EMCa

energy market consulting associates

Review of WA Energy Market Framework in Light of Climate Change Policies

Advice on Network Issues Identified in AEMC's First Interim Report

A Report to the Australian Energy Market Commission (AEMC)

Energy Market Consulting associates

22 June 2009

Disclaimer:

This report has been prepared for the Australian Energy Market Commission (The Commission) to provide background information, analysis and advice to assist the Commission in preparing the Second Interim Report in its review of energy market frameworks in light of climate change policy. This scope of this report is defined by the Commission in its Request for Proposal and is confined to the network-related issues in Western Australia (identified as issues B5 and B6 in the Commission's first interim report, published in December 2008).

The analysis and information provided in this report is derived from information provided to EMCa by a range of parties including WA market participants, WA government and WA regulatory bodies and is also informed by material in submissions made to the Commission. This report is intended as part of a process which will include further public consultation and the development of specific market changes by parties to the WA market. This report is not intended to provide the sole basis on which specific policy decisions are made by those entities. EMCa disclaims liability for any errors or omissions, for the validity of information provided to EMCa by other parties, for the use of any information in this report by any party other than the AEMC and for the use of this report for any purpose other than the intended purpose.

In particular, this report is not intended to be used to support business cases or business investment decisions nor is it intended for use in relation to regulatory cases such as for cost recovery or tariff setting purposes. Readers of this report should be aware that it does not take into account business-specific circumstances.

Energy Market Consulting associates
PO Box 542,
St Leonards, NSW 2065
Australia

Phone: 0412 559 138 / Phone **(**intl): 61 412 559 138
Email: psell@emca.com.au
Web: www.emca.com.au

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Consultants: Paul Sell
Bill Heaps

Executive Summary

Background and scope

Energy Market Consulting associates (EMCa) is pleased to present this report to the Australian Energy Market Commission (the Commission). The purpose of the report is to provide input and advice to the Commission to assist it with its 2nd Interim report, by progressing consideration of the network issues that the Commission identified in its 1st Interim Report[1].

Scope and issues previously identified

The purpose of this report is to further examine the network-related WA market issues identified in the Commission's 1st Interim Report and to propose measures that could be taken to address those issues. The scope of the issues concerns connection to and augmentation of the transmission network, in order to accommodate economically efficient development of renewable generation in the WA market. In its 1st Interim report, the Commission identified the following issues:

B5: Connecting new generators to energy networks

- Issues relating to the connections queue, which has a large number of applicants and long delays with the assessment process;

[1] Review of Energy Market Frameworks in Light of Climate Change Policies, 1st Interim Report, AEMC, 23 December 2008

- Issues relating to sharing of connection assets by multiple generators.

B6: Augmenting networks and managing congestion

- Issues that may be arising as a result of the unconstrained planning approach that is applied in this market, which was seen as likely to be precluding connection of otherwise viable generators or may be triggering economically inefficient levels of transmission investment;
- Issues relating to the lack of appropriate linkages between the costs of congestion and the costs of network augmentation;
- Issues with the Reserve Capacity Mechanism.

The Commission identified these issues and discussed some possible mitigation options. These are further developed in the current report.

Analysis and review process

The starting point for our review process was the issues that Commission identified in its 1st interim Report. We discussed the matters raised in that report with Commission staff and reviewed relevant submissions. The Commission also provided EMCa with preliminary briefings on equivalent and related matters which the Commission was developing in regards to the NEM, for its 2nd Interim Report.

EMCa obtained further briefings through discussions with the WA industry. We met with representatives of Western Power, Verve, Synergy, the Office of Energy, the Economic Regulatory Authority and the Independent Market Operator and had further subsequent phone and email communications with staff in these organisations.

Findings: issues identified and proposed measures for consideration

Overview

Much has been made of the length of the applications queue that Western Power administers and the delays to generation proponents that this implies. While EMCa considers that there are ways in which the connection applications process could be improved, to a large extent we consider the queue to be a symptom of more fundamental issues related to the recognition and treatment of constraints in the WA transmission network. We consider

that the most beneficial measures will be those that address this underlying cause.

EMCa considers that Western Power's unconstrained planning policy can be viewed as being at the centre of connection queuing and access issues. We consider that a change to this policy, which would align Western Power with other jurisdictions in the region, would free up a considerable amount of existing network capacity at minimal cost. This would clearly facilitate the provision of access to renewable generators, while also allowing Western Power to make best use of limited capital funding resources. It would also effectively place new and existing generators on the same footing, which is not the case at the moment.

Implications of this change would need to be considered and addressed: this would include ensuring that implications for existing generators are well-understood and considering some market-related changes (such as to the RCM) and some system management-related changes.

Measures to improve connection processes

EMCa considers that there are three measures that should be considered in regards to the connection process. These measures address issues that were broadly categorized as "B5" in the Commission's 1st Interim Report. The measures that EMCa proposes are:

- Improving market information, including on the applications queue itself, on constraints and on augmentation costs;
- Modifying certain aspects of queuing policies and procedures;
- Reviewing the approach to allowing for shared connections.

Improving market information

When generators apply for connection of a new project they face uncertainty regarding both the timing and final costs they will face. Improvements and additions to the information provided to potential project proponents could assist in reducing the number of speculative projects entering the queue. This could include improvements to make the queue visible to prospective applicants. Providing details of system constraints, augmentation timeframes and indicative capital contribution costs would assist proponents to assess the viability of their projects at an early stage.

Modify queuing policies and procedures

A combination of desegregating the queuing process on a regional basis, assessing projects based on defined criteria and restructuring the application

charging regime could prove valuable. The addition of an annual maintenance application fee could provide an incentive for projects that are making slow progress to be removed from the queue by the project's proponent.

Review approach for facilitating shared connections

It is logical to consider areas where multiple generator projects are likely to occur on an aggregated basis. Undertaking network studies and calculating capital contributions for shared connection and deep network augmentation will lead to more efficient outcomes if undertaken on an aggregated basis rather than on the basis of individual generation projects, as they are at present. Project timing differences may present a challenge but understanding and managing these issues is core business for an electricity network provider.

For shared connection assets where multiple generator connections are likely, EMCa considers that a common approach in both the WEM and NEM is possible.

Measures to improve access to the transmission network

EMCa considers that there are five measures that should be considered to address the underlying causes of application delays, namely improving the basis on which access to the transmission network is provided. These broadly relate to the "B6" issues previously identified by the Commission. The first three of these measures meet a common and significant objective: namely, releasing free capacity in the existing network. The measures are:

- Releasing free capacity by allowing new generators to connect on a constrained basis;
- Releasing free capacity by relaxing the unconstrained planning criterion;
- Releasing free capacity by taking steps to optimize line ratings;
- Improving the augmentation regulatory approvals processes;
- Reviewing methods for charging for augmentation.

Releasing free capacity by allowing new generators to connect on a constrained basis

Recent wind generator connections have been made on a potentially constrained basis through the use of generator run-back schemes that protect against network circuit overloading if constraints occur. Such schemes can enable some new generators to be developed and to access

the network sooner and at somewhat lower costs than they could in the absence of such schemes.

We consider that there is merit in considering formalising policy in relation to such connections. However there are also implications, such as for system management and for the RCM, which we believe have not yet been fully addressed and would need to be if this was to become a policy.

EMCa remains concerned about the differentiation between new and existing generators that is inherent in such schemes and the lack of economic signals for any inefficient existing generators to be displaced. These issues would be addressed by the next measure, as below.

Releasing free capacity by relaxing the network planning criteria as they are applied to generators

As the Commission noted in its 1st Interim Report, Western Power applies a conservative security standard (N-1) to network planning for generation access. In effect this is the same standard that is applied to loads. This policy applies a higher security standard than is applied for example, in the transmission networks in the NEM and in New Zealand.

EMCa considers that if the network planning criterion for generation below 600 MW was reduced to N-0, significant levels of additional transmission capacity would become available for new renewable generation projects. This change would also represent a step towards providing access to all generators (existing and new) on an equivalent basis.

It is important to note that relaxing the network-imposed planning standard does not mean that generation is then necessarily provided with less secure access; rather, it places the onus on generators to consider the economic trade-off between the cost of being sometimes constrained and the cost of augmentation.

Releasing free capacity through changes to line rating procedures

When planning for generator connection, the worst case (summer peak) line ratings are currently applied. A more dynamic approach to line rating, for example taking account of wind chill that is likely to increase line ratings when wind generation is at greatest output, and greater dynamic monitoring of the network (e.g. “smart grid”) may unlock further “spare” capacity and thus further facilitate access by more renewable wind generation without significant cost to those projects.

Improve augmentation regulatory approval processes

EMCa considers that the Regulatory Test and the New Facilities Investment Test (NFIT) provide a broadly appropriate framework for the evaluation and regulatory approval of transmission capital investment projects. However, we consider that some aspects of the tests, which are most relevant to augmentations that are driven by new generation, do not seem to be appropriate or easily workable. Most notably, this involves the assessment of net benefits to market participants.

EMCa also considers that there is a lack of clarity in regard to some aspects of these tests. We understand that guidelines in respect of these tests are being considered or are in development and we strongly endorse this in the interests of facilitating smooth and efficient assessment of projects, regulatory consistency and transparency for renewable developers.

Review methods for charging for augmentation

EMCa considers that it may be more appropriate to assess and charge for the incremental cost of a particular network augmentation than to charge for the assessed incremental network impact of each such generator. The latter approach involves a set of rules about the way in which queue position influences a generator's assessed impact on the network, and these rules have no real basis in facilitating economically efficient outcomes.

Charging new generators for augmentations also has implications for the relative viability of new generators relative to existing generators and therefore, could considerably influence the pace of movement away from thermal and towards renewable generation.

EMCa recommends that the Western Power Capital Contributions Policy is reviewed in regards to its application to generators and that the rebate arrangements for capital contributions made for deep network augmentation are set out more formally and clearly. EMCa also recommends a review of the policy regarding charging based on assumed augmentation causality.

EMCa considers that development of the Generation Park concept (which has been proposed by Western Power) is worthy of further consideration. This would require development of an explicit policy and a review of the Regulatory Test and NFIT to ensure the these tests are workable and will lead to efficient developments with appropriate risk allocations.

Relationship with other issues not in scope

Implications for dispatch management and for the energy market

The release of free network capacity by relaxing network planning criteria as they apply to generation and thus allowing for the possibility of constrained access will have wider implications for existing generators, for System Management and for aspects of the Reserve Capacity Mechanism (RCM). In exposing existing generators to the possibility of constraints arising, better economic signals are provided. However the risks associated with those constraints need to be able to be managed and it needs to be ensured that there are appropriate mechanisms in the market to facilitate this.

EMCa understands that some hold the view that normally unconstrained network access is a prerequisite for the operations of the RCM. EMCa disagrees with this view and considers that there is an opportunity to enhance the value of the RCM by implementing appropriate changes to account for the operation of the RCM in a potentially constrained network environment. These changes would create a link between the value of generation capacity as already recognized in the WA market design, and the costs imposed by regional constraints.

Changes to System Management tools and processes would be required and there would be a cost associated with these. However the improved tools and processes would also provide better information to assist System Management in operating the system to the required margins.

Other WA market issues identified in the Commissions 1st Interim Report

Issue B4: System Operations and intermittent generation

The 1st Interim Report identified three impacts of intermittent generation: its impact on scheduled generation; increasing the need for balancing; and increasing the need for certain ancillary services. Addressing these issues may well alter the viability of particular proposed intermittent generation projects and this would therefore affect the queue. This puts greater onus on the queuing policy to help ensure that the queue changes to reflect genuine changes in circumstances for a project.

Issue B1: Convergence of gas and electricity markets

In spite of the limitations on the role gas seems likely to play, it seems feasible that the value that gas could bring could be improved through some changes to align the electricity and gas markets. EMCa considers that convergence in these areas should be further examined, especially if there was any consideration of changing gate closure times in the electricity market for other reasons.

