AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

11 May 2012

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Dear Commissioners

**Electricity Network Regulation – Submission to Issues Paper**

We welcome the opportunity to provide our submission to the Productivity Commission's Public Inquiry on Electricity Network Regulation – Issues Paper.

In our submission we present our views on the need for change to the framework for network development and regulation to contain rising electricity prices and promote inter-regional competition in electricity supply.

We propose that that a national approach is required for transmission network planning and that revenue regulation must focus on rewarding services.

Our submission provides the rationale and the evidence supporting our views.

Yours sincerely

Matt Zema
**Managing Director and Chief Executive Officer**

Attachments:

Electricity Network Regulation AEMO's response to the Productivity Commission's Issues Paper

# ELECTRICITY NETWORK REGULATION AEMO'S RESPONSE TO THE PRODUCTIVITY COMMISSION ISSUES PAPER

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FINAL

# Contents

# Executive Summary

The framework for network development and regulation can be changed to contain rising electricity prices and promote inter-regional competition in electricity supply. AEMO estimates the savings delivered to Australian energy consumers could reach $1 billion per year. There are a number of measures that that can be introduced to achieve this:

- **Meet reliability economically:** A probabilistic cost-benefit approach to network planning delivers efficient outcomes. It optimises the option selected against the value placed on electricity supply by consumers and delivers it at the right time. A deterministic approach, in contrast, delivers network assets before they are required and unnecessarily increases network charges.
- **Reward the services provided not the assets constructed:** Network businesses should be rewarded for meeting outcomes that are required by consumers and generators. Revenue regulation must therefore focus on providing returns for valued services, not for the number of assets built.
- **Promote inter-regional trade:** The framework must promote inter-regional trade and create inter-state competition. Presently, market participants do not have certainty and adequate ability to hedge their positions against inter-regional network congestion. This can be addressed with a financial rights regime.
- **Plan nationally:** Only a national body can deliver a national network. The current state-by-state approach delivers sub-optimal outcomes and cannot consider alternative options such as gas transmission. Only a national planner can deliver the most efficient coordination of generator and transmission investments.
- **Independence delivers optimal results:** An independent planner who uses competitive tendering for network services will deliver the most efficient outcomes. Contestability introduces a market mechanism and also provides scope for innovation. Generators connecting to the national network benefit by being able to negotiate with an independent body that does not have a vested financial interest in growing its network asset base.

## Meet reliability economically

A probabilistic cost-benefit approach to network planning optimises the option selected and investment timing. A deterministic approach delivers assets before they are economically required and raises the cost for end customers. Probabilistic cost-benefit planning will contain forecast price rises and deliver the required levels of security and reliability.

A number of alternative reliability planning approaches have been applied across the NEM in an attempt to deliver efficient solutions. Recent reviews suggest that these methods have resulted in over-investment in networks.

A better price-service approach for the development of the transmission system, such as the approach used in Victoria and in some international jurisdictions, will meet consumers' reliability needs as well as forecast demand without imposing unnecessarily high costs.

## Reward the services provided not the assets constructed

The "building block" method for setting network revenues creates an incentive to over-invest in network assets. The growth in capital expenditure over the past five years demonstrates the strength of the rewards for building assets. Jurisdictions by jurisdiction comparisons indicate that much of this expenditure is not required by the age of network assets or the growth in demand.

A more efficient arrangement would reward businesses for delivering outcomes not assets. This would enable innovative and cost effective solutions to be developed, such as sophisticated digital control schemes, demand side and generation support options. Network businesses would also be incentivised to utilise existing assets for their full engineering service life rather than replace them at the end of their economic life.

An outcomes service focused approach to transmission development has resulted in significantly higher transmission utilisation and lower transmission prices in Victoria compared to other NEM regions without any discernible consequences on network reliability.

## Promote inter-regional trade

Investors need appropriate tools to confidently manage congestion within a region and facilitate trade between regions.  Generators and retailers are currently unable to manage existing and future intra-regional congestion, let alone inter-regional congestion risk.

Where trading occurs between a generator in one region and a customer in another, the basis risk must be managed. The market relies upon the Settlement Residue Auction (SRA) instrument to offset the basis risk of inter-regional trades. However results are poor due to the limited capacity of the SRA instrument to perform this task. As a result only about 25% of the total capacity of SRA is taken up.

Upgrading network assets to augment transmission capacity across regional boundaries would not improve performance in many instances without supporting changes to the market design. To manage risks when trading between regions, participants need certainty and the ability to hedge their positions both of which can provided by a financial rights regime.

## Plan nationally

Australia's transmission regulation and planning regime must optimise network development on a national basis to deliver the most efficient response to the challenges of the future.  Network development is currently state focused with limited appetite or incentive for a national approach.

One part of the national solution includes coordinated development of gas and electricity transmission infrastructure.  Gas transmission pipelines transcend state borders and can be constructed at one-third of the cost of electricity transmission.

Renewable generation to meet national legislated targets requires connection remote from the existing grid.  State-based approaches to this challenge have already led to significant network congestion, such as in South Australia, and will continue to result in inefficient outcomes without new transmission developments to integrate remote renewal power into the NEM.

## Independence delivers optimal results

Independent planning coupled with the competitive provision of network services will deliver the most efficient outcomes.

Network planning integrated into transmission businesses currently supports and strengthens their natural monopoly characteristics. The construction, ownership and ongoing provision of network services can be provided competitively, provided that planning decisions are independent.

Many large network augmentations can be delivered via competitive tendering. This is not the case in most jurisdictions today. Appropriate returns can be made available for provision of network infrastructure with higher rewards for delivery of better services.

# 1 Introduction

The Commonwealth Government has asked the Productivity Commission to undertake an inquiry into aspects of network regulation against the background of rising electricity prices and falling sector productivity.

The inquiry focuses on the potential use of benchmarking as part of the regulatory regime and on the effectiveness of the regulatory arrangements for interconnectors in the NEM.

Recent price increases have occurred because of the revenue setting arrangements which reward investment in low valued capital infrastructure, such as those investments to meet arbitrary redundancy standards. Therefore the Productivity Commission's should consider issues beyond the specifics of benchmarking or the development of interconnectors. It should consider whether the framework for the regulation and development of Australia's network infrastructure delivers efficient and effective outcomes.

AEMO has not addressed the specific questions raised by the Productivity Commission. Rather, it presents AEMO's views on the deficiencies of the current revenue setting and planning frameworks.

Where possible AEMO has presented its views on how these deficiencies can be addressed.

# 2 The framework for network development and revenue setting must change

## 2.1 Consumers are changing their consumption patterns

The Australian economy is driven by international demand. Over the next decade the economy is forecast to grow at its long-term trend of around three per cent. This reflects the strong international consumption of Australia's resources. The Western Australian and Queensland economies will grow faster than other states in the short term. Tasmania, South Australia, Victoria and NSW will grow below trend.

Despite this, AEMO is forecasting that annual energy sales will decrease while maximum demand growth will continue to increase, but at a slower rate than previously forecast

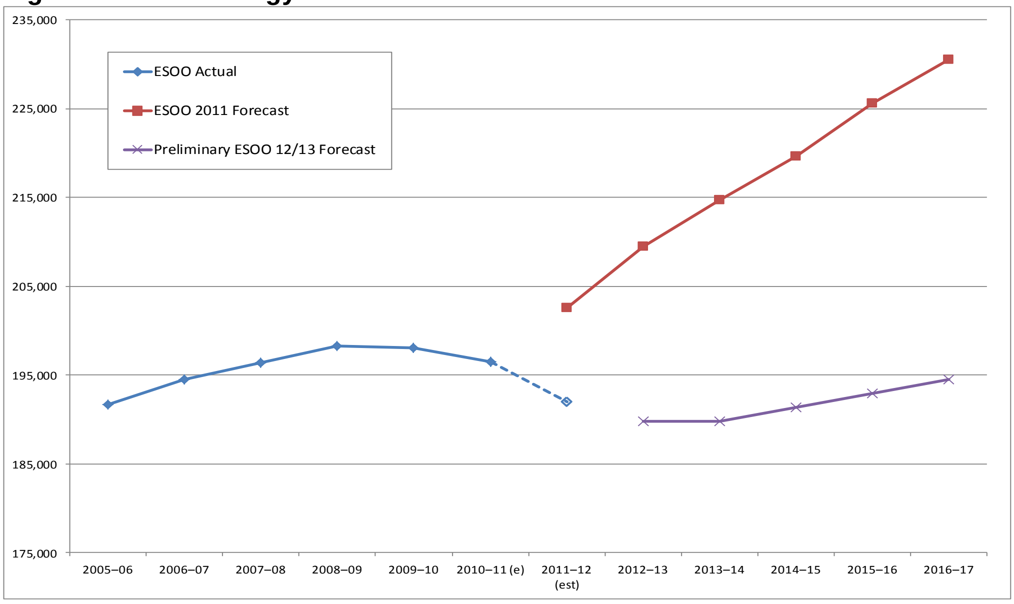
There are a number of reasons for this:

- Electricity consumers are changing their energy use. In response to rising electricity prices and government incentives consumers are changing their behaviours, adopting energy efficiency programs and installing rooftop solar photovoltaic systems.
- Australia's economic growth is strong especially in the mining sectors . Other sectors, such as manufacturing and retailing are economically affected by softer local and global demand. The consequence of the strong demand for Australian minerals is a higher Australian dollar which has resulted in the closure of some large industrial plants and reductions in output at others.

A five per cent reduction of forecast growth in annual energy has been observed across all five NEM regions over the past seven months with the estimated annual energy figure revised from 202.6TWh to 192TWh for 2011-12.

Figure 1 highlights the reduced energy sales over the past three years and compares it with the 2011 ESOO forecast.

**Figure 1 – NEM Energy Sales**




(source AEMO)

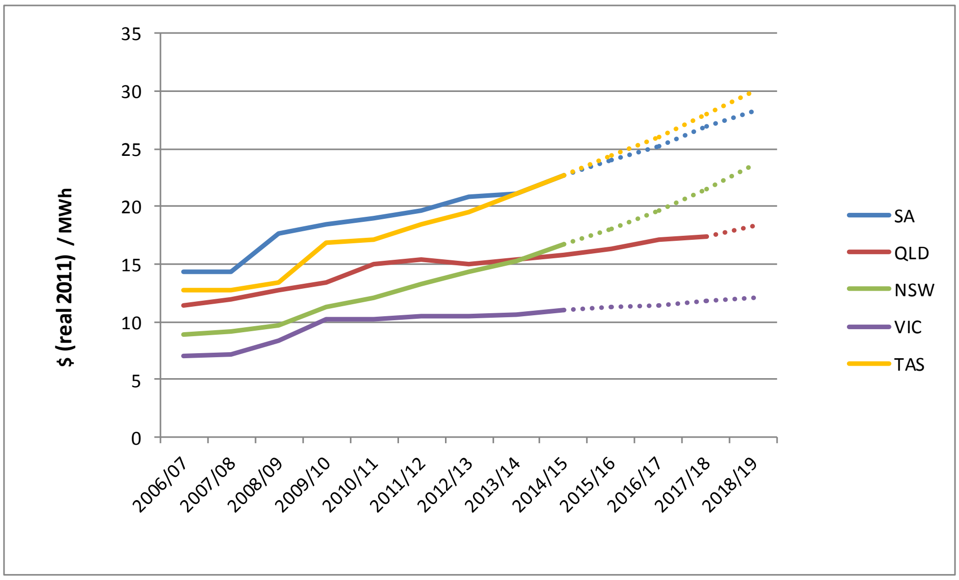
## 2.2 Network businesses are not incentive to respond appropriately to this change

In December 2011 the AER's *State of the Energy Market Report*[1] reported that network investment over the current regulatory period is forecast to exceed $7 billion for transmission networks and $35 billion for distribution networks. This represents an increase of over 80 per cent for transmission and over 60 per cent for distribution (in real terms)[2].

