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Dear Sir

Submission to the Inquiry into National Electricity Network Regulation

Sinclair Knight Merz (SKM) provides this submission to the Inquiry into National Electricity Network Regulation to assist the Productivity Commission (the Commission) 's consideration of prospective regulatory strategies to improve efficiency of electricity networks. Our consulting teams have over 35 years of experience in development of the electricity sector, including extensive experience in economic forecasting and regulatory analysis. Based on this market experience and our previous consulting work, SKM seeks to bring to your attention three matters:

1. SKM believes there is a gap in the regulatory frameworks with respect to long-term planning for the integration of networks with distributed generation resources, and we propose a regulatory concept which should provide a path to close that gap with modest additional effort on the part of network service providers (NSPs), when compared with the potential benefits.

2. SKM has previously examined providing firm inter-regional access in the National Electricity Market (NEM) and supports the Commission's recommendation to give this concept more development effort.

3. Reliability standards in the NEM and the South-West Interconnected System (SWIS) don't currently include an economic benefits test to contrast the cost of augmentation with the marginal cost of unserved energy. Instead, the standards drive investment decisions and regulatory intervention based on the average cost of unserved energy leading to excessive reliability in many instances.

We do not seek to make a comprehensive response to the Draft Report[1] in this submission, as SKM is generally in agreement with the main conclusions and the importance given to the broad range of issues considered. Our objective is to focus on the three matters summarised above, where we have relevant experience to offer. The remainder of this submission provides more detail on these matters.

1. Framework for integrated planning of networks and distributed resources

The first item primarily relates to the efficiency of networks in delivering long-term benefits to customers, and the challenge of designing integrated networks to meet demands that are relatively infrequent and increasingly uncertain. It is needed because:

- Signals and incentives for demand management to support networks are weak.
- Distributed generation is disrupting the planning and performance of distribution networks, especially in voltage and reactive power control (eg high solar photovoltaic [PV] penetration) and in some cases maximum short-circuit current levels ("fault level control")

SKM has considered the information gap[2] that customers have about the networks that serve them relative to the knowledge networks have about their customers. The nature of the relative information gap appears to be changing over time: Customers are becoming more active in self-generation and managing their consumption, the forward planning for which is largely hidden from the network owners. However, customers are not well informed about future network costs and capability and, therefore, integrated planning between customers and networks around embedded resources is inefficient. The only mechanisms are negotiations for connection of embedded generation on an ad hoc, project-by-project basis, or NSPs seeking non-network solutions at the time network augmentation is to be approved.

Increasingly dynamic markets in distributed generation and energy storage provide both a threat and opportunity to networks. The threats are that:

- As the penetration of distributed energy generation increases, the peak demand is more difficult to predict.
- In some networks approaching saturation by distributed generation, demand is becoming peakier or lasting less thus reducing utilisation even more.

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[1] Productivity Commission 2012, *Electricity Network Regulatory Frameworks*, Draft Report, Canberra.
[2] Often referred to information asymmetry" referring to the lack of information that electricity customers have about the networks that serve them.

The opportunity is that distributed generation and load control, if suitably planned and operated, can

- Increase network utilisation if output is matched to local peak demand, thereby reducing peak power flow on critical network elements
- Defer capital investment in generation, transmission and distribution due to the reduced peak power flow
- With suitable network control equipment and strategy, improve supply reliability.

Two mechanisms would reduce the information asymmetry and provide significant economic benefits.

- Network operators could provide information regarding the capacity cost and capacity value at each significant node in their networks.
- Improved metering of customer demand that will better inform the network owners of the loads on the network and, potentially, facilitate control of customer demand.

1.1 Capacity cost and value in the network

Capacity cost and value respectively represent location-specific costs incurred as peak demand increases and conversely the network deferral benefit of reducing peak demand. Defined with reference to a forecast peak day load shape and peak demand forecast, these figures could, potentially, be supplied for each transmission supply station, sub-transmission node, substation, high voltage feeders and for large distribution transformers (say above 300 kVA) that may be constrained at times of peak demand[3].

While these figures are somewhat analogous to the Transmission and Distribution Loss Factors that also indicate the merit of a location, they would reveal important location-specific economic information on which investment decisions can be based. More clearly than a loss factor:

- High costs indicate locations where constraints are expensive to relieve, and provide information regarding the cost up to which non-network solutions would be worth developing.
- Low costs indicate locations where there is capacity to accept increased load without imminent capital cost, and where demand-side load reductions are of little long-term value.

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[3] It would be unreasonable to expect marginal capacity value to be published for every HV feeder and distribution transformer because the value would be very low where the load is stable and there is substantial spare capacity. It would be sufficient to say that the value is too low to be assessed for demand side planning purposes.

These figures will therefore inform participants with respect to locations for demand-side providers to focus their efforts on preparing future non-network solutions to alleviate network constraints.