Equivalent issues in the NEM

A5: Connections

The Commission has raised the issue of shared connections in the NEM. EMCa considers that there is not an inherent reason why NEM and WEM processes for addressing shared connections should differ. EMCa considers that the concept of Network Extensions for Remote Generation (NERG), as outlined in the Commission's 1st Interim Report, warrants further consideration and that this should be explored for both markets.

A6: Congestion and Augmentations

There are significant differences between the NEM gross pool arrangement and the net pool arrangement in the WEM. In addition, the WEM has introduced the Reserve Capacity Mechanism (RCM) which provides generators with credit for availability. EMCa considers that differences between the NEM and WEM are such that a common approach for congestion and augmentation is unlikely.

Final Comments

The suggested reviews and proposed options contained in this report have the potential to produce significant economic and wider benefits for Western Australia, by supporting the development of appropriate levels of renewable energy in an efficient development sequence. They could also facilitate the deferral and overall reduction in the levels of network investment that are otherwise thought to be required.

Whilst the objective of the review was to assess implications for increased levels of renewable generation, we consider that there are likely to be wider benefits obtained from a review of network access arrangements for generators and associated WEM market mechanisms such as the RCM.

EMCa would like to thank the industry, government and regulatory stakeholders in WA who met with us and provided information and insight. EMCa would also like to thank Commission staff (particularly Andrew Truswell, Colin Sausman, Christiaan Zuur, Hannah Cole and Scott Stacey) for the information and ideas that they discussed with us and which have formed input to this report.

1 Introduction

1.1 Introduction

Energy Market Consulting associates (EMCa) is pleased to present this report to the Australian Energy Market Commission (the Commission). The report is to provide input and advice to the Commission to assist it with its 2nd Interim Report, by progressing consideration of the network issues in the WA electricity market that the Commission identified in its 1st Interim Report[2].

EMCa would like to thank the industry, Government and regulatory stakeholders in Western Australia (WA) who met with us and provided information and insight. EMCa would also like to thank Commission staff (particularly Andrew Truswell, Colin Sausman, Christiaan Zuur, Hannah Cole and Scott Stacey) for the information and ideas that they discussed with us and which have formed input to this report.

1.2 Terms of reference

This report examines the network-related WA market issues identified in the Commission's 1st Interim Report. The terms of reference provided to us are as follows:

> *The main area of focus for the consultant in terms of developing and assessing options for change will be the transmission network augmentation arrangements in the South-West Interconnected System (SWIS), in order to address the issues identified in sections*

[2] Review of Energy Market Frameworks in Light of Climate Change Policies, 1st Interim Report, AEMC, 23 December 2008

B5 (connecting new generators to energy networks) and B6 (augmenting networks and managing congestion) of the 1st Interim Report. In particular, consideration will need to be given to the role of transmission in congestion management, and the current "unconstrained" planning approach employed in the SWIS. The evaluation of any options for change developed should include consideration of impacts on charges, the connection application and construction processes, and the current connection application queue.

1.3 Overview of our process

The basis for the current report is the Commission's 1st Interim Report and the issues that the Commission identified there. EMCa has discussed the matters raised in that report with Commission staff and also reviewed submissions on the 1st Interim Report to the extent that they were relevant to the WA issues that we have been asked to consider.

The Commission provided us with preliminary briefings on equivalent and related matters that the Commission is considering in regards to the National Electricity Market (NEM) for its 2nd Interim Report. However the timing of the current report predates the Commission's drafting of the 2nd Interim Report; hence there may be some inconsistencies that need to be addressed at a later stage.

EMCa was provided with vital further briefings and opportunities for discussion with the WA industry. EMCa met with representatives of Western Power, Verve, Synergy, the Office of Energy, the Economic Regulatory Authority (ERA) and the Independent Market Operator (IMO) on two occasions – first in a series of meetings with each organisation and, a week later, in the course of a Public Forum arranged by the Commission, during a meeting of the WA Issues Advisory Group and in further follow-up meetings. EMCa also clarified some matters through phone conversations and emails.

1.4 Structure of this report

This report contains four main sections in addition to this first introductory section 1 which sets out the background, purpose and scope of the review.

In section 2 we have commented further on the scope of the review, and have provided a very brief overview of the relevant features of the WA market to assist readers who may need this report to be usable without recourse to wider information. However, we caution that policy decisions should not rely on this overview alone.

In section 2 we have also noted some important linkages between our analysis in this report and the Commission's analysis in the NEM, and with other WEM issues identified by the Commission but which are not within the scope of the current report.

In section 3 we cover matters which represent a development of Issue B5, as identified by the Commission in its 1st Interim Report, that is, issues relating to the connection of new generators. These comprise issues relating to the connection queue and issues relating to shared connections.

In Section 4 we cover matters identified by the Commission as B6, which relate to network augmentations. These resolve into matters relating to network constraints, including the basis on which generators are permitted to connect to the network (i.e. unconstrained or potentially constrained) and matters relating to augmentations to relieve those constraints, including network augmentation decision processes and charging.

For each of the matters covered in sections 3 and 4 above, we have outlined relevant aspects of the current market framework and its application by way of policies and processes; outlined issues, including the implications of the issues (why they matter); and we have suggested measures for further consideration, which we consider likely to lead to improvements compared with the currently-applied policies and processes.

Comments are also provided on the likely processes by which these measures could be considered for implementation. This would necessarily involve industry processes according to the WA market governance and regulatory structure.

In section 5, we summarise our main findings and the proposed measures to progress improvements in regard to each of the issues identified.

2 Background and context

2.1 The implications of climate change policy

The Commission has been requested by the Ministerial Council on Energy (MCE) to undertake a review of energy market frameworks in light of climate change policy. The following is extracted from the Commission's published scoping paper for this review[3].

> *The Australian Government is developing a range of policies and measures that aim to address the environmental and economic challenges of climate change and to reduce greenhouse gas emissions. In this Review, we are analysing the impacts of the Government's two key climate change policies: the Carbon Pollution Reduction Scheme (CPRS) and the expanded national Renewable Energy Target (expanded RET). Both of these policies will have large and direct impacts on the energy markets. This is because Australia's energy sector is a large emitter of carbon and the CPRS will put a price on those carbon emissions. The expanded RET's objective is to increase the amount of electricity generated from renewable sources.*
>
> *Noting the potential changes that energy markets will need to accommodate, the Ministerial Council on Energy (MCE) on 13 June 2008, agreed that there was a need to conduct a review of the current energy market frameworks to determine whether they require amendment to accommodate the introduction of CPRS and the expanded RET. The MCE has directed the Australian Energy Market*

[3] Review of Energy Market Frameworks in light of Climate Change Policies; Scoping Paper, AEMC (10 October 2008)

Commission (AEMC) to undertake the Review and provide a Final Report to the MCE by 30 September 2009.

The Review is to:

- *examine the potential impacts of the CPRS and expanded RET on both the electricity and gas markets across all jurisdictions;*
- *determine what adjustments may be necessary within the existing energy market frameworks, having regard to the National Electricity and Gas Law objectives – to deliver efficient, safe, secure and reliable energy supplies in the long term interests of consumers; and*
- *provide detailed advice to the MCE on implementation of any amendments required.*

The AEMC is to have regard to:

- *the MCE's requirement that amendments will only be supported if they contribute to the energy market objectives;*
- *the need for amendments to be proportionate;*
- *the value of stability and predictability in the energy markets regulatory regime; and*
- *any other AEMC Reviews, Rule changes or MCE reforms that may relate to this Review.*

In the Scoping Paper it was stated that the review would apply to the Western Australia Electricity Market (WEM) and the Commission's 1st Interim Report specifically addressed a range of WA market issues.

2.2 Relevant aspects of the WA electricity market

The South West Interconnected System (the SWIS) is the largest of Western Australia's 31 power systems[4]. It serves the majority of the south west region of Western Australia, from Kalbarri in the north, to Kalgoorlie in the east and Albany in the south, supplying approximately 840,000 retail customers across a network of almost 88,000 kilometres of power lines[5]. The state-owned retailer Synergy is the sole supplier to all electricity customers in the SWIS that consume less than 50 MWh. Synergy and other competing businesses

[4] The others being the North West Interconnected System and 29 regional, non-interconnected power systems. (Source: Australian Energy Regulator, State of the Energy Market 2008.)

[5] Western Power website, May 2009

supply those consumers that consume more than 50MWh per annum. The state-owned Western Power is responsible for the transmission and distribution of electricity across the SWIS. A ring-fenced business unit within Western Power, System Management, operates the SWIS.

The SWIS has a peak demand of approximately 3,800 megawatts (MW), with installed generation capacity of approximately 5,000 MW[6], of which some 60 percent is owned by the state-owned generator Verve Energy[7], with the rest owned by private companies. The generation capacity mix is approximately 40 percent coal, 55 percent natural gas/distillate and 5 percent renewables[8].

Figure 1: The South West Interconnected System

(Source: Western Power, 2009)

[6] Impacts of Intermittent Generation, Scoping document to assess the impacts of intermittent generation, Sinclair Knight Mertz, May 2009

[7] Verve Energy website, May 2009

[8] Energy WA, Installed Electricity Generation Capacity, WA Office of Energy, August 2008

Under an expanded Mandatory Renewable Energy Target (MRET)[9] [10], the level of renewable energy generation in the SWIS is predicted to increase over the next decade, but is expected to be limited by the amount of wind capacity that the SWIS can handle[11]. Currently the predominant form of renewable energy in the SWIS is wind, with a little over 200 MW connected[12], and a further 1,300 MW of wind capacity seeking connection[13].

It is anticipated that other forms of renewable generation will arise, e.g. geothermal (hot dry rocks), biomass and solar (thermal and photo voltaics)[14]. These other renewable generation forms will not necessarily be as intermittent as wind. Nevertheless, wind is predicted to be the most dominant form of renewable generation in Western Australia over the next decade or two[15].

Consequently, a key issue facing the SWIS is planning for and managing the system operation issues associated with intermittent generation.

The Western Australia Electricity Market (WEM) is administrated by the Independent Market Operator (IMO) and regulatory oversight of the electricity market is predominantly undertaken by the Office of Energy and the Economic Regulatory Authority (ERA).

The WEM Objectives are:

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[9] With a target for generation from renewable energy sources of 45,000 GWh by 2020, which when combined with pre-MRET renewable generation of approximately 16,000 GWh, will represent approximately 20 percent of Australia's electricity supply.

[10] Additionally, the Western Australian government's climate change policy includes a renewable energy target for the SWIS of 15 percent by 2020 and 20 percent by 2025. (Source: A Renewable Energy Target for Western Australia, Scheme Design Paper, Sustainable Energy Development Office, Government of Western Australia, August 2007.)

[11] Report to Department of Climate Change, Benefits and Costs of the Expanded Renewable Energy Target, McLennan Magasanik Associates, January 2009

[12] IMO website, May 2009

[13] Submission from Western Power to AEMC, February 2009. As noted later in this report, a greater amount of generation is seeking connection, when all generation sources are taken into account.

[14] Report to Australian Government Department of Climate Change, Electricity Market Forecasting, Modelling of carbon pricing scenarios, ROAM Consulting, December 2008

[15] Review of implications for energy markets from climate change policies – Western Australian and Northern Territory elements; A report prepared for the Australian Energy Market Commission, Frontier Economics, November 2008.

(a) to promote the economically efficient, safe and reliable production and supply of electricity and electricity related services in the South West interconnected system;

(b) to encourage competition among generators and retailers in the South West interconnected system, including by facilitating efficient entry of new competitors;

(c) to avoid discrimination in that market against particular energy options and technologies, including sustainable energy options and technologies such as those that make use of renewable resources or that reduce overall greenhouse gas emissions;

(d) to minimise the long-term cost of electricity supplied to customers from the South West interconnected system; and

(e) to encourage the taking of measures to manage the amount of electricity used and when it is used.