Retail electricity prices over the past three years have risen about 30 per cent around the country, with bills for customers in NSW increasing 22 per cent in one year[3]. It is predicted that prices for consumers in Brisbane, Sydney and Melbourne could double again within the next six years.

In the next five years up to $46 billion will be spent on upgrades and extensions to the transmission and distribution networks (refer Figure 2).

**Figure 2 – Transmission Prices (real $2011)**




(source AER)

There are three reasons often cited for the increase in network charges:

- Peak demand growth, largely due to increased air-conditioning growth
- Increases in the cost of capital; and
- Ageing assets

The evidence does not support these propositions. Rather, the expenditure levels are a result of numerous matters which include a generous revenue setting framework that supports investment in capital not the provision of services, a change to the planning standards

A comparison of the Victorian and South Australian transmission regulatory asset base growth highlights the strength of the capital expenditure incentives.

The regulatory arrangements in the two states are very different. In Victoria AEMO, an independent body, plans and procures augmentation investments. The majority of the network is owned by a privatised asset owner SP AusNet who is responsible for replacement and

[1] The AER website, http://www.aer.gov.au/content/index.phtml/itemId/751331

[2] State of the Energy Market 2011, http://www.accc.gov.au/content/index.phtml/itemId/1021485, Pg 62

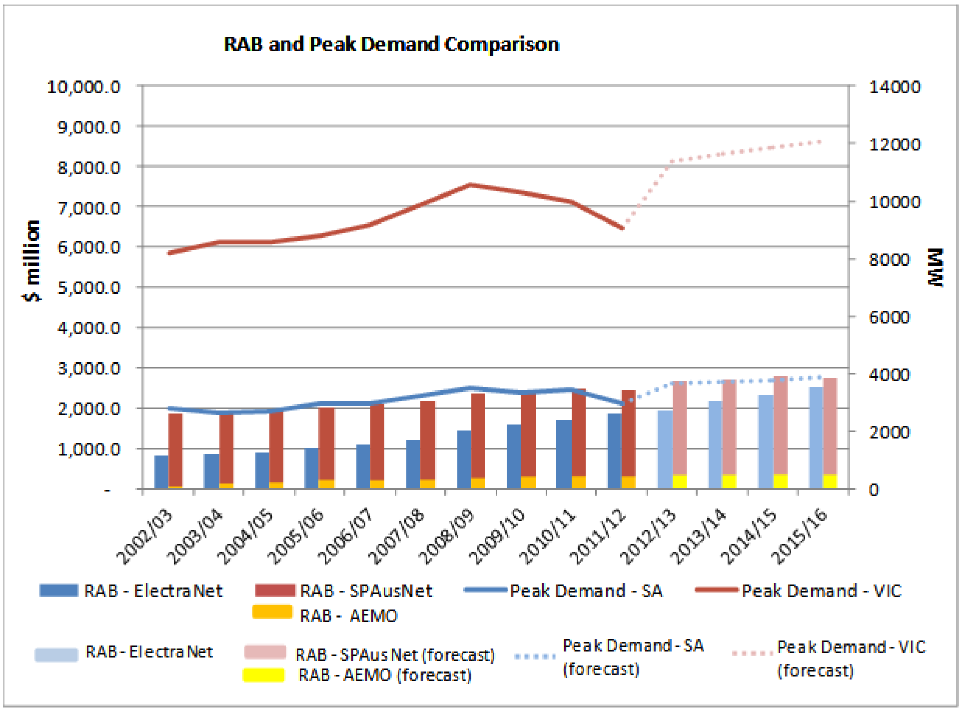
[3] http://www.theglobalmail.org/feature/the-hidden-cost-of-infinite-energy-part-1/19/

maintenance of the system. In South Australia, ElectraNet a privatised asset owner, is responsible for augmentation and replacement investment.

Both states have similar peak demand profiles, which reflect the parallel weather conditions and had similar asset age profiles. The age of the South Australian network was slightly older than the Victorian network.

At the commencement of national revenue regulation the Regulatory Asset Base (RAB) of the South Australian asset owner was half of Victorian asset owner. By 2015-16 the RABs are forecast to be similar. This is outlined in Figure 3 below.

**Figure 3 – Comparison of growth in Victorian and South Australian RABs**




(Source: Extracted from AEMO and AER)

The framework must change to arrest the price increases and the over-investment in low value capital assets.

# 3 Meet reliability economically

Network planning is complex. Network planners are faced with many decisions based on potential future states of the world. Traditionally, network planners plan to a redundancy standard. This has historically served consumers well particularly where network planners have used their discretion on how much to delay high cost investments.

More recently the application of strict redundancy standards to achieve reliable service levels has resulted in higher-than-necessary network investment and subsequently resulted in price increases.

## 3.1 Planning standards must change

### 3.1.1 Deterministic Planning

Deterministic planning standards, often mistakenly referred to as reliability planning standards, drives over-investment in the network and results in high consumer prices. Deterministic standards applicable in all states except Victoria are redundancy standards expressed in an N-X format where 'N' represents the total number of transmission assets in service and 'x' defines the level of redundancy required.

For example, if x=1, the transmission system must continue to operate satisfactorily if any one asset is removed from service (for example, through failure). The most common approach is to use x=1 but in some areas, such as central business district loads, x=2 is often used.  Adopted strictly, this is a coarse approach and peak demand growth can trigger expensive augmentations which provide only an incremental benefit to customers.

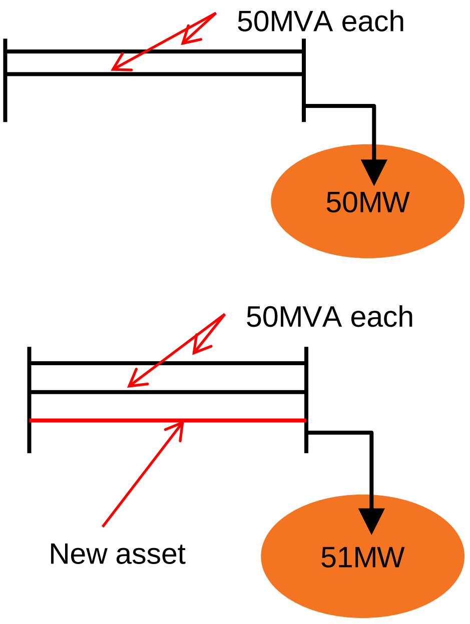
**Deterministic Planning**

Assume a 50MW demand centre.

Under the N-1 criteria the demand centre will need to be supplied by two 50 MVA rated lines. This will guarantee that the demand centre is supplied if one of the lines is out of service, whether due to maintenance or a failure.

Assume now that demand grows by 1 MW and t the N-1 criteria is exceeded.

The asset owner will be required to build a new line to satisfy the N-1 criteria.




This approach is adopted in Queensland and New South Wales, and modifications of this approach are adopted in South Australia and Tasmania. In Queensland and New South Wales, the input-focused arrangements are exacerbated by assumptions about generator availability where in many cases the biggest generator within a state is assumed to be out-of-service when undertaking the N-X assessment.

This can exaggerate the augmentation required. In addition, given that the probabilities of the loss of a transmission element are not taken into account, the transmission system must continue to provide adequate, secure energy supplies to customers after the loss of any element. These aspects of the deterministic standard drive over-investment of transmission assets and consumer costs.

This approach has other shortcomings. It often limits consideration of alternative inter-regional options (such as the importing cheaper generation from a neighbouring region ) to address identified needs on the basis that the level of reliability of the intervening interconnector is not robust enough. As a consequence, rather than delivering a full market-based solution, unnecessarily high levels of network redundancy are justified by a cost-benefit analysis.

The effect of a strict interpretation of N-1 can be understood with reviews of recent RIT-Ts[4].

### 3.1.2 Hybrid Planning

South Australia has devised a unique method for setting deterministic planning standards. It uses a standard that is informed by a probabilistic calculation of the value of an outage at load connection points (using economic considerations) which are converted to and expressed as a deterministic standard.

Demand centres are allocated into one of six reliability categories which are designed to capture the assumption that as demand at a connection point increases over time, so does the economic cost of losing the connection point's supply.

The probabilistic approach is used to compare the cost of increasing reliability standards of a connection point to the next deterministic reliability level with the value of the increased reliability delivered to the connection point.

The analysis is conducted prior to the regulatory reset of the asset owner. As a result, it requires assumptions to be made on the demand and augmentation option up to seven years in advance of the likely augmentations to address an emerging constraint.

**Hybrid planning methodology in South Australia**

This method allocates connection points to one of six reliability categories and applies a probabilistic cost-benefit approach to compare the capital cost of moving to the next reliability category with the value of the increased reliability delivered to the relevant connection point.

The assessment process for each connection point involved the following considerations:

- Calculating the average number of hours each connection point will be without power (relies on typical failure rate data, which is based on historical observations, and is collected for different categories of equipment (transformers, lines, cables) at different voltage levels)
- Multiplying the number of outage hours by the connection point demand to establish the number of megawatt hours (MWh) that, on average, are unable to be supplied each year.
- Assessing the value of lost customer load or unserved energy, as being the number of lost MWh multiplied by the cost of unserved energy to customers.
- For connection points with a high value of lost customer load, comparing the capital cost of upgrading to a higher reliability standard with the benefit, in reduced unserved energy, the upgrade provides.

[4] Refer AEMO's submission to the AEMC's Transmission Framework Review First Interim Report

The approach delivers better outcomes than those of a strict N-X approach because it identifies different levels of reliability according to demand for each connection point and considers a VCR when determining the level of reliability required at a particular connection point. It also allows an independent body to establish and audit the arrangements. For example, a suitable reliability standard may be to retain a standard equal to X=1 but with a stricter requirement on the TNSP to restore service.

There are some inefficiencies of the South Australian model including the difficulty in applying the approach in regions with a large number of connection points or a more "meshed network" (where a connection point is interconnected to many other connection points (either load or generation) within the network). The integrated nature of a network makes it harder to limit the options available for providing reliability to a connection point and inconsistency can arise between connection points in a meshed area.

Another inefficiency of this model is the potential to trigger additional network investment based on a connection point's original level of reliability that is required to be maintained. An example of this is the Waterloo connection point which is currently in one of the higher reliability levels of the Electricity Transmission Code (ETC) Category 4 based on historical demand levels and network topology.

ElectraNet's *2011 Annual Planning Report* identified that the transformer capacity at the Waterloo connection point will exceed the N-1 reliability level within the next five years and recommended upgrading the existing transformers by no later than 2014/15 in order to meet the ETC. However, existing and forecast demand suggest that a lower category of reliability would sufficiently meet the needs of the connection point and the augmentation would add an unnecessary cost to consumers which cannot be economically justified until more than 10 years after ElectraNet's proposed augmentation need date.

This shows that an inefficiency exists with the South Australian model where a connection point is not allowed to be moved to a lower reliability category (based on more current demand forecast levels) than its current level. This is rule does not have to apply in all reviews, however including the ability to move a connection point to a lower category would not make the hybrid model any more appealing for other reasons, and would not reduce consumer costs. This is because a shift to a lower reliability category would leave assets on the network under-utilised and thereby reduce the efficiency of the network which would impact market outcomes. Increased risk of stranded assets could also arise for asset owners, and cost recovery of those assets would be more difficult.

Should the load growth not occur as originally expected however, the augmentation plan still proceeds based on the original assessment of the review. This leads to over-investment of assets and contributes further to the issue of under-utilised assets.