Further, this provides an economic basis for the development of a cost reflective network pricing structure and appropriate technology for neutral market incentives for peak demand management (or otherwise). It could be argued that while information such as this remains within the network service providers, it acts as a barrier to efficient development which is inconsistent with the NEM objective. Its provision would enhance competition and facilitate efficient market development by informing non-network participants of the cost of augmentation to the regulated network. Information such as this would:

- Assist in the development of Government policy by highlighting spatial diversity of network augmentation and requirement. It provides a guide to both the timing and cost of demand growth. Policy development would then be informed by indicators of the cost of resource allocation. for example: a policy that drives a widespread roll-out of smart meters as opposed to a targeted or progressive roll-out in specific locations supported by a cost benefit analysis.

- Enhance the approach of demand-side providers and distributed generator developers by providing an effective ranking of locations and opportunities where appropriate targeted solutions can be developed. This facilitates a strategic long-term planning approach to resource deployment by providing more effective planning information and avoids the costly and inefficient process of repeatedly testing what may be inappropriate solutions in unsuitable locations.

- Enhance market competition. Incentives for network service providers to examine all network and non-network solutions are enhanced, increasing consumer confidence in the appropriate development of the network and largely defeat the current, somewhat clichéd claim of “gold plating” in the regulated network.

SKM requests that the network planning frameworks for Australian Transmission and Distribution networks be modified to include a requirement for NSPs to publish measures of capacity value and cost for each substation supply node. These measures will need to be aligned with the planning obligations and time frames for each NSP, Some suitable measures for consideration would be:

1. The **average** cost of supplying peak demand in A$/kVA/year as the basis for revealing the embedded cost that would be needed to recover the supply chain network costs. This would be a benchmark for fully cost reflective pricing on a regulated basis and would reveal underlying fixed costs based on historical decisions.

2. The **marginal** cost of supplying increased peak demand in A$/kVA as the basis for revealing what additional costs would be incurred in present value terms at the regulated weighted average cost of capital (WACC) if the demand were to increase.

The measure could be based on a one off step increase in load, or an increase which subsequently grows at the local rate of growth projected. In principle, this would be the same as the marginal cost of reducing demand if the effect of load growth on future project timing is smoothed rather than stepped. The value would include the present value of future operating costs associated with new assets.

3. The **incremental** cost of supplying peak demand in A$/kVA for a nominated step increase in peak load (say between 2% and 5%). This calculation account for changes in project timing on an annual rather than a smoothed basis. Small changes of peak load would have an incremental value of zero until the step load change was large enough to influence future project timing[4].

4. The **decremental** cost of supplying peak demand in A$/kVA for a nominated reduction in peak load. This calculation would account for changes in project timing on an annual rather than a smoothed basis. Small reductions of peak load would have an incremental value of zero until the step load change was large enough to influence future project timing.

There is significant interest in the structure of the network businesses and their cost drivers. Cost / benefit information associated with changes to demand at each location provides a powerful tool to understand network value. It provides an additional incentive to optimise network value. It is not considered feasible for network pricing to truly reflect current economic value as it would lead to volatile network pricing that customers and network owners would find problematic[5]. SKM expects that stability in network pricing is valued by customers and network owners, and, therefore, other measures are needed to transact network economic value between networks and customers to drive efficient outcomes.

Therefore in a framework where some network costs are equalised ("postage stamped") across multiple locations and customers, there is place for demand-side resources which have a higher unit cost and a higher unit value than measured by the network charges they displace. This value pricing for integrated planning would facilitate joint planning of networks and distributed resources and provide value signals to encourage efficient allocation of resources. It would be expected to markedly increase competition and entry in demand side resources through lowering the cost of information.

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[4] In theory the value should never be zero for a practical change in load because in the future there will eventually be a project right on the threshold of critical timing that would be affected and the costs would change on a present value basis. However, within the normal planning time frame of 20 years, there may be locations where a 1% change in peak demand would have no effect on future project investment.

[5] For example nodal pricing down to distribution level which includes the impact of network constraints would provide efficient incentives in theory but in practice could not work without hedging that would smooth out the economic signals, much as current network charges do when combined with regionally priced energy.

1.2 Improved metering for network service providers

Smart Meters are a complex issue for networks. NSP's are suffering from a lack of detailed information about behaviours and the contribution of new consumption and production technologies at the consumer level. While smart meters alone will not solve these problems, the information and capabilities that can be provided and utilised by NSP's will be a key enabling technology for increased network utilisation and reliability. Publishing capacity value would give clarity on the impact of widespread smart meter roll-out covering areas with different levels of constraint.

(For Recommendation 10.1) If a capacity value for networks was published, it would focus and enhance the justification for smart meters. The cost of smart meter roll out could be informed by the value of network benefits, energy market optimisation, customer value and enhanced network functionality.

1.3 Complementary reforms to support demand management

(For Recommendation 12.2) Our proposal for publishing capacity value could be added to Recommendation 12.2 to strengthen the discipline to integrate demand side resources.