For investment in the transmission network and the facilitation of generator connections, the 2009 Western Power Statement of Corporate Intent (SCI)[16] sets out the following objectives:

"The operating and capital expenditure requirements should achieve the following outcomes:

- *network asset condition and service performance should comply with all relevant legislation and regulations;*
- *service performance should comply with the established benchmarks and therefore satisfy customers' expectations in terms of reliability and quality of supply;*
- *generation connections should be facilitated to ensure that security of supply is maintained;*
- *assets must be renewed to ensure that service performance is not compromised in the medium term;*
- *asset management strategies should be aligned with industry best practice;*
- *the life-cycle costs of providing services should be minimised by appropriately balancing operating and capital expenditure; and sustainable efficiency gains, in terms of improved*

[16] http://www.westernpower.com.au/documents/aboutUs/STATEMENTOFCORPORATEINTENT200809.pdf

performance, increased output and lower cost should be delivered over time.

In addition, it is essential that expenditure plans are feasible given the availability of internal and external resources, and the need to ensure that expenditure is executed efficiently."

2.3 Overview of network issues previously identified by the Commission

The issues identified by the Commission in its 1st Interim report are summarised as follows:

B5: Connecting new generators to energy networks

- A connections queue has been established and there may be aspects of the design of this queue process which are precluding connection of the most cost-effective new generation in the appropriate (least cost) order. This queue has a large number of applicants and there are long delays with the assessment process;
- A bilateral negotiation process for connection may be leading to a range of issues relating to free-riding, first-mover advantages, cost sharing and allocation of congested access, all of which may be detrimentally affecting project risk and the connection of generators in least-cost priority.

B6: Augmenting networks and managing congestion

- There may be aspects of the network planning approach (in particular, that it is being undertaken on an unconstrained basis) that may be precluding connection of otherwise viable generators or may be triggering economically inefficient levels of transmission investment in order to provide unconstrained connection;
- Related to the "unconstrained planning" approach, there appears not to be a link between the costs of congestion and the costs of augmentation, which may be resulting in over-investment, or in high "deep connection charges" or rejection of an access application. This may also be leading to inefficient generator location decisions;
- There may be issues with the Reserve Capacity Mechanism (RCM), which may be affecting the IMO's analysis of the likelihood of congestion and therefore of opportunities for and implications of some new generator connections.

The Commission has identified these issues from its analysis to date and from the submissions from stakeholders as part of the process that led to the 1st Interim Report. In its report, the Commission also discussed possible mitigation options and these are further explored in the current report.

2.4 Relationship with other issues not in scope

2.4.1 Other WA market issues

There are some linkages between the issues addressed in the current paper and other issues identified in the Commission's 1st Interim Report.

Issue B4: System operations and intermittent generation

The main linkage is with issue B4: System Operation and Intermittent Generation. The 1st Interim Report identified three impacts of intermittent generation:

- Its impact on scheduled generation, in particular the interaction between higher levels of wind generation with greater output volatility, and the relative inflexibility of the predominantly coal plant that comprises the majority of current WA generation capacity;
- Increasing the need for balancing, noting that balancing is not currently a competitive service and is undertaken almost solely by Verve at the direction of System Management, with market rules neither compensating Verve for the full cost nor charging market participants the full cost and, therefore, is likely to be leading to inefficient dispatch;
- Increasing the need for certain ancillary services, noting that they too are neither procured nor charged to market participants on a cost-reflective basis.

The Commission considered that each of these three factors was likely to be leading to inefficiencies in the development of wind generation. By inference, wind generation is considered not to be efficiently bearing the costs that it imposes on the system; this suggests that changes to the WA market framework along the lines that the Commission suggests would remove or reduce the presumed subsidy in favour of wind generation and increase its costs (or reduce certain benefits that it currently receives).

To the extent that the business case for some applicants' projects may be based on the current assumed favourable System Operations regime, any revisions to the Queuing Rules may lead to a reassessment by those applicants. If the projects were subsequently shown to be not viable then the

access regime should be structured in such a way that it would be in their interests to withdraw their access application.

A further implication flows from the proposed changes to unconstrained planning (issue B6) which would have an impact on System Management practice and the RCM. This impact is described in section 4 of this report.

The Commission also considered that System Management services may be able to be provided more efficiently with the suggested changes to the market framework.

Issue B1: Convergence of gas and electricity markets

In its 1st Interim report, the Commission outlined the likely value that gas could play in providing for the increasing need for low-merit-order generation as a back-up to intermittent generation, such as from wind. The Commission also noted the limitations in pipeline capacity and the high cost of gas in WA, relative to the Eastern states, such that it seems unlikely that there would be significant investment in gas-fired generation for this role.

EMCa considers that the lack of availability of relatively low-cost back-up to wind generation, when combined with more cost-reflective charging for balancing (as discussed above) may limit the amount of wind generation that is viable. Again, this has implications for the applications queue in that it is efficient that this should comprise wind generation prospects that have a suitable prospective business case when charged the appropriate costs that they impose on the system (or, equivalently, that they are able to obtain an income stream that reflects the net value that they provide in the system).

In spite of the limitations on the role gas seems likely to play it seems feasible that the value that gas could bring to the market could be improved through some changes to align both markets. The Commission has noted that there are different gate closure times in the different markets, making it difficult for gas generators to bid gas generation reliably into the Short Term Electricity Market (STEM). And we note that the gate closure times in both markets are considerably in advance of real-time knowledge of wind generation.

EMCa considers that convergence in these areas should be further examined, especially if there was any consideration of changing gate closure times in the electricity market for other reasons.

2.4.2 Equivalent issues in the NEM

Issue A5: Connections

The market environment for the physical connection of generators to transmission networks is essentially the same in both the WEM and the NEM. Both markets have the concept of shallow and deep connection. Shallow

connection generally covers assets that can be considered to be dedicated to a single (or small number) of connected parties. Deep connection is considered to cover the core transmission system where the use is shared by many connected parties.

The efficient allocation of capital contributions between parties using common connection assets is an issue for both the WEM and NEM. Where a number of new generators are located in the same area it may be technically and economically appropriate to construct shared transmission capacity. It appears that improvements in regard to this issue are under consideration in the NEM and it is logical that a common solution be considered for both markets. This is discussed further in section 3.3.3.

Issue A6: Congestion and Augmentations

There are significant differences between the NEM gross pool arrangement and the net pool arrangement in the WEM. In addition, the WEM design includes the RCM which provides generators with payments for availability.

There are significant differences in the rules and regulatory frameworks in each market and they impact on the frameworks for managing network congestion and deep network augmentation. The inter-regional transmission arrangements in the NEM are not required in the WEM, which does not have regionally-different prices.

Because of differences between the NEM and the WEM, we consider that it would not be productive to seek to achieve a common approach for congestion and augmentation.

3 Issue B5: Connecting new generators to the energy networks

3.1 Introduction

In its 1st Interim Report, the Commission identified the unconstrained planning approach, the connection process (in particular, the queue of connection applications) and issues arising from the bilateral connection negotiation process as issues that were likely to be constraining the connection of renewable generators. Since renewable generators are typically smaller and more numerous than traditional thermal plant, it is more likely that there will be opportunities to share connection assets.

This section focuses on two issues:

- the queue process; and
- processes to enable efficient sharing of generator connections assets.

In Section 4, we state our view that the unconstrained planning approach is a strong contributing factor to the applications queue being as long as it is and

progressing somewhat more slowly than it otherwise might. The unconstrained planning approach strongly influences Western Power's position on augmentation requirements, which are discussed in Section 4. While noting the interaction between these issues and the size of the connections queue, we consider that there are, nevertheless, issues with the queue process and it is these that we address in the current section.

3.2 Connections queue process

3.2.1 Current queue-related processes

Access Code and connections policies

Western Power's Access Arrangements are established under the provisions of the Electricity Networks Access Code 2004 (with amendments currently to November 2008). The Access Arrangements describe how Western Power will provide network services to its customers. The Applications and Queuing Policy is set out as an appendix to the Access Arrangements.

The objective of the Applications and Queuing Policy is to manage connection applications and the development of access contracts. The policy covers how:

- applications are to be made;
- applications are processed and managed;
- the queue is managed;
- applications can be withdrawn or modified; and
- an Access Offer is made.

Under the Code (clause 2.4A) Western Power and applicants are permitted to negotiate outcomes which differ from those allowed for under the Applications and Queuing Policy (as approved by the Regulator); however this cannot infringe on the application of the Policy to other applicants. Under Clause 2.5 of the Code, it is acknowledged that the Policy effectively limits the services that Western Power can offer and terms of those offers, because they must be consistent with the Code.

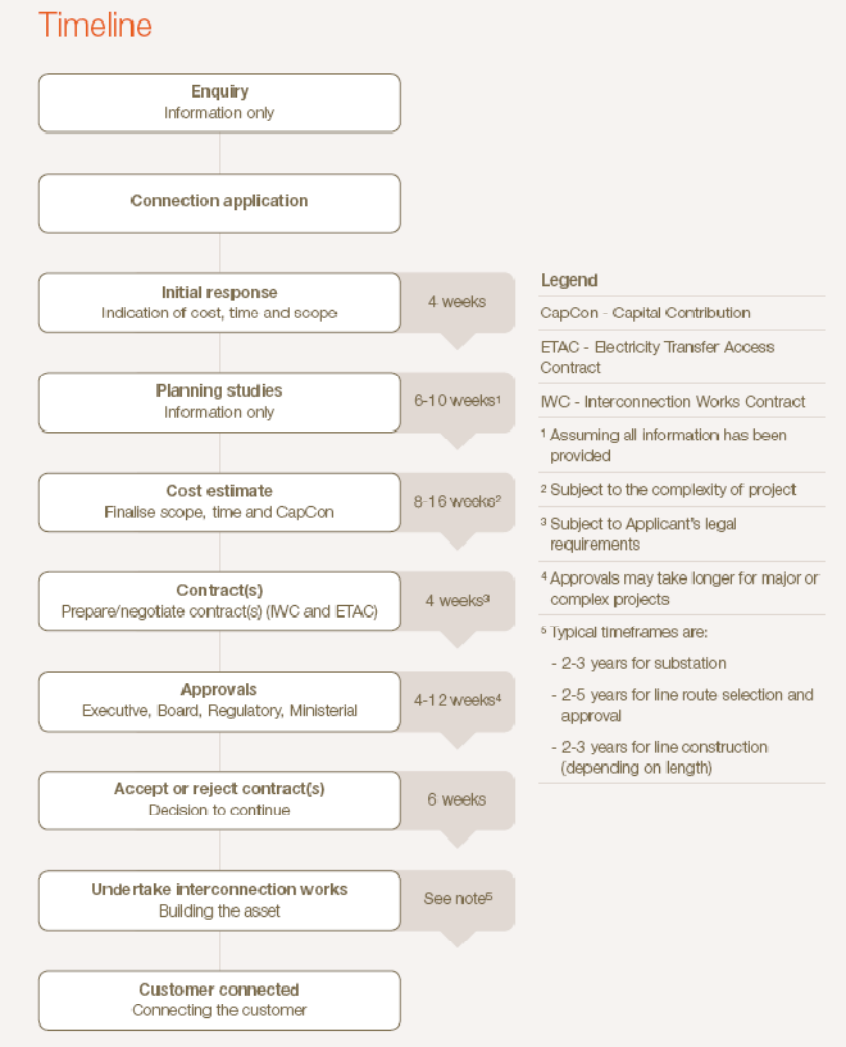
Overview of application process

All generators wishing to connect and inject electricity to the Western Power transmission network must receive and accept an Access Offer from Western Power. An Access Offer is only made once the application has passed

through various stages of an assessment process and, most importantly, can be assured normally unconstrained[17] access to the network.

Issues arising from the normally unconstrained access requirement are discussed in section 4.2. Western Power's generator application and assessment process is set out in the diagram below[18].

Figure 2: Western Power's access applications process



[17] The term 'normally unconstrained' is used in this report to describe the N-1 planning standard applied for generation connections. In Western Australia it is referred to as 'unconstrained connection' and sometimes as 'firm connection'. In EMCa's view, the term "firm connection" can be confused with firm access rights and "unconstrained connection" implies that the connection is never constrained. Neither of these correctly describes the WA situation.