### 3.1.3 Probabilistic Planning

The probabilistic approach used by AEMO and the Victorian DNSPs employs an economic cost-benefit assessment. Probabilistic standards require the transmission system to provide adequate and secure supplies of energy to customers under a wide range of contingencies, each treated as a random event.

This approach takes into account the probabilities of a wide range of contingencies occurring (e.g. transformer failure rates), with probabilities assigned on a range of possible operating conditions including demand levels and network topologies. It therefore assesses the probability that events likely to cause constraints and load shedding in the transmission system will occur during the planning horizon.

The reliability needs of consumers are determined by a survey based valuation of uninterrupted electricity supply expressed in the VCR.

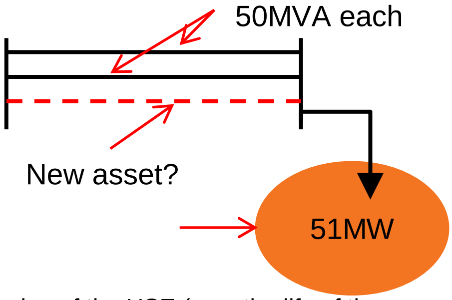
The approach enables transparent network development with an optimal level of reliability, rather than focus on the level of redundancy, and allows for low probabilities of high impact events. It achieves the optimal level of system reliability, security and congestion to address the identified need at the right time. While it can suffer from being lengthy, given the number of inputs required, any unforeseen events can be taken into account through appropriate safeguards.

**Probabilistic Planning**

Assuming the same example used in Section 3.1.1 where forecast load is expected to increase to 51 MW.

The probabilistic approach will consider the value of unserved energy (USE), that is the value of load that might be shed taking into account the probability of losing one of the lines and its duration:

*Value of USE (per annum) =*
*USE x Pr (loss of a 50MVA circuit) x VCR x duration*




If the cost of the new asset is equal to or less than the value of the USE (over the life of the asset) then the construction of the asset can proceed, otherwise it can be accepted that load shedding is a credible alternative if alternative network/non-network option is also uneconomic.

The economic benefits of this approach over other approaches are significant.

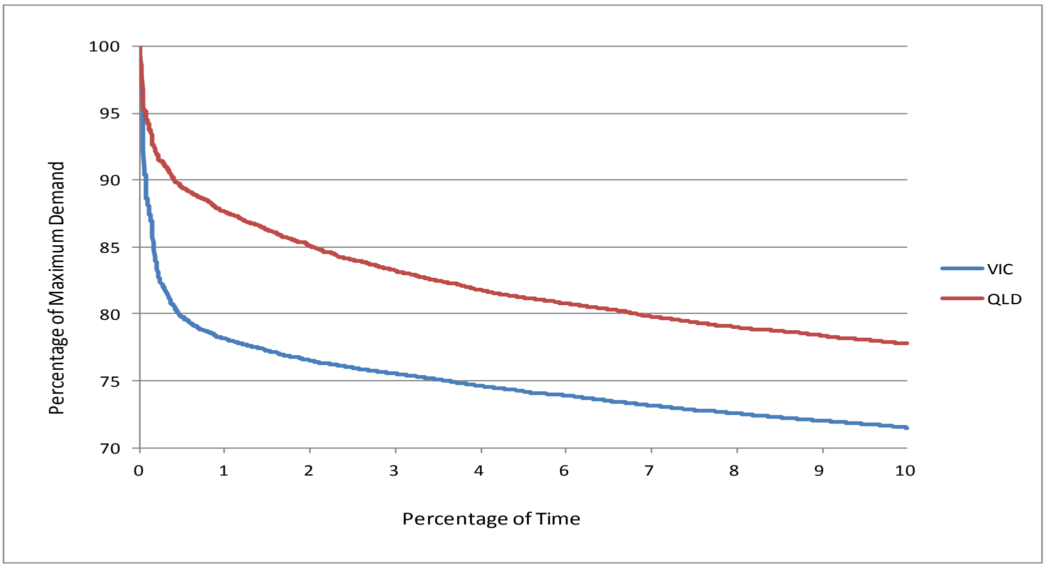
AEMO compared the timing and options selected under a probabilistic and deterministic planning approach in its *2011 Victorian Annual Planning Report* (VAPR). The comparison showed a saving of at least $550 million, in net present value terms, using the probabilistic approach. This is expected to be an under valuation of the benefits because of the strength of the incentive to over invest in network assets under the current revenue setting arrangements.

Probabilistic planning can be rolled out across the NEM and arguably deliver more benefits in states like Queensland, which have flatter load duration curves, than in states such as Victoria and South Australia which have shorter peaks.

In addition, the Queensland region consists of three distinct sub-regions with differing demand profiles, which probabilistic planning would take into account as it considers a broader range of demand scenarios.

Figure 4 shows the peakier nature of Victorian demand compared to Queensland demand. The nature of Queensland's demand characteristics means, investments based on probabilistic planning would cater for a larger percentage of Queensland's high demand conditions than investments based on deterministic planning, which are based on the peak demand period only.

**Figure 4 – Normalised Load Duration Curve FY2010-11 (top 10% of the time)**




Source:AEMO

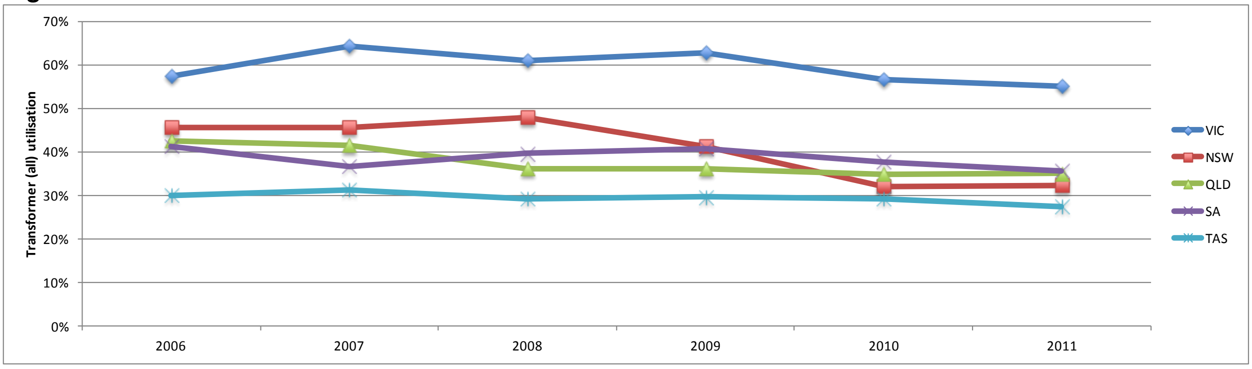
The benefits of this approach are significant.

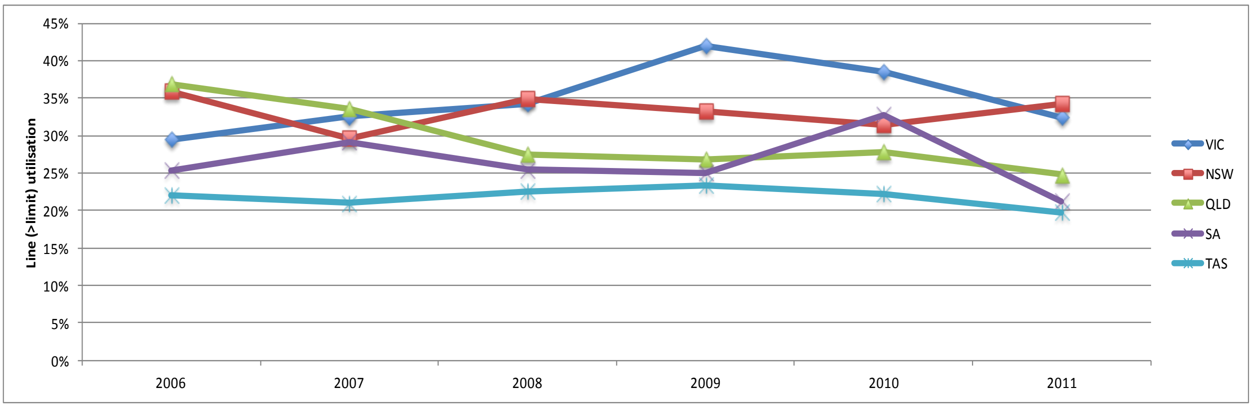
AEMO has also calculated existing asset utilisation rates from 2006 to 2011. The data used covers transformers and lines. The parameters reflect the average asset utilisation of all circuits in the relevant state.

Various weightings have also been applied to calculate the averages. For transformers, the transformer rated MVA has been used. For lines, the rated MVA has also been used. However, MVA resistance has also been used to attempt to estimate the impact of line length on the averages. For lines the averages for different line voltages have also been calculated to enable comparisons between voltage levels to be assessed.

Figure 5 clearly indicates that Victoria has the greatest utilisation of their networks and efficiency in infrastructure provision

**Figure 5 – Transmission Network Utilisation**

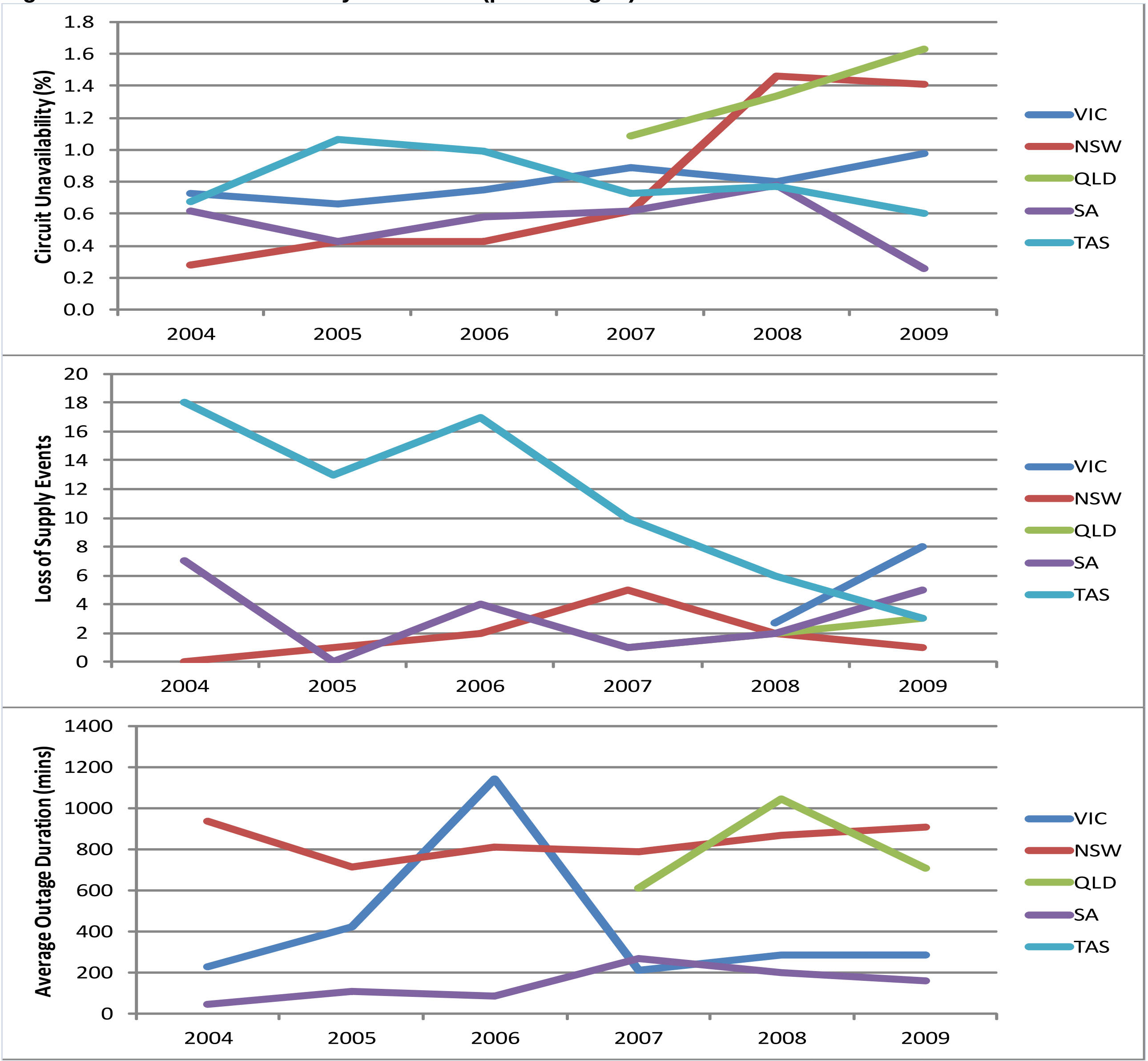



Source: AEMO

The higher network utilisation has not come at the cost of network reliability as demonstrated in Figure 6 below.

