With a DMO function present, these constraints would be provided by the DSO to the DMO as the limits within which operation would be required.

The exact manner in which the DSO might safeguard energy supply might evolve over time depending on the nature of any DMO function that emerges. Consideration on the interaction between DSO functions and that of a possible DMO would benefit greatly from trials.

If you wish to discuss any of our comments further, please contact Bruno Coelho on 08 8404 5676.

Yours sincerely

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