[18] Generator grid connection guide, Western Power, May 2008

The application process requires each project to be assessed to determine if it is subject to the Queuing Rules. The Queuing Rules apply:

(a) where there are competing applications;

(b) to determine the priority of an applicant's connection application in the queue.

Constrained and unconstrained access

The Queuing Rules effectively produce two classes of project: the **normally unconstrained** project and the **potentially constrained** project. Whilst the network is considered by some to be designed to be unconstrained, continuous connection can never be guaranteed. Therefore, it is considered more appropriate to define this network planning criterion as "normally unconstrained". The same logic can be applied to the constrained status because the network will typically not be constrained all the time. EMCa considers that it is more appropriate to define this level of network planning security as "potentially constrained".

Normally unconstrained projects pass through the assessment process most quickly. Western Power literature suggests that assessment takes up to 52 weeks before an Access Offer is made. Unconstrained projects are those that are provided with access to existing unused network capacity. This is done on a first come first served basis; that is, an applicant is able to use existing capacity (at the generator Network Access Charges prevailing at the proposed point of connection) provided, at the time of the application, there are no other competing applicants for that same network capacity.

Once there are applicants effectively competing for capacity, then from that time we understand that all subsequent applications are placed in the queue until such time as capacity is available. Potentially constrained projects take as long as is necessary before normally unconstrained access to the network can be achieved[19]. Normally unconstrained access may require significant network augmentation; for example, one project has been in the queue since 2002, pending such network augmentation. The first come, first served allocation methodology produces the queue and effectively means that the project highest in the queue obtains the first mover rights to the existing network capacity. Other projects located in the same constrained region but applying at a later time would be required to fund network augmentation if all the existing capacity has been allocated to projects that have already been connected (or have accepted an Access Offer).

[19] See Section 4 for discussion of Western Power's unconstrained planning approach. This "normally unconstrained" access is defined by Western Power as that which meets an N-1 security standard for generation connection. This means that under the largest single failure that could occur on the network, all generation could still inject at its maximum capacity (assuming there is sufficient demand).

Implications for network modelling and price offers

Western Power takes into account the capacity allocation feature of the queue when it undertakes system modelling for a particular project. EMCa understands that the modelling assumes that all generation in the queue ahead of the project under assessment has been commissioned. This effectively means that the project being assessed, for the purposes of network planning, is not assumed to have access to any existing network capacity other than that which generators higher in the queue do not require.

Implications for Western Power resource prioritisation

Another feature of the queue is to allocate Western Power's network planning and systems analysis resources. Projects that are higher in the queue obtain priority access to Western Power's resources over those lower in the queue.

Queue bypass and amended applications

In order to manage queue priorities and changes to projects over time Western Power have introduced a by-pass facility. The by-pass facility allows for projects to be relegated to a lower position in the queue if Western Power considers that they have failed to meet specific requirements, relative to another project that has met such requirements. Western Power's criteria for determining if a project is a candidate for by-pass are set out in its Applications and Queuing Policy[20]. The reasons why by-pass may occur are:

- not progressing to an Access Offer for reasons of seeking financial, environment, government or other approvals;
- undergoing arbitration of an access dispute;
- failing to use reasonable endeavours to progress an application; and
- where an application is frivolous, vexatious or not made in good faith.

Western Power may also relegate a project to a lower position in the queue if there are changes to:

- technical data particularly to do with the dynamic model output values and impedance values;
- capacity by > +/- 5%;
- physical location of connection point (such that the electrical point of connection changes); or

[20] Western Power Applications and Queuing Policy

- other changes to scope which would result in revising or reducing steps in the application process.

At the time of this review there were 50 (renewable and non-renewable) projects in the queue with a combined potential nameplate generating capacity of around 5,000 MW. EMCa understands that Western Power has undertaken or is in the course of undertaking technical studies for around 16 of these, while the remainder are awaiting either technical study resource commitment from Western Power or financial commitment to such studies from the project proponent.

Provision for multiple queues

Importantly, the Queuing Rules have provisions for Western Power to form more than one queue.[21] This provision enables separate queues to be formed that relate to specific constraints. We understand that Western Power maintains a single applications queue for the purpose of prioritising studies; once those studies have been undertaken then we understand that Western Power prioritises access to capacity based on the location of the projects. In effect this appears to create separate queues for access to currently-constrained network capacity. However we have not seen evidence of these multiple queues and there is little to indicate how they are managed.

Information

Under clause 24.15 of the Applications and Queuing Policy, Western Power is required to provide information to queue applicants on their position in the queue. This clause refers to *competing applications* and appears to apply to applicants' positions in regards to competing for constrained capacity rather than applications for system studies. This clause requires Western Power to inform applicants that a competing application exists, whether it is behind or ahead of the applicant, the circumstances leading to the other application(s) being considered to be *competing*, the likely time to make an access offer and to commission the necessary augmentation and certain details on the competing application (except to the extent that the competing applicant has deemed this to be commercially confidential.)

3.2.2 Implications: Why is this issue important?

Currently the Western Power Application and Queuing Policy constrains all of the benefits available from potential new generation projects, where a transmission constraint currently exists or would exist if that generation was given access. This means that benefits that could be obtained from the use of normally available (but potentially constrained) network capacity are

[21] See Clause 24.3 Western Power Applications and Queuing Policy

foregone. While the unconstrained planning policy itself is addressed in Section 4, we consider that there are nevertheless a number of issues caused by the queue process and we address these in the current section.

Inefficient means of allocating planning resources and network capacity

The queue is an inefficient means of allocating planning resources and network capacity as it is based on a first come, first served principle. There is nothing in this process that would lead to higher quality and higher probability projects obtaining access to existing network capacity or engineering planning resources ahead of lower quality and more speculative projects placed higher in the queue solely because of their application date.

When establishing priority, the queue does not take into account the potential net benefits, probability of completion and practical achievability of projects. The benefits of gaining a high position in the queue relative to other projects in the same region may be significant, since it may provide access to existing capacity at minimal cost; such capacity is then not available to other projects further down the queue. This means that there is an incentive for speculative projects to be included in the queue and thus secure higher places than those that have a higher likelihood of proceeding. Planning resources are therefore inefficiently allocated and speculative projects can effectively block high net value projects from proceeding.

In addition, the capacity and resource allocation features of the current queuing process produces strong incentives on prospective generators to join the queue early as significant value may be realised in securing access to resources and network capacity.

Inefficiencies introduced through by-pass process

The by-pass facility introduces potentially inefficient outcomes by placing incentives on project proponents to avoid changes to project specifications. This is because any material changes to a project specification may mean that the project is relegated to a lower position in the queue. A project proponent may therefore avoid changes to a project that would otherwise increase its overall net benefit.

The by-pass and 'relegation' features allow Western Power to change the relative position of projects in the queue. Such actions are likely to be contentious and may lead to significant wealth transfers between project proponents. It is understood that, since the introduction of the by-pass rules in July 2007, only one by-pass has occurred.

A significant issue with queue by-pass (or any other step which changes a project's relative position) is Western Power's requirement (under the current policy) to recalculate the network studies for all other projects in the queue. The cost of the study reworks is charged to each individual project. This means that all by-passed projects incur additional costs even through those

projects have not contributed to the cause nor benefited from the outcome of the reworking.

As renewable projects are more likely than fossil fuelled generation to experience specification changes over the project planning period the relegation procedure is likely to place renewable projects in a lower position in the queue.

Capture of capacity credits

An issue identified in the 1st Interim Report was that generators may be in a position to secure capacity credits if they obtain an Access Offer based on their position in the queue. In this way, it was considered that the RCM could be providing an incentive for speculative generation projects to gain a position in the queue.

EMCa has considered this, and has come to the view that the RCM does not appear to provide a strong incentive for prospective generators to gain a place in the queue as capacity credits can only be allocated once a project is committed; and the value of those credits is only realised once the generator is commissioned.

The 1st Interim Report also considered that if connection of a new generator was delayed, there would be implications arising from any capacity credits that had been issued to the generator. There are two potential implications:

1. The generator would be unable to meet availability requirements under the capacity credits and may face financial penalties;
2. The IMO assessment of the available capacity reserves may be optimistic.

Whilst we consider that both of these are material issues for new generators, they are not specific to renewable generation.

To address the second issue, the 1st Interim Report suggested that performance incentives could be introduced to incentivise Western Power to deliver connections on time. In its submission on the 1st interim Report, Western Power considered that any incentives or penalties it faced would ultimately be borne by its customers. EMCa considers that, as the Access Offer for new generators is essentially a bilateral arrangement, it would be more appropriate for any incentives and penalties to be ring fenced so that it would be Western Power and not its customers that would face the cost of non-performance.

3.2.3 Solution options for consideration

The possible solutions to the issues described in section 3.2.2 are considered below.

Increase planning resources

Progressing applications through the assessment process is subject to the availability of engineering resources to complete studies and network design. The engineering studies required for renewable generation can be more extensive than those needed for conventional fossil fuelled generation plant. This is because the intermittent nature of most renewable generation introduces more complexity into the system studies. Modelling of intermittent generation requires increased attention to system dynamics and may increase the complexity of modelling and system studies.

Increases in planning resources would provide some reduction in the queue and potentially reduce the length of time between an enquiry/application and the making of an Access Offer, albeit at a cost. However we consider that only a relatively small improvement could be achieved, given the current length of the queue and the fact that major network augmentation would still be required to connect new plant under the current unconstrained approach.

Our chief concern with this option is that it would not lead to a more efficient ordering of the queue. That is, it would do nothing to facilitate the connection of new generation in a least-cost sequence or to filter those most likely to proceed from applications that effectively represent simply a low-cost option to utilise scarce transmission capacity.

EMCa considers that changes to the queue process itself and the consequent improvement in the allocation of existing planning resources to projects would achieve more substantial benefits than simply increasing resources.

Improve market information

The cost of that share of network augmentation required to allow generator connection under Western Power's planning policy is largely represented by the capital contribution component of Access Offers, once these are made (as discussed in Section 4). It would be helpful if indicative information was to be published on these likely costs for potential generators at different locations. This may lead generators to be able to improve their own viability assessments earlier in the process and this may act to filter out from any access queue those projects that are unlikely to be viable, before they absorb scarce technical resources and, importantly, before they effectively deny those resources to more viable projects.

At present, information on the content and length of the queue is provided to those in the queue. Potential new generation project proponents are not able to obtain this information. It is likely that the information contained in the queue is most valuable to those planning generation projects because they would be in a position to see the likely time delays in progressing an application for connection in that location.

Except for information that is deemed by an applicant to be commercially confidential, it appears that Western Power can publish information about

applications. EMCa recommends that queue information is published, and that Western Power establish a policy as to what information it will make available, so that applicants are aware of this when they make their applications.

Modify queuing policies and procedures

EMCa considers that a revision of certain aspects of Western Power's current queuing policy would provide for a more efficient allocation of network planning resources. Options that could be considered include:

1. Produce explicit regional or 'constraint grouping' queues as allowed under clause 24.3 of the Queuing Rules. This would facilitate aggregation of projects for the purposes of system studies, augmentation cost allocation (see section 4.4.3) and the provision of more transparent and useful information to current and potential applicants (see "Improved Market Information" above).

2. Define the current queue as an "enquiry queue" with a first come, first served prioritisation up to the point of commitment to a high level feasibility study. Projects that have completed initial feasibility studies could then be placed in regional "access queues", based on regional constraints and the augmentations that would be required to relieve those constraints, as per (1) above. It is worth considering prioritising projects in regional access queues by assessment against a set of criteria, although this can be problematic unless a highly objective set of criteria can be devised.