**Figure 6 – Circuit Unavailability 2004-2009 (percentages)**




Source: AEMO

## 3.2 Focus on Output Targets

Sections 3.1.1 to 3.1.3 have outlined the differences between reliability standards used on the mainland NEM. Importantly, deterministic planning places more emphasis on the inputs needed for reliability planning. That is, specific requirements on redundancy levels of the transmission network under peak demand conditions following the loss of a network element. The probabilistic approach focuses more on output targets to meet the value that customers place on not losing electricity supply based on the probabilities of a range of events occurring.

Planning requirements that consider the level of redundancy to be provided on the network are key drivers of capital expenditure. As such there is less focus on targets for reliability outcomes and performance, including System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) measures. These output targets are set as an incentive for distributors through the revenue-setting framework which provides for incentive arrangements (Service Target Performance Incentive Scheme, STPIS). However under the current framework, these incentives are outweighed by the incentive to construct assets.

Recent reviews have investigated the standards and outcomes of reliability planning, particularly on the distribution network.

The Queensland Government requested an independent panel, chaired by Darryl Somerville, to undertake a review of the expenditure of the three government-owned electricity businesses in Queensland. The Electricity Network Capital Program (ENCAP) Review 2011 report was published in December 2011 and follows the Electricity Distribution and Service Delivery (EDSD) Review conducted in 2004.

The Panel reported that an appropriate balance between security, reliability and cost can be achieved by distribution businesses. In particular, greater use of cost-benefit analysis could be applied where the benefits of significant investment on occasion could be considered to be outweighed by the cost. The Panel also believes that there are alternative methods now available (since the 2004 EDSD review) which allow for more efficient investment in capital that better reflects the needs of customers in the current economic climate while still achieving an appropriate level of security.

The Panel recommended that some flexibility in the application of the reliability and security standards can be justified, and cost-benefit analysis of capital investment can be applied as the primary planning criteria in some situations, but this should be clearly documented. The Panel therefore accepted the proposed standards from ENERGEX and Ergon Energy of meeting reliability and security of their networks through better network utilisation, the use of mobile equipment and the use of cost-benefit approaches in specific circumstances[5].

More recently, as part of the AEMC's review of frameworks and methodologies for achieving distribution reliability outcomes, the Brattle Group were engaged to analyse the effectiveness of approaches applied internationally, and to provide advice on "best practices" that may be relevant in Australia. Specifically, issues considered include the characteristics of the relevant electricity networks, the approach to distribution reliability, recent reliability performance, governance arrangements, potential links between the approach to reliability and recent network investment, and customer service standards[6]. The review found that some Australian jurisdictions do not focus solely on reliability performance but instead on how distribution businesses must plan their networks.

The Brattle Group recommends that reliability performance targets should be set at realistic and achievable levels as incentives are only effective when a distributor has a realistic chance of at least avoiding the maximum penalty. Standards set to provide longer-term certainty will further maximise the chance that distributors will make efficient cost versus reliability trade-offs. The Group also believes that targets should be set in a transparent and predictable manner and that understanding reliability targets in the short and long-term allows distributors to fully incorporate reliability thresholds into their planning.

The Group noted that there appears to be relatively little direct evidence of companies making reliability-cost trade-offs, although this may simply reflect the way that expenditure data are reported. On the other hand, it may indicate that the evolution of reliability standards has not been sufficiently predictable to make reliability-cost trade-offs practical.

The Brattle Group believes that regulators should consider customer willingness to pay (WTP) when setting standards and targets. They believe that understanding the value of reliability to

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[5] ENCAP Review Final Report, http://www.business.qld.gov.au/energy/electricity-queensland/review-electricity-distributors.html

[6] Information Sheet – The Brattle Group Paper, http://www.aemc.gov.au/market-reviews/open/review-of-distribution-reliability-outcomes-and-standards.html

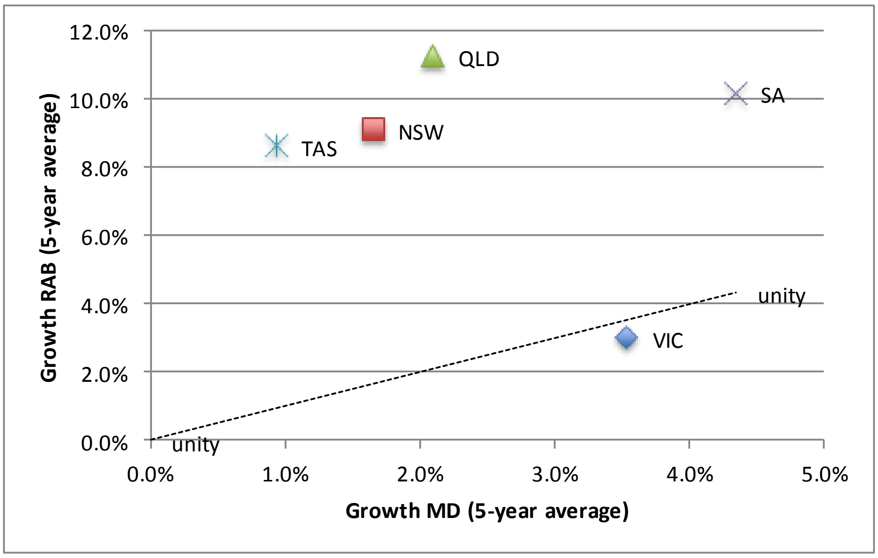
customers provides important information which can help in determining the level to use when setting the reliability incentive schemes. It can also provide information needed to determine whether the allowed revenues currently in place reflect acceptable levels of reliability or if customers would be willing to pay more if reliability was enhanced.

AEMO believes that more focus on benchmarking SAIDI and SAIFI would improve operation of the network, expenditure on maintenance, and sufficient crew to restore service within an acceptable timeframe. This, combined with a probabilistic approach to reliability planning, will reduce the amount of capital expenditure required to meet reliability requirements and encourage investments which benefit the market.

Below are some results from a benchmarking analysis which show network utilisation rates as well as TNSP expenditure between 2004-05 and 2008-09. This analysis identifies parts of the network which are not being used to their maximum capacity or capability to encourage more efficient use of the existing network (see Figures 7 to 8). These figures show that networks in Victoria (where probabilistic cost benefit planning is employed) have been utilised more efficiently than other networks in the NEM[7].

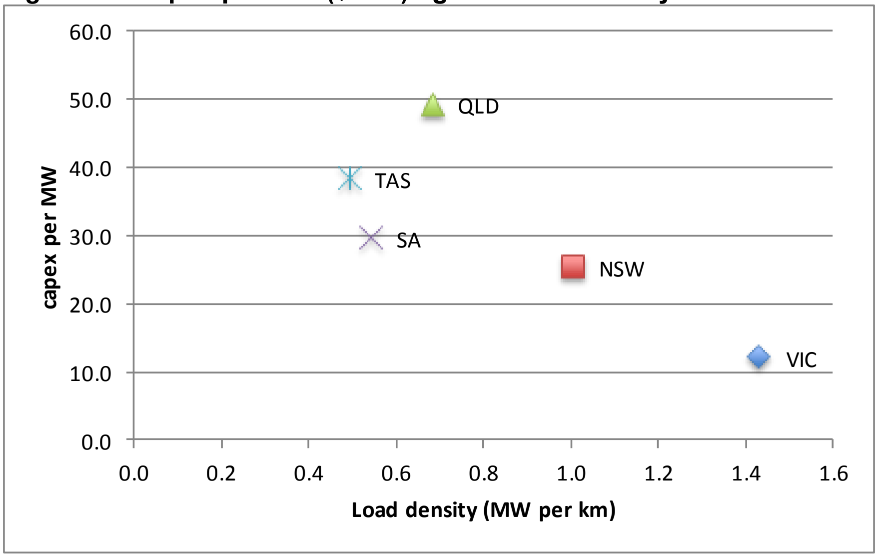
[7] AEMO does not currently have control over SP AusNet's replacement program, however if there was some arrangement in place, utilisation efficiency may be further enhanced.

**Figure 7 – Five-year average growth in Regulated Asset Base (RAB) as a percentage of growth in Maximum Demand (MD)**




Source: AEMO

**Figure 8 – Capex per MW ($'000) against load density**




Source: AEMO

The figures above indicate that regions other than Victoria have spent a high amount on assets relative to their growth in maximum demand over the last five years. The trend of high expenditure and low utilisation of some businesses on their networks also reflects the inefficiencies of state-by-state planning arrangements and indicates that the current revenue framework combined with input focused reliability standards planning does not produce efficient network outcomes.

## 3.3 AEMO's Reliability Planning Solution

Consumer demand for energy at peak times drives most augmentation expenditure. Although peak demand continues to grow, the overall energy demand has fallen.[8] A probabilistic assessment of reliability planning encompasses the impacts of declining energy and removes the impact of per unit cost increases currently being delivered through redundancy planning standards.

[8] See AEMO 2011 ESOO Update, http://www.aemo.com.au/planning/esoo2011.html

The current revenue cap framework could provide an incentive for profit motivated network businesses to delay constructing an augmentation beyond the optimal construction time. Safeguards should therefore be introduced to prevent network businesses unduly delaying investments and placing reliability at risk.

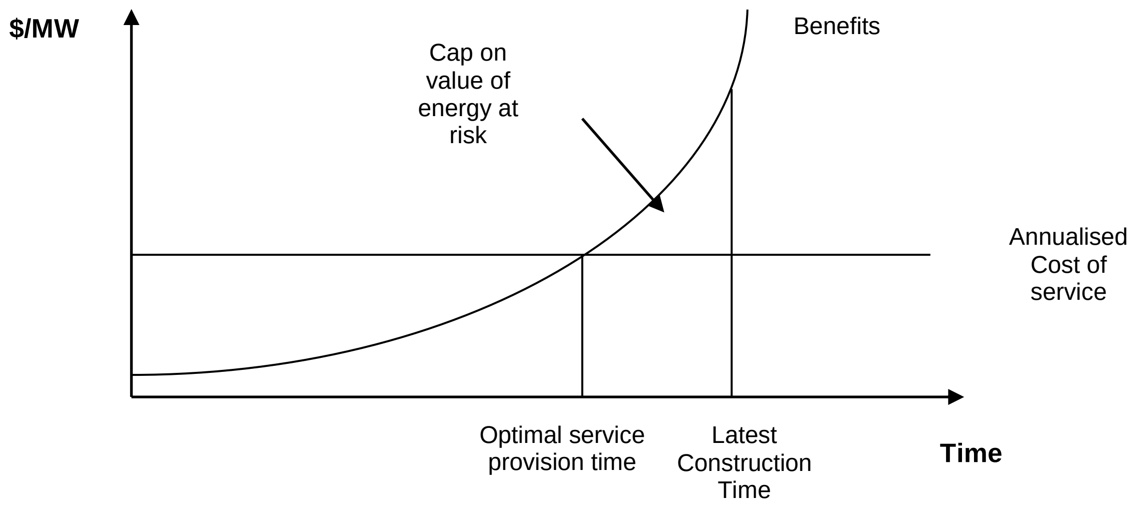
For transmission, this would involve providing investment decision making to an independent planner. For distribution different safeguards are required. The standards should be established and verified by an independent body with sufficient expertise.