2. Delivering firm inter-regional transmission access

In 2005, McLennan Magasanik Associates[6] (MMA) conducted a confidential study into the feasibility of providing firm inter-regional transmission rights across the interconnections in the NEM. Currently inter-regional access is non-firm because the settlement surplus from auctioned inter-regional capacity may be reduced by counter price flows or from reduced interconnection capacity as a result of network outage, or an unusual load and generation condition. MMA developed an evaluation method that enabled the auction of firm capacity through a bidding process. Final quantities are sold according to a value criteria derived from a risk analysis that the settlements under the firm access regime would not excessively exceed the settlement surplus available from the NEM. A practical analytical method was developed, supported by market modelling, that would optimise the value of firm capacity sold according to bid value and the residual settlement risk.

The scheme would fund AEMO or third party to manage and administer the residual settlement surplus risk. Deficits could be funded through commercial insurance as the risk profile would be reasonably quantifiable. Surpluses could be used to insure for future deficits or held to fund future potential deficits in an investment trust. Deficits not covered by insurance would be recovered in subsequent years by reducing the quantity of firm access cleared, having regard to a greater need to generate a settlement surplus. Surpluses would be distributed in future years by increasing the quantity of firm access cleared in the auction. The proposed method would provide an efficient basis for allocating firm access across the NEM interconnectors and

[6] McLennan Magasanik Associates merged with Sinclair Knight Merz in 2010 and the team operates within the Strategic Consulting organisation of SKIM.

managing the settlement surplus risk. SKM therefore supports the proposal to develop firm access rights across interconnectors. Further consideration of the duration of the access rights and the lead time of the auction is needed.

The primary benefit of this scheme would be that power purchase arrangements for intermittent generation would not be locked into one region as they tend to be now. Secondarily, retailers and generators could purchase firm access and trade hedges more efficiently across regions with less risk than they do now. Such a facility would increase competition in the wholesale contract markets and, consequently, the regional retail markets.

SKM has not performed any analysis of how such a scheme might work within regions for intra-regional constraints, or whether it could work effectively under all foreseeable market conditions. For example, the market power impacts have not yet been assessed.

3. Efficient reliability standards

Thirdly, previous work done by SKM MMA for the Reliability Panel reviews has shown that the NEM reliability standard at the generation level is potentially inefficient because at 0.002% of energy demand in all regions across the NEM it is not adjusted to reflect:

- The regional characteristics of generation resources and their reliability
- The different regional load profiles, for example, being much peakier in South Australia and flatter in Queensland
- The actual load shedding arrangements and the particular market segments for which the load is at the front of the load shedding queue. This particular aspect is highly sensitive and confidential and in SKM MMA's previous experience, governments do not want to publicly admit it might exist as a social or economic issue.
- In light of the preceding item, the assessed marginal cost of customer supply interruption for the actual customers whose load is at risk, rather than the average customer value.

While not examined by SKM MMA, it would not be surprising if the inefficiency of reliability standards applied at the transmission and distribution level in many locations. One exception where reliability of networks is better matched to the local value of load at risk is in central business districts. In such locations either a higher than market average value for unserved energy is recognised, or a higher level of redundancy (such as N-2 planning criteria).

SKM MMA proposes that the value of customer reliability be reviewed by market segment and that reliability standards at system and transmission level [7] be based on an economic model of

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[7] Treating distribution reliability using marginal costs would not be expected to be much different from average costs below substation level because there is no continuous redundancy and the whole customer

the cost of spare capacity and the marginal cost of load at risk where this is feasible based on customer type and preferences.

SKM MMA also believes that the application of the reliability standard be clarified. That is, boundaries should be established that will govern the application of the 0.002% to describe an acceptable outage duration per customer and regional long term averaging basis by which to measure long-term outcomes relative to the standard.

Whether or not this total cost is to be minimised on an expected value basis or a risk adjusted basis, is not clear to SKM MMA. For example, it may be better to consider an extreme event risk rather than an average exposure. The Reliability Panel could define the standard as the probability that unserved energy in a year would not exceed 0.0YY% of energy demand with a XX% probability to reflect the situation that more extreme events are much more costly than the average level of disruption. These measures also align with an understanding of the value / cost of generation and transmission capacity balanced against alternatives for supply and demand-side initiatives and as an additional bound on the value of reliability to customers.

4. Summary

Three areas have been identified where network regulation has thus far failed to provide for an effective integrated planning framework across the full supply chain, particularly with demand side resources. With an economic basis for reliability standards based on actual marginal load at risk, a trading system that could provide firm access across the interconnections, and better planning information about the cost and value of network capacity, the NEM would be more competitive and more efficient in delivering customers benefits through more efficient prices and services.

Yours sincerely

Ross Gawler **Craig Oakeshott**

load is at risk of a failure rather than some portion of it as applies with loading shedding arrangements designed to manage loading at subtransmission and transmission supply level.