3. Restructure access application charges. This could include (for example) charging for the full expected costs of system studies at the access application stage (with subsequent true-up), and charging a significant (non-refundable) access application fee. In addition, an ongoing annual administration fee could be charged to maintain a project's position in the queue. Any balance of charges over and above the costs incurred could be rebated against project costs if the project proceeds; if it did not proceed then a "termination fee" could be deducted from any balance of charges above costs incurred. These options would discourage projects without strong commitment from entering the queue and would also provide an incentive to withdraw from the queue if or when the proponent considers their project to be unviable[22].

4. Auctioning current positions in the queue to project proponents. This may eliminate low value speculative projects and place higher value

[22] To the extent Western Power over-recovers from such a charging regime, this would not be retained; it could be applied generally against the costs of technical studies or other costs relating to those projects that proceed.

projects higher in the queue. Auction proceeds could be applied to the cost of network studies thereby reducing the cost to all projects. It may be possible to hold subsequent auctions or to otherwise allow existing queue positions to be bilaterally traded. In this way, new projects could obtain higher places based on their assessed value. A significant concern with this option would be that the potential value it creates for holders of good queue positions may become a primary driver for applications; further, such a process would entrench values and the perception of rights related to queue position, making it difficult for Western Power to alter the queue process or to take any further steps which might affect these values.

EMCa considers that a combination of options 1, 2 and 3 is likely to reduce the inefficiencies inherent in the current queue process, improve the allocation of network planning resources and provide a transparent and fair process for project proponents.

The existing queue could remain and form the initial enquiry queue. The number of speculative projects in the advanced regional queue is likely to reduce if the full costs of planning studies are required to be paid in advance.

Impact of changes to constraint management and augmentation policies

As we noted at the outset of this section, the issues with the current queue are largely symptoms of more significant issues relating to Western Power's capacity allocation and augmentation policies, together with a lack of mechanisms to deal with constraint cost signalling and constraint management in the WEM. Addressing these issues in an effective manner would reduce the extent to which queue policies are required to play a role in allocating transmission capacity and facilitating connection of generators in an efficient sequence. These issues are addressed in section 4.

3.3 Shared connections

3.3.1 Current process for charging for shared connections

Relevant policies and their basis in the Access Code

Western Power's Access and Queuing policy and its Capital Contributions policy set out how Western Power determines charges for connections, including policies for shared connections. Some aspects of the Access Code provide requirements that those policies must meet.

Assessment of connection cost

In the WA SWIS, connection requirements and associated charging to new generators are based on Western Power's assessment of the connection investment requirements for that generator. Where a new connection is required, and where Western Power determines that a single connection is required to connect a particular generator, then the cost of that connection is charged to that generator.

Where Western Power determines that a particular connection asset could be shared between multiple applicants, then more complex situations arise.

The first such situation is where it is clear to Western Power that it could connect more than one applicant in the access applications queue by sharing a connection investment. In this situation, Western Power's policy is to allocate the cost of the connection to each such proponent.

A second situation arises where an applicant could be connected using "spare" capacity on an existing connection asset. Where the original connection was made within the past ten years, and another generator has contributed to (or may be continuing to contribute to) the cost of that asset, then the costs to each party may be shared, such that charges from the proponent would be partially rebated to the original contributor.

While Western Power's capital contributions policy allows for this situation, it appears that the application of this policy and the details of any rebate mechanisms depend on the connection agreement with the initial proponent.

A third situation arises where Western Power assesses a single connection application but considers that it is reasonably likely that new generation will arise within the next ten years (even though no applications have been lodged) and which could utilise the same connection asset, if designed and built to accommodate this. In this case, Western Power's policy allows consideration of such potential future generation and the structuring of charges to the applicant that might represent only an apportioned share of the total cost.

Queue confidentiality

A further facet of the connections process that is relevant to shared connections is that, as we noted in the previous section, the queue is currently confidential (though this is under review by Western Power). We discuss the implications of this and other aspects of the shared connections process below.

3.3.2 Implications - why is this issue important?

Implications as described in 1st Interim Report

In its 1st Interim Report, the Commission described the issues relating to shared connections. These were described most fully in section A5, in regard to the NEM. In Section B5 of that report, the Commission stated that it considers that the same issues apply to WA. The issues were summarised as follows (AEMC, 2008, pp. 81,82):

> *Essentially the same two issues identified in the NEM are also present in the SWIS:*
>
> - *multiple connections in the same place at the same time, with the difficulties in coordinating an efficient connection between multiple parties. This is because the first generation developer would have to pay all the costs of extending the network, and all subsequent generation developers use this network at lower cost;*
>
> *and*
>
> - *the difficulty in predetermining the optimal size of connection assets where additional new remote generation is likely but not ready at the time of the first connection application.*

In section A5 of the Commission's 1st Interim Report, it is also noted that shared connection issues become more significant with the advent of increased renewable generation, since this tends to involve smaller plant than conventional generation and, while they may be more remote from the existing network they may also be clustered with other like generation. Therefore, steps to facilitate efficient investment in shared connection assets, cost-reflective charging and appropriate allocation of access risk for these assets will help to provide an environment that encourages the efficient development of renewable generation.

Implications of judgments in the application of shared connection policies

From EMCa's reading of Western Power's policies and from our discussions, it appears that the first of the two issues raised (as above) in the 1st Interim Report does not apply in WA; that is, it appears that (at least within a ten year window) there is provision for the costs of a new connection to be shared on an equitable basis, if and when new users of that connection asset arise.

However, there appear to be aspects of significant discretion in determining charges where there are initially multiple applicants, or where Western Power considers that new generators might arise and provide the opportunity to share a connection asset. For example, where there are multiple applicants, either all applicants would need to be considered to proceed (in which case if

any one applicant did not, there would be an under-recovery) or difficult assessment must be made as to which projects were likely to proceed, in order to build in a risk allowance.

Further and more problematic judgments are required where there are no current applications and it is only Western Power's judgment that new applications will arise.

Efficiency implications given likely increase in small co-located generators

Were sharing of a dedicated connection asset to occur only occasionally, then the current processes may lead to reasonably efficient outcomes, since they are cost-reflective on an incremental basis. However, where there are numerous generation opportunities and many situations in which it may be more efficient for connection assets to be shared, then issues in efficiently charging for and optimally sizing shared connections become more relevant and may reduce the likelihood that new generation will be developed in an economically efficient sequence.

The value of information in revealing opportunities for sharing and thus reducing connection costs

Other consequences flow from the current policy that the connection queue is confidential; these issues were also recognised and described in the Commission's 1st Interim Report. Because of this, applicants cannot recognise where their connection offer has been influenced (positively or negatively) by assumptions made regarding other applicants. Nor would they be able to realise the potential benefits available if another applicant was to connect and thus share connection assets.

Western Power is the only party with full visibility of the connection queue and in principle can see the possibilities for shared connections. But without knowledge of the viability of the intending generators, Western Power has incomplete information to assess the connection sharing options that are most viable and that would lead to the most efficient generation development schedule.

In short, neither the prospective generators nor Western Power have sufficient information for generation to be developed according to a least-cost sequence, in terms of the combination of generation and transmission connection economics. The transmission information and offers being presented to prospective generators is insufficient to enable them to make their investment decisions in a way that will lead to a reasonable proxy for least-cost outcomes. And, even if it was assumed to be appropriate for Western Power to define a least-cost generation development schedule (by building connections to support it), it does not have the economic information on generation options to enable it to do so.

3.3.3 Suggested solution options for consideration

Relationship between NEM and WEM solutions

EMCa understands that the Commission will (in its 2nd Interim Report) propose some suggested changes to processes for enabling shared connections in the NEM. While the WA market is very different from the NEM in many respects, we see no compelling reason why similar processes for shared connection should not be developed to apply in both markets. Although the relative importance of shared connections may vary jurisdictionally, the issues that such processes need to address are similar in nature. There are also advantages in facilitating generation development and minimising new entry costs, if the processes that intending generators face are the same in each market.

EMCa suggests that any review of WEM policies in regard to shared connection should be undertaken in conjunction with any similar reviews that might be undertaken in the NEM.

Suggested direction for revised policies on shared connections

EMCa considers that there is merit in further developing the Network Extensions for Remote Generation (NERG) concept that the Commission proposed in its 1st Interim Report, to apply in WA and in the NEM. EMCa considers that this approach would represent a further development and further formalisation of Western Power's policies, which are already allowed for under the WA Access Code, in regard to Western Power taking account of the likelihood of future generators that may be able to share connections.

A more formalised NERG mechanism could provide a more transparent and more equitable regime for new smaller-size generators and a better prospect of them being able to realise the network cost advantages of shared connections, where these exist. As a result, we consider it more likely that multiple smaller generators will be developed in a reasonable approximation to a least cost sequence.

The main challenges with such a regime arise from introducing a greater degree of central co-ordination and centralised decision-making into what is, at present, a series of bilateral processes involving Western Power and each intending generator. This will require some independent planning / regulatory oversight. Care should be taken to ensure that this does not lead to unnecessarily high standards and costly requirements being imposed on potential connectees. And there needs to be an appropriate balance between the risk of proceeding with "white elephant" investments whose costs are then borne by Western Power's customers and/or shareholder, and the risk of an overly cautious approach that makes shared connection an unattractive proposition because of the regulatory overhead involved.

In our experience, differences between projects are such that a highly prescriptive approach is unlikely to be workable and even less likely to cover appropriately all the circumstances that will be encountered. EMCa suggests that this applies particularly in regard to technical design, but also to the regime for charging the multiple generators. EMCa suggests that charges on an MVA-km or similar basis would be broadly appropriate, but it is unlikely that a formularised approach will accommodate all possible further connectees (in terms of their size, location, timing and technical implications) without becoming unwieldy.

EMCa considers that any scheme should be flexible enough to allow for constrained operation where the generators on a particular shared connection want it. However we have reservations about allocating capacity rights to "unused" capacity and suggest that generators have rights only in regard to whatever generation they have connected or have normally unconstrained financial commitments to connect.

Beyond this, we understand that the Commission does not wish to develop a prescriptive solution for the WEM and, given the complexities of developing a revised policy to accommodate shared connections, we concur that it would be inappropriate to do so without the involvement of the WA market operating and governance entities. We indicate what we perceive to be an appropriate process in section 3.4.3, below.

Matters to be addressed in developing a more formal regulatory mechanism for shared connections

There are a number of matters that will need to be addressed in developing the NERG concept for shared connections. These include the following:

- the appropriate balance between devolved decision-making (by generators facing economically-efficient price signals),and various more centralised options, such as decision-making by Western Power or an independent body (e.g. deciding to build "hubs" or other shared assets without full financial commitment from generators);

- in more centralised options, the risk (if any) to be taken by Western Power and the regulatory disciplines on Western Power (to the extent that it is permitted to pass on risk to customers) through independent planning and/or regulatory oversight such as by the National Transmission Planner (NTP), if applicable, and the ERA;

- noting that there are many aspects to investment decisions, ranging from whether or not to build a particular shared connection (as opposed to dedicated connections), connection sizing, level of security, the hub end-point and other aspects of design that may be required for some but not all intending generators;

- in relation to design, the extent to which a standards-based approach is imposed and the ability of generators to negotiate their specific requirements;

- the access rights that generators obtain, to the extent that these go beyond "reasonable endeavours" – including access rights to unconstrained operation and the dispatch and financial mechanisms that operate when constraints do occur, and any capacity rights (to the extent that the assets may not immediately be fully utilised);

- the complex measurement issues that can arise in defining "capacity" and "constraints", recognising the technical interactions that may exist between generators on a shared connection asset;

- the level of financial commitment sought from intending generators at different stages of the process from indicative interest through to construction approval for the connection assets;

- the mechanisms for charging, including differentiating between generators based on their position on the shared connection asset, differentiating based on cost-causing technical factors, and differentiating between those generators that commit prior to connection construction approval and those that arise subsequently, including any rebate schemes;

- the period for which initially-set charges apply, the process for their review and the factors to be taken into account (e.g. different generation out-turn? Capital cost? Operating cost? Cost of capital?)