The probabilistic planning process should also be accompanied by a cap on the potential exposure of the value of energy at risk. These caps could differ at different points in the network depending on the type of customers supplied and the value they place on unserved energy.

The cap would need to be determined and expressed as a $/MWh value. The caps would need to be accompanied by penalties for non-compliance and would be monitored by the AER. This ex-ante approach could work in concert with existing ex-post reliability targets such as SAIDI and SAIFI.

This approach is outlined in Figure 9 below. Typically when augmenting to meet reliability requirements the benefits associated with any augmentations are initially low. Over time as peak demand and energy at risk increases the benefits will also increase, as depicted by the curved line. The optimal time to construct the augmentation will occur when the customer benefits exceed the annualised cost of the augmentation, as depicted by the horizontal line. As delaying the investment beyond this point would be attractive to the network business who would have received revenue based on its forecast of the optimal timing, the cap on the value of energy at risk will determine the latest construction timeframe. This will ensure that the business does not place considerable reliability at risk.

**Figure 9 – Capping energy at risk**




Source: AMEO

# 4 Reward the services provided not the assets constructed

Revenue regulation rewards TNSPs for building transmission assets, rather than the services those assets provide. Despite a major overhaul of the NER in 2006 to drive network businesses to provide services for their returns the revenue setting calculation, known as the building-block approach, a significant proportion of their revenue is based on the cost of new investments. There are some incentive programs designed to encourage certain positive service outcomes such as the Service Targets Performance Incentive Scheme but these represent only a small percentage of the total revenue allowance). In some cases there is no revenue at risk for failure to deliver the desired outcome on the market impact component of the scheme.

To remove the inefficiencies of the current revenue-setting framework regulation must encourage the provision of services and not assets through network business incentives. This could be achieved by improved co-ordination between network planning and revenue regulation where a portion of the value of energy is allocated at connection points and the businesses are rewarded for maintaining capability and meeting a defined reliability level.

## 4.1 The Building Block approach rewards building assets

Transmission businesses must be rewarded for meeting output targets. An outcomes focused regime will reward the network service owners for delivery of services and improve transparency. In contrast, jurisdictional redundancy standards are input focused and lead to incentives to build new assets. The ex-ante building block approach, coupled with an asset-focused redundancy standard applied in most regions, have driven significant increases in network expenditure. While the majority of these increases have been in the distribution network, transmission network charges have increased considerably in many states over the past decade.

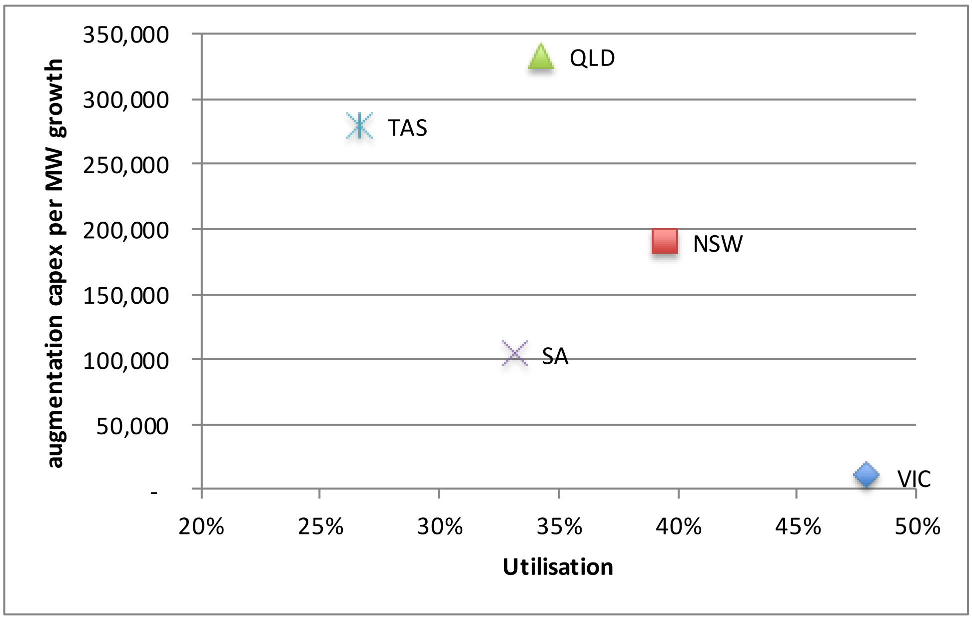
One of the main criticisms of the building block approach is that it closely resembles rate-of-return regulation[9]. While there are incentives designed to improve operational behaviour, the power of the incentive is low compared with the incentive of the business to over-invest in its asset base or drive down the unit cost of investment. This is known as gold plating or the Averch-Johnson effect[10].

Under the building block approach a TNSP is rewarded for delivering transmission assets with an ongoing payment stream for the life of the asset. Decisions to increase the network capability to minimise the impact on the market are not rewarded to anywhere near the same degree. The approach provides the incentive for the TNSPs to rely less on improving operational practices and focus on delivering network assets, which is evident from analysis on network utilisation between jurisdictions shown in Figure 10 below. The figure shows that less expenditure has been made on new augmentations to the Victorian network and as a result, the existing network has been more efficiently utilised. This might be partly due to a culture of rating network elements too conservatively in the first place and de-rating them if the elements are deemed to be over-burdened.

[9] See for example Paul Joskow's "Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks", 15 September 2005.

[10] Named after the seminal paper on the matter by Harvey Averch and Leland L. Johnson**, '**Behaviour of the Firm Under Regulatory Constraints**'** the paper investigated the effects of the regulatory rate of return being set above the firm's true cost of capital and its decision to invest in capital over labour.

**Figure 10 – Augmentation capex ($) against network utilisation**




Source: AEMO

## 4.2 Capital Expenditure is highly rewarded

Network businesses have a significant incentive to over-invest in network assets. Under the current revenue-setting framework, actual expenditure does not undergo sufficient review for assurance that capital expenditure spent above the allowance has been efficiently incurred. It is automatically rolled into the Regulated Asset Base (RAB) for the next regulatory control period.

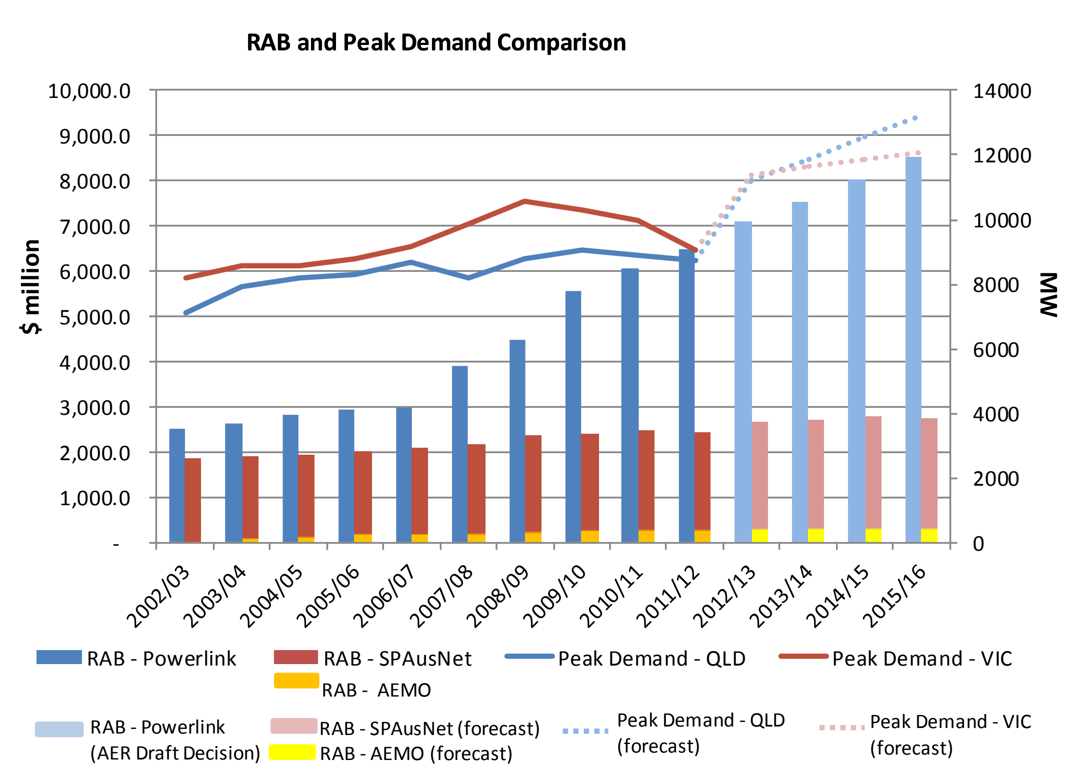
The AEMC's recent Directions Paper on Energy Network Regulation has raised a concern that there appears to be an incentive on NSPs to defer capital expenditure until the end of the regulatory control period. The AEMC considers that a deficiency in the Rules exists where factors outside of the Rules may provide incentives for capital expenditure beyond the allowance and that the Rules could be enhanced to allow for some form of incentives relating to actual expenditure which differs from the forecast.[11] Consultants Stephen Littlechild and George Yarrow, engaged by the AEMC, voiced similar views on this matter.

The outcome of the current arrangements is highlighted below in Figure 11 which shows the impacts that the different jurisdictional planning arrangements in the NEM have on a business's regulated asset base (RAB).

The figure shows that although Victorian peak demand is higher than the Queensland demand, the Victorian TNSPs have spent less on their network compared with the Queensland TNSP. This is a reflection that asset focused transmission framework directly affects the revenue determination process.

[11] AEMC Directions Paper – Economic Regulation of Network Service Providers

**Figure 11 – Comparison of RAB and Peak Demand between QLD and VIC**




Source: AEMO

## 4.3 Innovation is not supported

A consequence of the building block approach is that it does not support investment in high value services.

An example where network businesses are not rewarded for the provision of services is reflected through the number of Automated Control Schemes (ACS) used in each region. ACS are designed to maintain system security following an event, however, rather than businesses developing innovative solutions to resolve network security issues, they tend to construct assets.

Table 1 shows that Victoria has the most ACS compared with other regions. This further emphasises results from that the utilisation of existing network to assist in the security of the system is not encouraged or incentivised in other regions. This appears particularly the case in those regions which have strict network redundancy standards.

**Table 1 – Automated Control Schemes in the NEM**

| Region | Number of control schemes |
|---|---|
| QLD | 23 |
| NSW | 30 |
| VIC | 39 |
| SA | 35 |
| TAS | 23 |

# 5 Promote inter-regional trade

The promotion of national trade is one of the key objectives of the NEM. While the energy only market has worked very effectively in delivering generation to meet potential shortfalls, the level of inter-regional trading has decreased.