- the extent to which generators are prepared to allow their technical information to be shared (in the interests of transparency of the connection design process) and processes if generators are not agreeable to this to occurring; and

- charging for network augmentation (deep connection) costs that are likely to arise as a result of multiple generators connecting to the shared connection asset.

EMCa recommends that these matters be taken into account in developing the NERG concept.

Queue confidentiality

EMCa has already proposed (in section 3.2.3) that more information on the access queue should be published. EMCa considers that this would considerably assist smaller generators to see for themselves any opportunities to share connection assets with another project and thus reduce their connection costs. Greater reliance on generation proponents being able to make commercial arrangements to realise such opportunities, would reduce the onus that is now implicit on Western Power and, therefore, the

investment risk arising from the current process in which Western Power makes its own assessments of future generation needs.

3.4 Summary of suggested measures for closer consideration

3.4.1 Connections queue process

Improve market information

By making available specific information on the queue, location of constraints and likely costs of network upgrades, proposers of prospective generation projects would be able to better assess the viability of their projects. In conjunction with other suggested measures (which would reduce the implicit value of queue position and require greater financial commitment to enter and remain in the queue), the publication and use of this information is likely to deter some speculative projects from making applications and entering the queue, and encourage projects to withdraw from the queue when they consider their project to be no longer sufficiently viable.

EMCa recommends that information on the queue, the location of constraints and the likely cost of network upgrades should be considered for publication.

Modify queuing policies and procedures

EMCa considers that three of the suggested options for improvements in the queuing procedure have the highest value and should be considered further. These options are:

1. Produce regional or 'constraint grouping' queues as allowed under clause 24.3 of the Queuing Rules.

2. Define the current queue as an enquiry queue with a first come first served prioritisation up to high level feasibility study. Projects that have completed feasibility studies can then be placed in regional queues based on constraints.

3. Restructure charges to include greater financial commitment at the access application stage and some ongoing financial commitment to remain in the queue.

There are likely to be some transitional issues in regard to parties who are different stages in the current access application process. Option 2 above may assist with transition as it retains the current queue at the enquiry stage.

3.4.2 Shared connections

Relationship between NEM and WEM solutions

While the WA market has a number of significant differences from the NEM, we consider there to be no inherent reason why shared connections policies should not be similar. To the extent that work is undertaken to develop and improve on these policies and to make them consistent in the NEM, we suggest that both markets work together with a view to developing the same or similar policies and practices where possible. This will make best use of policy development effort and will also provide renewable generators with the advantages of a similar national regime.

Suggested direction for revised policies on shared connections

EMCa considers that there is merit in developing the NERG shared connections concept that was discussed by the Commission in its 1st Interim Report. The major challenge in developing this concept will be to obtain an appropriate risk allocation and to provide appropriate incentives to the parties. Without these, such a policy could lead to inefficient over-investment in connection assets.

3.4.3 Solution development and implementation responsibilities

EMCa understands that Western Power is currently developing some initiatives to improve queue management and to reduce the length of time for projects to receive an Access Offer. Some of the suggested solutions described above may already be under consideration by Western Power or other WEM stakeholders.

On first review, we consider that most of the areas for suggested change could be accommodated by changes to Western Power's policies. Specifically, it would appear that Western Power could modify its queuing policies and procedures, allow for the publication of greater information on its access queue and could alter the financial commitments that it requires from new generation projects. Under the Access Code, there are mechanisms for Western Power to change its approved policies, through processes that involve submission to the regulator and stakeholder input. It would not appear that these measures would require significant or, perhaps, any changes to the Access Code itself.

EMCa understands that changes to these aspects of Western Power's policies can be made at any time, and need not be initiated only in the course of submission and approval of an Access Arrangement.

EMCa has suggested that the NERG concept should be further explored, in conjunction with any development of this concept to apply in the NEM. This

would suggest a need for a joint working group. It would seem likely that the NERG concept would lead to a new mechanism in the regulatory schema and this would seem to require explicit recognition in the Access Code.

With regard to other information that we suggest be published, such as information on constraints and indicative augmentation costs, Western Power could undertake these studies and publish such information. EMCa suggests that there would be value in Western Power undertaking a small public consultation to confirm the information that parties consider to be most valuable.

4 Issue B6: Augmenting networks and managing congestion

4.1 Introduction

In its 1st Interim Report, the Commission stated that it considers network augmentation and management of congestion to be significant issues in the WA market. The Commission highlighted the "unconstrained" planning approach in which it is broadly assumed that generators are only connected if the network can offer a high level of access security (nominally, to N-1 level). The Commission suggested that this standard could be leading to inefficient over-investment in the transmission network.

In its report, the Commission also addressed the issue of locational signals, and noted the importance of signalling network augmentation costs to new generators in order that these costs are appropriately taken into account in their location decisions.

In this section, we develop further these issues, involving the policies that are applied to generators regarding access to the network, the implications of congestion for generators, how any network augmentation requirements are

determined to overcome such congestion and how augmentations are charged for.

Also, EMCa notes that the current lengthy queue of prospective generation projects (as described in the previous section) can be considered to be a symptom rather than the underlying cause of inefficiently constrained generator access. It would appear that the queue is lengthened considerably by the assumed requirement to increase transmission capacity by augmentation or some other means and much of the prospective new generation caught behind transmission constraints would use renewable energy sources (primarily wind). Therefore improving the processes for and outcomes of network augmentation would both reduce the length of the queue and, more importantly, improve the priority ordering of the queue such that it is more likely to reflect what is in effect an efficient generation development sequence.

4.2 Basis for generator access to the network

4.2.1 Current basis for providing generator access and determining need for network augmentation

Relationship between congestion, augmentation and locational signalling

Since new generation frequently precipitates a need for network augmentation, and this can be costly, efficient generation development requires that the associated network augmentation requirements are taken into account in ways that lead to efficient outcomes. This requires that the costs of network augmentation are reasonably well-signalled to the proponents of new generation, that there is a reasonably efficient process for determining those requirements, and that least-cost augmentation requirements are chosen, bearing in mind the alternatives to network augmentation (which may include, for example, "support" generation at a particular location, reactive support or demand management)[23].

The need for network augmentation depends on the level of congestion that is acceptable and can be managed. This is a function of planning standards, which prescribe the level of security for generators (and loads), since the interactions with all other users of the network mean that it is typically not feasible for this to be bilaterally determined by the prospective generator in

[23] For convenience we will use the AEMC's term "network augmentation" to refer to all of these options, including non-network options

negotiation with the network. More typically, and where there is more than one generator behind a congested part of the network, an issue of dispatch prioritisation occurs when the network is congested; therefore several generators may be affected by congestion.

Currently, Western Power bases its access offers to new generators on being able to provide normally-unconstrained access (on an N-1 basis). If Western Power's studies assess that the current network cannot provide this level of secure access to a particular generation proponent, then Western Power plans augmentations such that this planning criterion can be met, and the cost of these augmentations is included in Access Offers to those proponents (as described in section 4.4).

Existing generators are assumed to have access to the existing capacity of the network on this basis (i.e. typically to an N-1 security level). New generator proponents are not considered to have rights to use existing capacity except to the extent that it is not currently used by existing generators (at least, to that level of security). New generators are therefore required to bear the costs of augmentation to provide for that "required" level of network security for their own access and also to maintain for existing generators the same level of network security that they currently enjoy.

Basis for current approach

EMCa has researched the basis for the normally unconstrained approach applied by Western Power to new generator access.

Appendix 6 of the Code requires that Western Power develops and publishes Technical rules, and that these must set out Network Planning Criteria. The Code does not specify what those planning criteria need to be.

Section 2.5 of Western Power's Technical Rules sets out the Planning Criteria for Transmission and Distribution. The unconstrained (N-1) planning approach appears to be inferred by deduction from this section.

In clause 2.5.2.3, a range of circumstances is described where an "N-1-1" planning criterion is to be applied. This includes "*all power stations whose total rated export to the transmission system exceeds 600 MW*". In clause 2.5.2.1, a range of circumstances is described where an "N-0" planning criterion applies. There is no mention of generation in this clause.

The Technical Rules do not specifically state a Planning Criterion for generation under 600MW but require (clause 2.5.2.2(a)) that:

> *"Any sub-network of the transmission system that is not identified within this clause 2.5.2 as being designed to another criterion must be designed to the N-1 planning criterion."*

It appears that these clauses are read as requiring that all generation connections under 600MW (which would almost certainly include all renewable projects) must be designed to N-1.

In our view this is made slightly ambiguous by clause 2.5.2.2(b) which states that:

> *"For sub-networks designed to the N-1 criterion (excluding a zone substation designed to the 1% risk or NCR criteria in accordance with clause 2.5.3.2), supply must be maintained and load shedding avoided at any load level and for any generation schedule following an outage of any single transmission element.".*

In other words, the definition of N-1 relates to *supply* being maintained, which is the normal perspective for defining system planning criteria. Clause 2.5.2.3 (a) is also defined as relating to *supply to consumers* being maintained (on an "N-1-1" basis) but nevertheless, a subclause (clause 2.5.2.3(a)(4)) specifically applies this criterion to generation connections greater than 600 MW.

While there appear to be some ambiguities, these clauses in Western Power's policy appear to be taken as defining the current policy. And from our discussions, there does not appear to be doubt that Western Power is applying an N-1 policy security standard to generators.

Overview of constraints in the SWIS

In discussing congestion and augmentation policies, it can be helpful to have a broad picture of the applicability of these policies. The overview that follows is derived from our discussions; it should be considered illustrative only and is by no means a complete explanation of the augmentation requirements for projects in a particular area, nor of the alternatives that are or can be considered.

In the SWIS there are three major regional constraints considered to be impacting on Western Power's ability to connect new generation:

1. the Northern Region constraint which is limiting the connection of generation projects in the North Country region (Geraldton to Northern Terminal);

2. the Southern Region constraint which is limiting the connection of projects in the Southern Region. Western Power's Annual Planning Report states that there are a number of large generation proposals for this area and that 468 MW of new generation is committed to connect in the southern part of the SWIS by 2009/10; and

3. the East Country connection constraint which is limiting the connection of remote generation in the East Country region.

There are also limitations to the connection of new generation within the Perth metropolitan area. However, the transmission-connected generation projects in this area are less likely to be from renewable sources.

To relieve the first constraint, Western Power has proposed the construction of a new 330kV transmission line interconnection between Geraldton and Perth which may cost in the region of $600 to $800 million and deliver an additional 600MW capacity.

Constraints 2 and 3 are linked because, if connection of remote generation in the East Country is undertaken, that generation would feed into the SWIS via Muja and impact on the Southern Region constraint. To relieve the Southern Region, Western Power is considering the construction of new 330kV transmission lines between the South-West Region, Perth and Guildford. EMCa has been provided with a provisional ball park estimate for the cost of the 330kV lines at around $230 million. This would increase the transmission capacity by 1,000MW.

It is clear that a single renewable 'first mover' generator that is at the head of the queue is unlikely to consider it commercially viable to foot the bill for one of these major network upgrades. Because of this, under current Western Power policies, all new generation projects behind these constraints must wait until transmission capacity is increased sufficiently to provide them with N-1 access and, by implication, to maintain N-1 security for existing generators.

EMCa expects that other constraints would exist in locations where some deep network augmentation is required to provide normally unconstrained connection to a number of new generator projects. In a similar manner to the main constraints, it may not be commercially viable for a single generation project to pay for deep network augmentation.

4.2.2 Implications – why is this issue important?

Unconstrained planning standards leading to constrained access for new generators

It is possible to view the 'unconstrained' planning approach taken in the WEM as a 'constrained' access approach because new generators are constrained through being denied access to the network. The 'unconstrained' planning approach is likely to be inefficiently limiting access because it fails to balance congestion cost implications to generators with network augmentation costs. It is likely that there are instances (possibly many) where it would be economically efficient for a new generator to connect albeit on the basis that it may be occasionally constrained off (i.e. when an N-1 contingency occurs), but they are currently denied the opportunity to do so.

EMCa understands that Western Power has connected at least two wind farms on what has been viewed as an interim constrained basis[24]. It is understood that the connections are supported by a Special Protection Scheme (SPS) called a generator run-back which reduces generation output if transmission circuits become over loaded. Because the new generators are required to reduce output when a constraint would otherwise occur, it is considered that the network continues to meet the N-1 planning standard since, by definition, the generator's output does not exceed the N-1 rating at that time.

Western Power's Technical Rules contain the following statement:

> *"Western Power is required to provide open access to capacity in its electricity transmission and distribution systems. The principal objective of open access is to facilitate competition in the energy industry by allowing independent Generators to supply associated loads by utilising Western Power's networks."*

Under the current Access Arrangements early applicants can gain access to existing network capacity and later projects may face the considerable cost of network reinforcement. If, at the time of a generator application, there are no other projects competing for the available transmission capacity, the first applicant is not placed in the queue. If commissioned, this 'first off the block' project will get access to the existing transmission capacity.

Subsequent generator applications in the same location may trigger the need for augmentation and will therefore be placed in the queue. The subsequent Access Offer made to them may include a significant capital contribution requirement towards meeting the costs incurred by Western power for the augmentation. Early movers can therefore effectively secure access rights to the existing network capacity.

It is difficult to reconcile the above position with open access principles as the effect of the policy is to favour existing generators over new applicants. As renewable generation is likely to be a new applicant and thermal generation is likely to be an existing generator, the current approach can be considered to be a barrier to the achievement of the MRET in WA.

Implications for utilising existing capacity and for augmentation requirements

EMCa considers that the application of the normally unconstrained planning approach to new generator access applications is likely to be "locking up" a considerable amount of what might otherwise be considered to be available capacity. This could provide access to such generators on the basis that it is

[24] We have been informed that both Emu Downs and Walk Away wind farms are connected on a constrained basis with generator run back schemes in operation.

available to them at almost all times and we expect that this could be of considerable value to such generators. EMCa notes that intermittent generators such as wind and solar inherently have uncertain levels of output; we would not expect that a contingent transmission event would significantly alter the risk profile for proponents of such generation.

This approach is also the main driver for the very large augmentation projects referred to above, with an expected total cost of around $1bn. EMCa expects that a reassessment of the planning approach and its application may find that there are efficient opportunities to significantly defer much of this investment.

Implications for existing generators

The normally unconstrained planning approach differs from the NEM, in that existing generators are effectively provided with firm access to the network (at least to an N-1 level of security), and are therefore largely unaffected (in terms of ability to be dispatched) by the connection of new generators. In effect, this policy has created a quasi access right for existing generators which does not apply to intending generators. This is significant in that, in the first place, it differentiates between existing and new generators and, secondly, it does not provide an incentive framework that facilitates new and more efficient generators displacing existing less efficient generators. It could be perceived as being a barrier to such displacement.

Consideration needs to be given to linkages between the network planning criteria, the energy market and the Reserve Capacity Mechanism (RCM).

In discussions with stakeholders and at the AEMC Public Forum[25] the linkage between the unconstrained planning approach and the RCM was raised. It was proposed that the requirement for a generator to have normally unconstrained access to the transmission network is a prerequisite for the allocation of capacity credits to that generator. Without normally unconstrained access, availability of the generator at times of peak energy demand cannot be assured.

EMCa does not agree that the RCM is incompatible with allowing for a generator to be connected on the basis of potentially constrained access. We have noted above the two generators that have been connected on this basis. We understand that the capacity credits for these two generators were not adjusted by the IMO to reflect their potentially transmission-constrained availability. Given that capacity credits allocated to intermittent generation are de-rated in any case (with respect to their nameplate capacity) to account for the intermittency of their output, we consider that the implications of occasional transmission constraints can be handled in the same way.

[25] AEMC Public Forum on the 1st Interim Report on issues relating to the Western Australia Electricity Market 8th May 2009 Duxton Hotel, Perth.

Implications of the net pool

EMCa has also considered whether there are features of the WEM design that drive the perceived requirement for normally unconstrained access. Since the WEM is a net pool, there is an assumption that generation can normally be dispatched to meet its contractual obligations. However the STEM provides a market for parties to adjust their positions and one reason for a generator to need to do so is variation in its output. All generators need to be able to deal with this situation, for example, when they suffer a plant outage. And intermittent generators contract in the WEM, notwithstanding the uncertainty of their output.

Therefore in broad terms, we consider that the market design does not inherently drive the requirement for N-1 access security. However, changes to the basis for generator access will have an interaction with features in the market, and these are addressed in section 4.2.3.

4.2.3 Suggested solution options for consideration

Making better use of existing capacity

Additional transmission capacity can be obtained by:

1. taking actions that release 'free' capacity;
2. investing in capital expenditure projects that build more transmission assets; and/or
3. investing in "transmission substitutes" such as support generation, certain ancillary services or demand management.

EMCa considers that there is a significant potential for transmission network capacity to be made available to renewable generation projects at minimal network cost by relaxing the requirement for normally unconstrained connection. EMCa considers that solutions that release such network capacity may hold significant value and could allow for the deferral for a number of years of expenditure that could amount to many hundreds of millions of dollars and, at the same time, provide a lower network access cost for new generation proponents. EMCa notes the value of such a measure particularly if capital budget constraints limit Western Power's current ability to undertake significant augmentations.

In the sections below, we initially consider solutions that release free capacity before moving on to the more traditional capital investment option.

Allow for constrained connection of new generators

It is possible to consider connecting new generators on a potentially constrained basis thereby enabling some benefits arising from the additional

generation to be realised in the market, while maintaining the current unconstrained access of existing generators.

Generators connected on a potentially constrained basis would need to be required to reduce generation when their injection of electrical energy would cause overloading of transmission assets. These types of arrangements are generally known as generator 'run-back' schemes. It is possible for the control of generator run-back schemes to be either automatic, where the electrical loading on specific transmission lines triggers the run-back if limits are reached, or manual, where the system manager contacts the generator operator and requests reduced generation. The choice of type of run-back scheme will be dependent on the specific characteristics of each application.

As previously noted, Western Power has already applied run-back schemes (special protection schemes or SPS) to recent generation projects currently connected and operational. These arrangements are considered to be temporary; however, to our knowledge, no expiry timeframes have been placed on them. EMCa also understand that the generation projects are located behind major constraints which will take significant capital investment to resolve.

There is substantial international experience developing in the design and use of SPS. In several jurisdictions SPS have been used to increase the capability and capacity of existing networks. Examples where SPS have been used successfully include USA, Canada, Brazil, Sweden and New Zealand. It is likely that the extended use of SPS could benefit the SWIS and enable the connection of future generation without the need to await major network reinforcement.

A significant benefit from allowing for the connection of potentially constrained generation is that it is the generator proponent rather than Western Power that makes the decision on whether to connect on this basis. As it is the generator that sees the full economic consequences of connecting on a potentially constrained basis, they can also make commercial decisions whether to pay for transmission augmentation or enter into bilateral arrangements with other parties, such as, for example, with another generator whose constraint costs may be lower for load management or (with appropriate charging for ancillary services) to bear the cost of an ancillary service which has the effect of easing the constraint.

The connection of generators on a potentially constrained basis has implications for the RCM because generators connected on such a basis may not be able to generate during peak demand periods. EMCa considers that the RCM could be revised to accommodate constrained generation by applying probability analysis when calculating the allocation of capacity credits to the generator, and de-rating them accordingly. This is, in effect, done already when assessing the availability of specific generators.

An additional benefit that may be seen from the adjustment of capacity credits to reflect potentially constrained generation is that locating downstream of a constraint or paying to remove a constraint will enable the

generator to realise an increase in its allocation of capacity credits. This will provide additional economic information for generators when making location and investment decisions and, to the extent that capacity credits reflect the value of capacity in the WA market, will further assist in promoting an efficient generation development sequence.

The connection of potentially constrained generation is currently occurring and it is important that these arrangements are formalised and fully integrated into policy and market rules. It is particularly important that the potential implications for the RCM are understood and accommodated.

A drawback of imposing run-back requirements only on new generators is that it perpetuates the current differential treatment of new generators (compared with existing generators) and may pose a barrier to the displacement of less efficient generators with more efficient new generators.

Reassess planning criteria in relation all generation access

EMCa considers that Western Power's planning standard of N-1 for generation generally[26] could be relaxed without reducing the security standard to consumers. If the security standard for generators was reduced to "N-0" this would mean that if a transmission line was tripped, some generation may be constrained but other market mechanisms are designed to ensure that there is still sufficient available to meet demand.

EMCa considers it likely that if the N-I security standard for generation was relaxed there may be considerable transmission capacity available in the existing assets. EMCa recommends that initial network studies are undertaken to establish the benefits and costs of relaxing the N-1 security standard for generation connection.

This change would affect existing generators and the impact of the change on the existing and new WEM participants would need to be assessed. From a generation competition and industry efficiency point of view, it is important that constraint costs are appropriately signalled to each party so that efficient decisions can be made in regard to new generation, the continued operation of existing generation, the drivers for network augmentation, energy contracting and contract risk and with regard to generation dispatch.

There are costs associated with the introduction of potentially constrained generation. However, given the (approximately) $1 million per MW price tag for some transmission augmentation, we consider it likely that the transmission capacity released by the use of SPS and security constrained dispatch management tools will be considerably lower.

[26] Or, at least, below the 600MW threshold currently set in the Technical Rules, presumably on the basis of being the largest tolerable contingency event.

EMCa recommends that the WEM stakeholders undertake a full cost benefit analysis on the options for moving away from the current normally unconstrained access approach.

Dynamic line rating

The capacity of transmission circuits is determined by thermal ratings. The ratings are set to avoid transmission lines breaching tolerances between the lowest point of sag in a line and the ground. Ambient temperature is an important variable that can affect the sag of a transmission line. To take variations of temperature into account it is normal practice for summer and winter ratings to be applied. However, simple seasonal ratings can be very conservative as ambient temperatures can vary considerably between day and night and depending upon prevailing weather conditions.

Dynamic Line Rating (DLR) is being used on some networks to release significant additional existing network capacity. EMCa understands that between 10 and 20% additional transmission capacity has been gained in Tasmania since the introduction of DLR on a proportion of its high voltage transmission circuits.

Given that wind has a cooling effect on transmission lines it is likely that at times of high wind generation output, the ambient conditions are much lower than the rating design ambient temperatures. EMCa understands that, when undertaking system studies for wind farms, Western Power assumes the worst conditions (i.e. summer peak temperature). It may be possible to connect further wind generation to the network by adopting a more dynamic approach to transmission line ratings.

Other technologies such as fast acting transmission systems (FACTS) that utilise high voltage electronic components to manage energy flows on networks are becoming commonplace. These technologies can enable networks to be managed dynamically and release additional capacity from existing assets.

WEM balancing implications with potentially constrained generators

In the WEM net pool arrangement, security constrained dispatch would mean that generators that were constrained would face deviation charges when their output was constrained below their contracted (or STEM) quantities. The quantum of deviation charges would depend on the extent to which a generator was unable to foresee a constraint at the time of making its STEM offer. Nevertheless, deviation charges would effectively take on a new role as quasi congestion charges. This could be an advantage, from the point of view of market efficiency, since it can be seen as a mechanism for signalling congestion costs. This would provide a cost reflective (economic) charge to generators for being located behind a constraint.

Because they were not designed for this role, we suggest that the structure and quantum of deviation penalties be reviewed to ensure that they do not

produce any significant distortion to efficient dispatch and efficient energy contracting and risk allocation. This would also be the appropriate time to consider whether there was any value in introducing locational and/or dynamic elements to deviation charging.

System management implications with potentially constrained generators

The increased use of multiple SPS on a network would require careful design and operation. There will be a limit to the number of SPS that can be installed on a network but the use of this technology can produce significant gains in capacity prior to major capital investments being made.

Allowing for constrained generation in system management would involve additional system management costs. A constraint management tool, featuring a network model and constraint equations would be required. Additional operator resources and skills would be needed in order to manage dispatch on dynamically based network capacity.