This problem must be addressed to maximise the benefits associated with new inter-regional transmission developments.

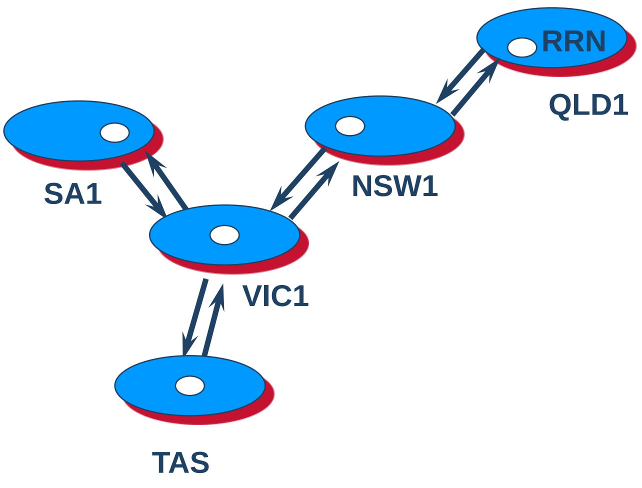
## 5.1 The NEM is a regional market

The NEM is not a nodal market (refer Figure 12). Instead one is price paid to all generators within a region, and the same price is paid by all customers. All customer load is settled at the regional reference price. Within a large region, generators are able to trade with retailers without basis risk that can occur to some extent because generators and customers are settled on the same price adjusted for predictable loss factors, although generators can be constrained off in unpredictable ways.

The regional price is the marginal cost of supply based on offer prices at the regional reference node, which is normally at a capital city load centre.

Market impacts from constraints or congestion in the market prohibit AEMO from selecting the lowest priced generation to be dispatched into the market. AEMO uses generator offers to determine which generators are dispatched and at what level of output. Subject to the transmission constraints, AEMO dispatches based on the price offers in ascending order until all demand is met.

**Figure 12 – Nodal NEM Dispatch Model**




Source: AEMO

When the interconnectors are uncongested the regional prices are adjusted for their losses and the prices align across the regions. At other times when the transmission network reaches its limit and the interconnector faces congestion it forces AEMO to limit the dispatch of the cheaper energy and dispatch the more expensive energy.

This economic inefficiency increases the total cost of dispatch as the lower cost generation is displaced by more expensive generation.

## 5.2 Disorderly bidding must be managed to improve intra-regional dispatch

It is imperative to manage congestion efficiently as it not only affects generators in the operational market but also has an effect on their financial ability in successful contracts in both the medium and longer investment terms.

Importantly, congestion will always remain in a residual quantity in the transmission regime between and within nodes. Optimising investment in relatively high cost transmission capacity requires an efficient market design to resolve congestion issues. It must also provide opportunities for market players to manage the commercial risk of congestion.

The term 'disorderly bidding' describes generator behaviour to maximise income when settlement income is inconsistent with the conditions at the generator's connection point. That is, the generator will bid below cost in order to increase its chances of being dispatched at a time of high price in the ascending order by AEMO until demand is met. It is a legal and rational individual response to the incentives created by the market design and the term is used without pejorative intent[12].

**Congestion in the network**

It is economically acceptable to have some congestion in a network covering distances evident in the NEM. To alleviate all congestion would be uneconomic, and some amount is inevitable, e.g. during forced network outages. It is important that when congestion occurs, the market is able to dispatch generators on the constrained network as efficiently as possible.

At times of congestion generators are incentivised to bid plant at the market price floor to be dispatched, resulting in an inefficient total dispatch and sometimes wasteful use of the residual network. This activity is termed 'disorderly bidding'.

Normally the generators, presuming competition, have an incentive to bid at fuel cost. They are paid the Regional Price X Volume Dispatched. However if they are situated behind a constraint they are incentivised to disorderly bid to recapture the volume lost.

It represents a classic overproduction problem, because the generator is being paid a price inconsistent with its local conditions. Its resolution requires the generator to face its true locational price, at least in relation to marginal changes in its own production.

The incentive placed on generators to generate is created by the regional settlement mechanism. This means that a generator in a location of surplus energy while its regional reference node is in deficit, has a commercial incentive to generate in contrast with its local physical circumstance.

Currently in the NEM there is a dispatch risk suffered by generators who are affected by congestion in that they will suffer loss of market volume compared to their capacity. In general generators have a relatively unfettered ability to bid their marginal offer price and technical parameters.

The result is that where intra-regional congestion exists, generators do not present a marginal offer relevant to costs. Instead a generator will bid such that it optimises its own dispatch with respect to the regional reference price (refer Figure 13). Our analysis suggests that the NEM is not managing dispatch congestion efficiently and that improvements to the current design are required.

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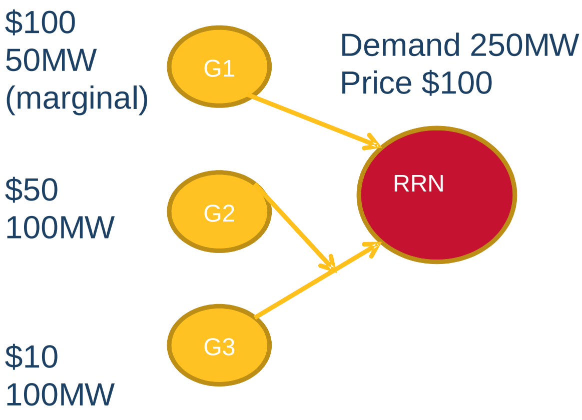
[12] Refer AEMO's submission to the AEMC's Transmission Framework Review Directions Paper and AEMO's pricing events reports which can be found at aemo.com.au/en/Electricity/Market-and-Power-Systems/NEM-Reports#pricing

**Figure 13 No disorderly bid behaviour**

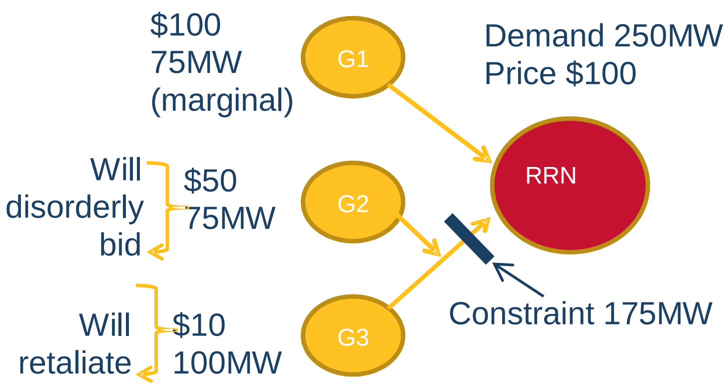



[13]

Source: AEMO

In the next example (Figure 14), disorderly bids will occur from G2 with G3 retaliating as there is now a constraint limit on the line (175MW limit).

**Figure 14 – Disorderly bids will occur**




Source: AEMO

## 5.3 Disorderly Bidding must be managed to increase inter-regional trade

Where trading occurs between a generator in one region and a customer in another then the basis risk (the difference in price between the two regions) needs to be managed. By design, the market relies upon the Settlement Residue Auction instrument (SRA) having a value that correlates to the basis risk. The instrument pays a fixed share of the rent that the settlement process accumulates when it transfers power from a low priced to a high priced region. AEMO undertakes quarterly auctions of the SRA Instrument to assist participants' management of this price basis risk between regions.

The market relies upon the SRA instrument to correlate to the basis risk. If it is a good insurance instrument then the expectation is that the proceeds would exceed the residue distributed. The results in Table 2, below, suggest otherwise.

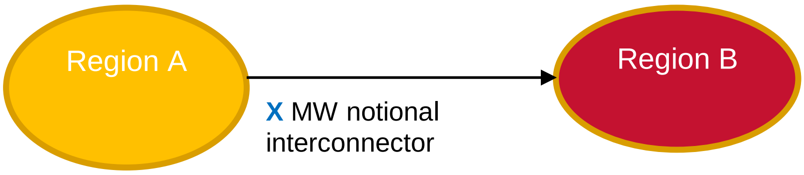
[13] "RRN" Refers to "Regional Reference Node", being the location where the pricing for the entire region is derived. It is generally at a terminal station deep within the main load centre (capital city).

**Table 2 – Over-payout of SRA Instrument (2000-2010)**

| Year | Residue Distributed | Auction Proceeds | % payout |
|---|---|---|---|
| 2009 | $240,214,026 | $60,782,580 | 25% |
| 2010 | $108,070,218 | $121,840,178 | 113% |
| 2011 | $137,578,469 | $114,655,171 | 83% |

The residue each hour approximates:

(Region B Price – Region A Price)*Flow (net of losses)/X[14]




A participant will find itself partially exposed to the price difference if the residue is smaller than expected during a large price difference. This occurs when the flow on the notional interconnector is smaller than expected. Causes of this include:

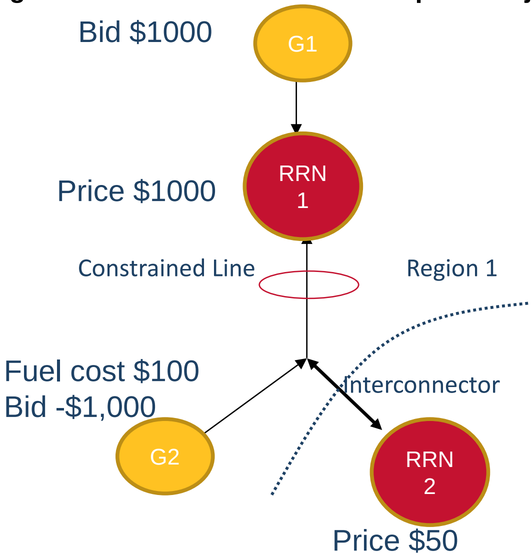
- The transmission capacity being lower than nominal, e.g. during network outages;
- The constrained dispatch solution results in a flow on the directional interconnector less than nominal, e.g. where the interconnector and a generator in region B compete for access to a constraint in Region B and the generator disorderly bids.; and
- Reversals in system flows within a half-hour.

Consider the example in Figure 15, below, where Constrained Generator 2 is being paid the price of Region 1. It has an incentive and a legal right to rebid all its output to the market price floor, of -$1,000/MWh.

In this example, when an interconnector and a generator compete for access, the generator will disorderly bid which undercuts the regional reference node (RRN2) price. As an interconnector cannot retaliate G2 will run in preference to generators in Region 2 even if they have cheaper fuel costs.

[14] Where X is a pre-determined notional capacity of the interconnector

**Figure 15- Interconnectors are dispatched just like a generator**




Source: AEMO

It is quite common for disorderly bidding to become so severe that the dispatch engine attempts to reverse the flow on the interconnector against the price direction. Under these conditions AEMO is obliged to "clamp" the interconnector to zero in an attempt to avoid negative residues. This is not always successful.

When the flow goes to zero or counter-price, the SRA instrument will pay zero, and the inter-regional trader will be naked to the price divergence.

The historical performance of the SRA was analysed in AEMO's submission[15] to the Directions Paper of the AEMC's Transmission Frameworks Review and examples are provided in Appendix A. These results show that the SRA has not performed well in protecting those market participants who wish to compete nationally. The major cause of this poor performance relates to the incentive for disorderly bidding.

The solution is to create a locational incentive, at the margin, for generator dispatch. This would resolve disorderly bidding, and will, in turn support inter-state trade.

## 5.4 A solution is a tradeable rights regime for generators

The importance of accurate locational pricing is well understood in electricity market economic theory. This has resulted in many markets, particularly in the USA, choosing locational marginal pricing (LMP), or "nodal pricing", where all transmission connection points are priced at their respective locational price. AEMO provides a "mispricing" report which reports the underlying locational price of each constrained generator in the NEM.

Whilst LMP appears attractive in a theoretical sense, it is unlikely to be pursuable in the Australian context for the following reasons:

- LMP is applied to customers as well as generation. This results in intra-state divergence in customer prices, which is very sensitive at a state government level, and some governments disallow retailers from geographically differentiating prices.

[15] http://www.aemc.gov.au/Media/docs/AEMO-4daa5135-b3cf-4700-a52f-773749e16fc2-0.PDF

- The NEM has developed its risk management and skills around the existing regional model, where generators and retailers within a state trade without locational basis risk. LMP market operators can auction a "Financial Transmission Right" (FTR) that apportions settlement residue similar to the NEM's SRA, and is used to hedge this risk. The change is significant, and it would require a large investment by the industry into the transition.

- Generators in the NEM presently do not pay for the common transmission network within their region and yet are settled at the load price for that region. In an LMP network, generators are typically settled at a lower price, and must purchase at auction the FTR to hedge the price difference. The resulting fund surpluses are then used to help defray the cost of the transmission network to customers. Thus the introduction of LMP from the current Australian arrangement would results in a significant wealth transfer from generators to customers.

For these reasons, AEMO does not advocate LMP. However market efficiency benefits can still be realised through less radical reform. The AEMC's Transmission Frameworks Review Pathways two and four are two examples of these.

Pathway two is a minimalist change aimed to resolve the disorderly bidding problem. It works by effectively settling each generator at their LMP, but then automatically apportioning them a share of the resulting settlement residue. That share is determined according to the product of the capacity of the generator at that moment and the intra-regional basis risk.

This removes the disorderly bidding incentive, because marginal variations in output are priced at the generator's own locational price.

Pathway four is a more significant reform, because it allows the generator to lock in a fixed share of the available network with the network owner. If implemented correctly, it should also resolve the disorderly bidding problem, but can go beyond productive efficiency to dynamic: it can provide a locational signal and long-term risk management mechanism for new-entrant generators. For the first time, it can also provide a commercial signal that would assist the co-ordination of generation and network investment towards delivery of an efficient overall investment outcome.

The AEMC's Transmission Frameworks Review has presented some achievable solutions. The challenge is then how the AEMC considers these against the National Electricity Objective, which is a net welfare gain assessment. Whilst the disorderly bidding events have resulted in extreme prices, zero inter-regional trade and chaotic dispatch, the AEMC consider that the direct efficiency loss of these outcomes is small. This is because the fuel prices do not vary greatly across the NEM. Thus if by disorderly bidding Delta's generators gained 2000 MW of dispatch at the cost of inter-state generators, and in doing so caused wealth transfers of hundred of millions of dollars, the actual higher fuel costs is only a few thousand dollars.

The challenge is to look beyond the cost of inefficient fuel usage to the second order efficiency effects of disorderly bidding. In AEMO's view these are predominately:

- A lessening of national competition caused by the inability to inter-state trade.
- Inefficient customer prices, where the disorderly bidding has caused price spikes.
- Inefficient utilisation of the existing transmission network due to flows being distorted through disorderly bidding.

# 6 Plan nationally

There are many complexities associated with planning a transmission network. Network planners have to consider the longer-term needs of the competitive energy sector and consumers. This requires an understanding of consumer and generator behaviour as well as impacts on the market from technology changes, policies, and the economy.

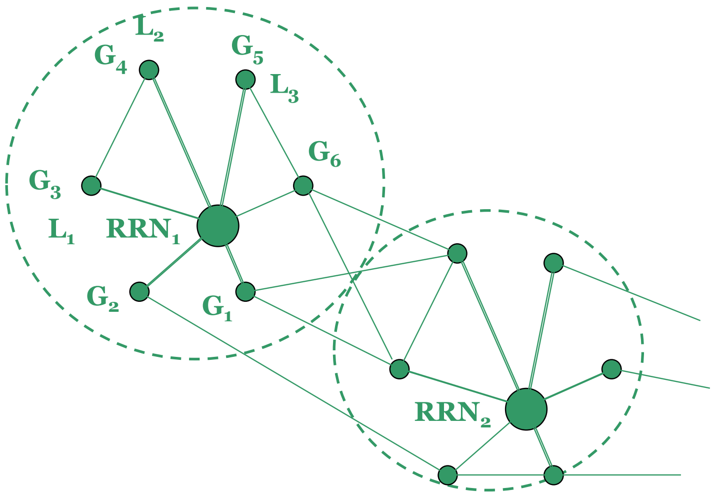
These matters need to be considered on a national basis. Presently these are considered on a state-by-state basis. This has already resulted in obvious inefficiencies.

## 6.1 Interconnectors must not exist for planners

Interconnectors are notional concepts required for market dispatch and settlement. In a network planning context, an interconnector is indefinable. It cannot be distinguished from others parts of the transmission network.

The network of transmission lines that make up 'the real network' is represented in the schematic set out in Figure 16.

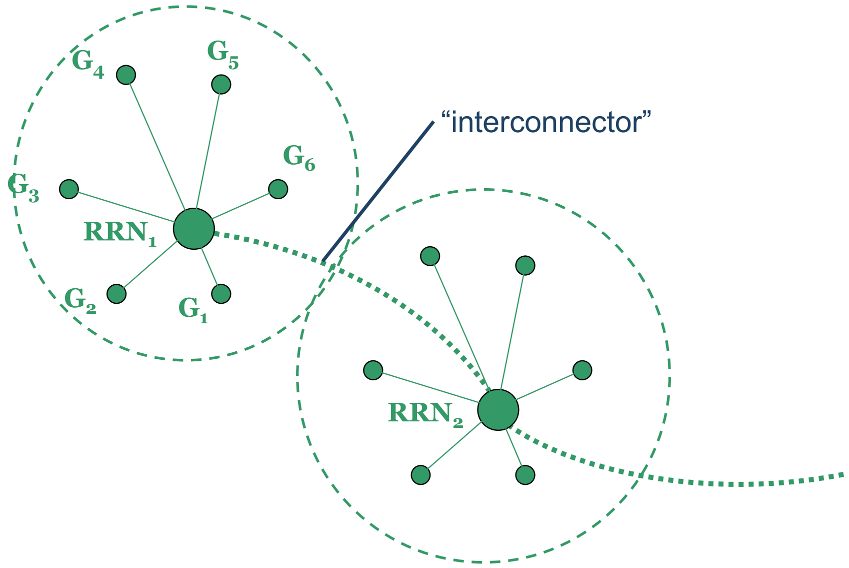
**Figure 16 – Schematic of 'The Real Network'**




Source: AEMO

The 'simplified' network' required for market purposes is set out in (refer Figure 17).

**Figure 17 – Schematic of computer representation**




## 6.2 The current framework will not deliver a national grid

Continued investment in transmission is essential to the efficient operation and success of the NEM. However, the manner in which assessments for such investment are undertaken, the analysis, public consultation and transparency of decisions is questionable.

There are many examples of the state-by-state approach to transmission planning which inhibits the development of a national grid.

Some are a result of the focus on redundancy of inputs.

Redundancy driven investments, which may not have significant inter-regional trading implications, are traditionally treated by the local network planner as a problem that must be solved solely from within the state[16].

The lack of planning accountability and responsibility which includes incentive mechanisms for network service providers is apparent in this example in the delay to maintain or improve interconnector capability. Planning on a national basis integrates the development of the total network and delivers the maximum net benefits to the market in a timely manner.

## 6.3 One party must be given responsibility and accountability for the development of a national grid

To address this problem requires the allocation of clear responsibility and accountability to an individual. Responsibility is defined as an obligation to carry forward an assigned role or function, while accountability is defined as the state of being liable for something within one's power, control, or management.

Each jurisdictional planning body has been assigned clear responsibility and accountability to maintain the reliability of transmission networks within its region.

[16] Refer AEMO's submission to the AEMC's Transmission Framework Review First Interim Report

However, in the NEM there is no party responsible or accountable for planning and developing the most economically efficient national grid. This problem has been recognised in a number of previous reviews.

For example, in the 2002 Parer Review it noted there was a lack of integration of transmission network planning throughout the NEM. It attributed the problem to the following

- current transmission planning is undertaken on a regional rather than NEM-wide basis,
- a real or perceived lack of independence in planning processes dominated by incumbent TNSPs[17]

It also highlighted the problems created by the competing commercial priorities within the then existing Inter-regional Planning Committee (IRPC)[18].

Similarly, in 2007 the Energy Reform Implementation Group noted[19]

> While the current level of transmission investment is reasonably appropriate, investment decision making is biased toward investment within each state rather than, where it is efficient to do so, having a true national character. The lack of clear incentives or mechanisms to ensure the efficient ongoing development of the national transmission system leads ERIG to the conclusion that opportunities for efficient investment opportunities have been missed in the past.

More recently Garnaut noted[20]

> It seems unlikely that a seamless national network can be built by five state-based transmission planners with parochial responsibilities.

He continues with

> I recommend instead that the National Transmission Planner assumes all National Electricity Market transmission planning. This requires each state to separate its transmission ownership from its planning. The Victorian experience shows that the separation is feasible, and has advantages.

## 6.4 A national planner can take a strategic national perspective

AEMO's NEMLink concept is the first national transmission project of its kind to be considered and represents a significant departure from the regional focus of the past. It attempts to draw together the key elements of each of the regional transmission networks and deliver a strong platform for inter-regional trade.

The NEM framework is incapable of delivering projects like NEMlink.

It would require significant coordination and cooperation of five transmission planners, alignment between the allowances in the revenue resets of each of the regulated businesses. The history of Inter-Regional Planning Committee (IRPC) suggests that such cooperation and coordination would not work in practice.

An alternative to a cooperative approach is a mechanism for alternative national asset providers to build, own and operate the services and receive a regulated return.

[17] Commonwealth of Australia, Towards a truly national and efficient energy market, 2011, p. 125

[18] Ibid, p. 126

[19] Commonwealth of Australia, Energy Reform: The Way Forward for Australia, A report to the Council of Australian Governments by the Energy Reform Implementation Group, 2007, p. 12

[20] R. Garnaut, Transforming Electricity Sector Update Papers 2011, No. 8, p. 34

## 6.5 A national planner can integrate government energy policies efficiently

The integration of renewable technology into the national grid has created technical and economic issues that need to be addressed. Renewable generation, with the majority from wind energy, is forecast to grow to between 4 GW and 6 GW by 2019-2020, and up to 10 GW by 2029-2030. Already there is a list of over 15 GW of proposed wind generation projects in Australia.

Studies commissioned by AEMO in 2011 concluded that as more wind and solar generation is connected to electricity grids they will displace synchronous generation. Further, as the nature of the grid changes over time, becoming more "asynchronous" there will be a challenge integrating them into a grid which has been designed to operate using synchronous technologies.

Much has been learnt in other parts of the world concerning the impacts and issues that arise when integrating wind energy into national electricity grids.

With an emphasis on learning from these experiences, AEMO has conducted a number of studies to understand the technical issues to enable the NEM to operate effectively and securely with renewable generation penetration.

Solar PV shares many of the same characteristics with similar integration challenges and therefore needs to be considered in integration into the energy system.

There are issues and challenges within international practice and experience in dealing with high levels of wind integrated into electricity grids. The focus is mainly on the physical and technical issues as grid integration of wind will be successful if the performance of the grid is enhanced or at a minimum maintained at a reasonable cost.

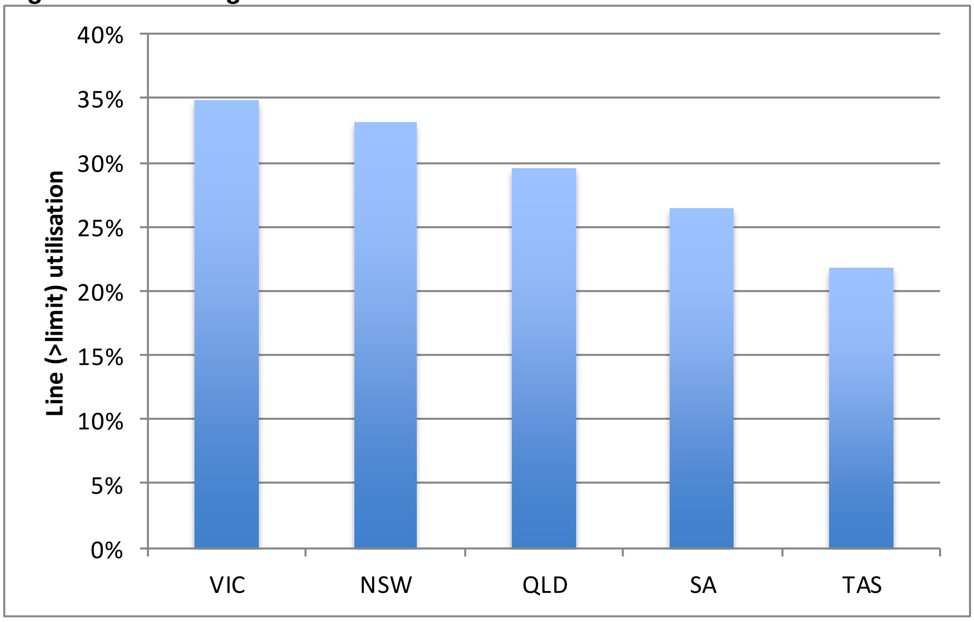
Further, if grid codes are maintained at a high standard more wind will be connected in the long-term and the system is operating with the knowledge of current wind turbine technological advancements, then wind energy can be successfully integrated into the energy system.

## 6.6 There are benefits from combining national System Operations and Planning

TNSPs are responsible for providing AEMO with the technical envelope to which the network is operated and planned, however there are occasions where a higher rating can be applied from AEMO's perspective as the NEM system operator. A network utilisation comparison over the past five years shown below in Figure 18 reflects the impact that the current state-by-state planning framework (as explained in Section 3.2) has on each TNSP's network utilisation.

The chart indicates that all regions except Victoria (where AEMO is the planner) do not utilise their networks as efficiently as possible which also reflects the region's methodology for reliability planning.

**Figure 18 – Average line utilisation across the NEM**




Source: AEMO

As the national operator and planner, AEMO would be able to plan for the NEM more efficiently by taking into account utilisation of the intra-regional network and importantly, the national flow paths. This would increase the utilisation of the current capability of the national grid and allow it to be operated at its maximum capability.

A case where a national flow path, or interconnector, was unable to be utilised to its maximum capability due to the inefficient development of revising its limit includes the Heywood interconnector's SA-VIC export limit. Options of increasing the interconnector limit due to network developments (including the increase in wind generation in South Australia) were reviewed however implementation of the increase to the export capability only occurred once AEMO had performed detailed studies from an oscillatory stability perspective.

As the system operator, AEMO is able to monitor the system's behaviour, e.g. oscillatory characteristics, under all conditions. Access to this information allows AEMO to plan the network, particularly the national flow paths, to its maximum capability and therefore allows more efficient network utilisation of the NEM. This also ensures inter-regional supply capability is continuously monitored and addressed and therefore provides a more efficient level of service to the NEM and its consumers.

Reliability planning would also benefit from a combined system operator and national planner due to information provided to AEMO as the system operator on TNSP outage schedules. AEMO currently has the schedule of all TNSP's planned outages. Access to this information, as well as the ability to suggest changes to outage schedules to provide more efficient market outcomes, allows improved accuracy of the probabilities of outages to be taken into account in the probabilistic planning approach to reliability on a national basis.

Further, with an access rights regime, where generators benefit from the ability to determine prices and be compensated for any discrepancies to the network, must be planned for effectively to ensure its market benefits are realised. This requires proficient co-ordination between network planning and system operations areas. The market would therefore benefit from AEMO encompassing the national planner function to ensure the rights regime is accounted for in network development and efficiently administered operationally.

# 7 Independence delivers optimal results

The market is capable of delivering many elements of the network supply chain. However, the current revenue setting and planning framework does not pass on the benefits of market innovation and cost to consumers.

This can be achieved with an independent national transmission planner who uses competitive procurement of network services and cannot be achieved with substitutes like the RIT-T.

### 7.1.1 The Regulatory Investment Test for Transmission cannot substitute for an independent decision maker

The RIT-T framework is based on cost-benefit principles to determine optimal investment options and timing. The transmission planning framework relies critically on the RIT-T and its predecessor the Regulatory Test.

The effectiveness of the regulatory test depends critically on either of two circumstances both the RIT-T and its application must be unambiguous, transparent and objective, or interested parties must be able to effectively evaluate a network service provider's application of the test.

The current RIT-T has undergone various revisions. Historically the regulatory test has not delivered high value investments. Today the RIT-T still fails to deliver.

The regulatory test ensures that investments that are uneconomic are not developed. Effectiveness depends on a commitment to the economic foundation of the test and a well-informed market and regulator.

The application of the RIT-T is an obligation on the TNSPs that has a value through its role as a consultative mechanism and one which provides some transparency on the TNSP's decision making capabilities. It may also have specific application to 'contingent' projects or those outside the ex-ante revenue cap.

These arrangements mean it is unlikely to prevent inefficient TNSP investment.

A TNSP's revenue does not depend on satisfying the RIT-T instead it is derived from the asset value of the project. The revenue is approved by the AER at the commencement of the regulatory control period. So while it is true that a TNSP must satisfy the RIT-T in order to build a project, it receives equivalent revenue whether the investment proceeds or not. Further the role of the regulatory test within the regulatory period is inconsistent with the intended objectives of the assessment.

It is suggested that the obligations on interested parties are nothing more than a high level statement of principles for the economic assessment of transmission investment. Information asymmetry between regulator and regulated asset owners is not working due to the lack of incentives to drive investment. Instead it lends a veneer of credibility to inefficient investment and in so doing imposes a greater "burden of proof" on the regulator should it choose to "optimise" such inefficient investment.

The regulatory test needs to improve so that its delivers effective and robust transmission investment. An independent party is needed for credibility in the market in regards to transmission investment as well as transparency. An independent planner –procurer will give effective regulatory incentives for efficient network investment, including simpler and more understandable arrangements. Additionally, an independent planner will have all the information that is required for the regulatory test to deliver efficient results as it is intended.

### 7.1.2 Provide a platform for competitive asset providers

The revenues of the Australian network service providers have been subject to economic regulation by various independent and national regulators for over 15 years.

This arrangement relies heavily on the AER being able to critically assess the projects of the regulated entity up to seven years before any detailed assessment is conducted by the regulated business of the need for the investment.

Due to information asymmetries one of the failings of these arrangements is that the regulator has been unable to critically analyse the projects of transmission planners.

This is in contrast to an independent planner which enables elements of the network service delivery chain to be provided competitively and be subject to competition.

In most jurisdictions there has been limited success for assets to be classified appropriately and contestability allowed for their supply. In Victoria such measures have applied. Recent work undertaken through AEMO's Connections Initiatives workstream has reaffirmed AEMO's commitment to increase the level of competition in the provision of transmission services.

The network service delivery chain, that is the provision of both asset construction and transmission services, should be provided competitively wherever possible and be subject to competition.

The elements of where the market is capable of providing network services are set out in Table 3.

**Table 3 – Elements of the provision of transmission services**

| Element | Description | Natural Monopoly |
|---|---|---|
| Planning | Consideration of a projects need taking into account current service levels, the need for future services (generation development or load growth), the options to address a need and the detailed design work | Yes |
| Constructing | The physical building or installation of equipment | No |
| Operating | Switching of the asset to deliver the defined service | No |
| Maintaining | Routine servicing of the plant or equipment | No |
| Owning | Ownership of the equipment | No |
| Connecting | Connecting new generation and loads (either directly or via distribution networks) taking into account the effects on existing and futures network users | Yes |

Competition in transmission networks is possible however it is limited to construction and ownership of assets. Operational competition is more difficult to achieve, however it also has some benefits.

AEMO performs its Victorian transmission services role through various functions including using competitive tendering provisions for investments where the capital costs are expected to exceed $10 million and can be provided separably by another party[21].

That is, if the net benefit for a project assessed against the RIT-T consultation is positive, the building assessment is to proceed. If the cost of the project is greater than $10 million then the project becomes contestable and is subject to competitive tendering arrangements. AEMO produces the documents such that it requests an asset owner to provide a level of service rather than defined assets. In this way tenderers are encouraged to be innovative in their solutions and it facilitates greater responses from demand side and generation solutions.

This competitive tender process is not available in other jurisdictions and therefore their efficiencies and deliverables are driven by profit motivation. In this way, profit motivated planners escalate the price of construction of assets where a not for profit planner reduces the cost when it encourages competition, transparency and innovation.

An economic benefit from competitive provision of transmission services removes the ability to price a plurality of tenders as there is an incentive to keep costs down.

Generators appear to prefer that an established asset owner own and operate any transmission assets needed for connection. This leads to a shift in the potential for the TNSP to exercise its negotiating position to extract monopoly rents to build, commission, operate and integrate them into the network.

## 7.2 Generator connection costs would be lower

The NEM needs to ensure that it is in the best position to deliver competition for investment dollars. At the time of connection generators should be provided with the choice to procure and provide all network services associated with their connection, be they shared or connection, or to enable the network service providers to provide those services.

AEMO is currently in the process of developing a framework that negotiates the level of contestability required by the connecting party to remove the risks of the connecting party. This will benefit generators by implementing a set of standards that will remove the risk if the built asset is rejected by the incumbent service provider.

Under such a model, the generator, being the party responsible for the funding of the investment, would have the right to determine who should build the assets. AEMO's experience is that this risk is effectively removed by careful functional specification design and contract preparation. Tender documents for contestable projects can be written to ensure that the new assets harmonise with old and minimum performance parameters can also be specified. These principles can apply to maintenance of the assets as well.

An asset designed and installed by third parties introduces an additional element of risk that is not faced when the party has absolute control over the design to commissioning connection process.

The assets will need to comply with pre-agreed functional specification as they will need to integrate with the rest of the network. The functional specification will need to be agreed and negotiated between AEMO and the asset owners. The ongoing maintenance and operations of the assets will then be transferred to an existing asset owner with a transmission licence.

[21] Separability is defined as the ability to provide these services without negatively affecting the assets of any incumbent transmission business

Once the risks of the connecting party are removed by implementing a set of standards that such a connecting party will have to meet if the project is rejected by the incumbent service provider the provision of both asset construction and transmission services would bring contestability in the framework.

Further, packaged contestable projects for private investment such as these could form part of a managed fund portfolio.

## 7.3 Applying competitive provisions nationally

There are limitations that prevent competitive connection being rolled out nationally. It will require an independent party with sufficient technical expertise to oversee its management. Therefore, even if a generator were willing to obtain a transmission licence and build, own and operate transmission assets, it would find it impossible to do so in these jurisdictions without legislative changes.

Currently TNSPs do not have cost pressures as all their costs are passed through to the asset base under the revenue reset process.

A role for the AER to review how that framework is implemented particularly where efficient "pre-build" and "right-sizing" works is appropriate.  Consistency would be achieved by a national planner and also report on all jurisdictions on the planner's performance by cost and performance benchmarks outcomes.