A study will be required to establish if the current dispatch tools used in the SWIS are adequate, or if an alternative constraint management tool is required. It should be noted that full network models for dispatch purposes (as opposed to sets of dispatch model constraint equations) are now quite common and developing these for the SWIS (if necessary) should not present significant issues. EMCa understands that Western Power System Management currently has an alternating current (a.c.) network model, though use of this for dispatch purposes would be unusual (because of the time to solve) and a direct current (d.c.).model would typically suffice.

Operating a constraint management system is likely to require some additional System Management resourcing. However, it will lead to System Management developing a higher level of awareness of the dynamics of supply, demand and network interactions. Increasing knowledge of the system dynamics will assist System Management in being able to identify further opportunities to improve the efficiency and security of the system and to provide more valuable input on system planning options.

Build transmission assets to remove the constraints on generation connection

As loading on a transmission network increases, it is inevitable that the time will come when capital investment in transmission assets has to be made. The significant cost of major transmission network investment generally means that allocation of the total capital cost to one single generation project does not make commercial sense. In the case of the two 330kV upgrades under consideration, the SWIS the price tags of around $600 to $800 million and $230 million would be hard to justify for a single generation project, especially given the typical scale of a renewable generation project.

In the absence of a single party willing to pay for these major capital investments Western Power must propose the investment under the regulatory framework.

Moving to define access as being on a potentially-constrained basis, would give generators a clearer perspective on the system costs of constraints and the value of easing them. This would assist in assessing the value of network augmentations. It would also assist participants in the WA market if they wished to explore other means of easing constraints and could lead to further market efficiencies.

While the primary options suggested in this section could reduce the need for network augmentations, nevertheless, network augmentations are likely to continue to be required and justified. In Section 4.3 we discuss the network augmentation approval process and suggest some ways in which this could be improved.

4.3 Augmentation approval processes

4.3.1 Current processes for regulatory approval of augmentations and deep connections

When a generation project that is in the queue triggers the need for deep network augmentation, the proponent of that project must await an Access Offer from Western Power. The Access Offer will include the costs of shallow connection (which we covered in section 3) and the cost of network augmentation (or "deep connection"). Under the Access Code, network augmentations are subject to two approval processes. Proposed major transmission investments must first pass the Regulatory Test (Chapter 9). And all network investments need to pass the New Facilities Investment Test (NFIT), which is a requirement under Chapter 6 of the Code, in order for Western Power to be able to add the investment cost to its regulatory asset base. This test also affects the level of capital contributions allowed for by the regulator.

Regulatory Test

If a proposed transmission augmentation exceeds $30m[27], then it must be assessed according to the Regulatory Test which is described in Chapter 9 of the Code. The Regulatory Test is defined as follows:

[27] Or if a distribution augmentation exceeds $10m

> *9.3 The **"regulatory test"** is an assessment under this Chapter 9 of whether a proposed major augmentation to a covered network maximises the net benefit after considering alternative options.*
>
> *9.4 A **"net benefit after considering alternative options"** means a net benefit (measured in present value terms to the extent that it is possible to do so) to those who generate, transport and consume electricity in the covered network and any interconnected system, having regard to all reasonable alternative options, including the likelihood of each alternative option proceeding.*

Western Power must not commit to a major augmentation unless the regulator considers that the test has been satisfied.

From Western Power documentation and from discussions, it appears that this test is being assumed to be essentially a test that the best option has been chosen out of a range of options that are considered[28]. In other words, it appears that the test is being interpreted as a test as to whether the chosen investment option has the greatest net benefit, albeit that net benefit may be negative, and not as a test as to whether there is expected to be a net positive benefit from the investment.

Since Western Power cannot commit to a major augmentation unless it satisfies the Regulatory Test, we would assume that it could not make an unconditional Access Offer where that access would require such an augmentation.

EMCa notes that there is provision in Chapter 9 of the Code to expedite, modify or waive the Regulatory Test, where the regulator forms the view in a particular instance that applying the Regulatory Test would be inconsistent with the objectives of the Test, as set out in the Code. However, it would be a concern if this clause was to be invoked as a matter of course, effectively to overcome deficiencies in the main provisions of the Code, and doing so would add to uncertainty for generation proponents.

New Facilities Investment Test (NFIT)

Requirements for a New Facilities Investment Test (NFIT) are set out in Sections 6.51A and 6.52 of the Code. The NFIT is a test that in effect authorises the addition of the new facilities investment cost to Western Power's regulatory capital base. The clause which enables this is as follows:

> *6.51A New facilities investment may be added to the capital base if:*
>
> *(a) it satisfies the new facilities investment test; or*

[28] For example, we refer to page 17 of Western Power's Transmission and Distribution Annual Planning report

(b) the Authority otherwise approves it being adding to the capital base if:

(i) it has been, or is expected to be, the subject of a contribution; and

(ii) it meets the requirements of section 6.52(a); and

(iii) the access arrangement contains a mechanism designed to ensure that there is no double recovery of costs as a result of the addition.

The NFIT itself contains provisions which, first, are aimed at ensuring that the costs are efficient. Then it must satisfy one or more of the following conditions[29]:

(i) either:

A. the anticipated incremental revenue for the new facility is expected to at least recover the new facilities investment; or

B. if a modified test has been approved under section 6.53 and the new facilities investment is below the test application threshold – the modified test is satisfied;

or

(ii) the new facility provides a net benefit in the covered network over a reasonable period of time that justifies the approval of higher reference tariffs; or

(iii) the new facility is necessary to maintain the safety or reliability of the covered network or its ability to provide contracted covered services.

A further clause (6.57) allows the NFIT to be applied to part of an investment, with only that part that satisfies the NFIT being recoverable as part of Western Power's regulated capital base. However, read in conjunction with clause 6.51A, it appears that the total costs of an augmentation are assumed to be able to be split, so that a component of the cost can be assessed as passing the NFIT (either because it is effectively covered by the anticipated incremental revenue or because it provides a net benefit) and the remainder is assumed to be recovered through capital contributions.

Under clause 6.51A all of the investment cost is currently added to the capital base, regardless whether it is funded through contributions or through Network Access Charges. This does not currently lead to "double recovery" of the cost, as the capital contribution is currently treated as revenue (for the purposes of the allowable revenue cap under the Access Arrangement), and this is consistent with clause 6.51A(a)(iii).

[29] Part of clause 6.52

It is not necessary for a project to have been assessed by the regulator under the NFIT, before Western Power commits to the project. If Western Power makes an Access Offer which requires a network augmentation (which is likely in most cases), then we understand that Western Power then needs to make its own assessment of the amount of that investment that it would expect to be able to recover under the NFIT, and include in its Access Offer a capital contribution requirement for the balance. If, subsequently, a different amount is assessed as being recoverable under the NFIT, then Western Power will have either over- or under-recovered through the capital contribution.

4.3.2 Implications – why is this issue important?

Investment approval

The two tests (where applied) largely determine whether an augmentation can be made, the nature of that augmentation (in relation to any alternative augmentation options and any alternatives to augmentation itself) and the capital contribution chargeable for that augmentation. Since some network augmentation will frequently be required (even if the measures suggested in section 4.2.3 for freeing up some existing capacity were to be implemented), the effectiveness of these tests is clearly of paramount importance.

The intention of the regulatory test and the NFIT are both to provide a degree of prudency to Western Power's investments and "...*to minimise delay to projects and other developments; and administrative and regulatory costs; and any other barriers to the entry of generators and consumers into the electricity market*[30]...". However we consider that there are aspects of these requirements that are currently not assisting with this objective.

Issues with the Regulatory Test

It is not entirely clear to us that the Regulatory Test is only an assessment of options and not a test as to whether an augmentation has a positive net benefit. If it does require an assessment of net benefits, then we consider that there are significant challenges in determining them in the WA market; since the Code requires an assessment of the net benefits to " *.those who generate, transport and consume electricity....*", the assessment (for the connection of a generator) largely needs to be based on the costs and value of that proposed generation plant, together with an assessment of any "competition benefits" that the generator may bring to consumers and (potential) cost savings in transmission elsewhere in the system (if any).

[30] Access Code, Clause 9.1(c)

EMCa would expect that assessing the first of these components would be extremely challenging for Western Power and would either require access to the generator's business case or it would require an expert to undertake a proxy generator viability assessment. In order for the project to pass the net benefit test, it appears that Western Power has to demonstrate that economic benefits would arise if the project was commissioned. In order to demonstrate market benefits, Western Power would need access to prices and market modelling so that the impact on market prices of the additional electricity generated could be calculated. These types of calculations are feasible in a gross pool where a marginal price for all generators is discovered and published. In a net pool such as the WEM where prices are largely hidden in commercial contracts, it is particularly difficult to determine a market benefit for removal of a constraint. However, economic analysis should be able to reveal the long run cost for specific generation and develop a basis for determining net benefit for a capital investment project in transmission.

Issues with the NFIT

EMCa understands that under the NFIT, it is likely to be unusual for an augmentation required for new generation to be able to pass the test based on incremental revenue alone (i.e. clause 6.52(b)(i)A). This is essentially because generator UOS charges are relatively low, and comprise around 20% of total UOS charges (with the remainder going to loads). Therefore an assessment of net benefit would tend to be also the binding part of the NFIT for augmentations driven by new generation and the same issues, described above, would apply.

EMCa understands that investment proposals submitted for approval under the NFIT are considered by the ERA on a project by project basis. In order to progress larger network investments, it may be necessary to consider a grouping of associated projects as these may produce an overall net benefit whereas each project, considered individually, might not.

Challenges with the Code augmentation test provisions

Western Power faces challenges when determining net benefits for generation-driven augmentations under the Code. Without clarity in the specification of this requirement, there would appear to be a risk that augmentations required to enable access for generators might take considerable time and require a large amount of effort. Further, any capital contribution offers that Western Power makes, prior to an NFIT on the relevant augmentations, might subsequently turn out to differ materially from the residual cost that arises once the regulator has determined the portion of the cost that meets the NFIT.

Summary of issues

EMCa considers that the Regulatory Test and the New Facilities Investment Test provide a broadly appropriate framework for the evaluation and regulatory approval of transmission capital investment projects. However, we consider that some aspects of the tests, which are most relevant to augmentations that are driven by new generation, do not seem to be appropriate or easily workable. Most notably, this involves the assessment of net benefits to market participants.

EMCa also considers that there is a lack of clarity in regard to some aspects of these tests. For example: whether it is intended that the Regulatory Test not consider if an investment has an overall net benefit; and the apportionment of costs between those that meet the NFIT and those to be recovered through capital contributions.

4.3.3 Suggested solution options for consideration

Reviewing regulatory test processes

While we note that some provisions of the current Code were amended as recently as November 2008, we recommend that the provisions relating to the Regulatory Test and the NFIT be reviewed to assess their workability specifically for new generation, taking account of the issues identified above.

It is not clear that the Code necessarily needs to be altered; however, if it is not, then we at least recommend that the ERA and Western Power work together to develop guidelines for both tests. These guidelines will assist Western Power to efficiently and effectively prepare augmentation test submissions for approval by ERA and will give generation proponents a clearer idea of the information that they could most usefully provide to Western Power to assist with augmentation approvals processes that affect them.

4.4 Charging for augmentation and other deep connection costs

4.4.1 Current process for charging for augmentations and deep connection costs

In the previous section we outlined the NFIT and noted that this includes consideration of the costs of an augmentation and which parties incur those costs (i.e. either through Capital Contributions or through the costs being

rolled into Western Power's capital base and becoming part of a tariff reset under a subsequent Access Arrangement).

Network Access Charges

Under the Access Arrangement, Western Power charges Network Access Charges to generators. Western Power's current Network Access Charges for generators are set out in the 2008/09 Price List. The applicable tariff for generators is the TRT2 Transmission Entry Service Tariff. TRT2 has five components:

- a user specific Connection Charge reflecting the cost of providing connection assets (capital or non capital costs);
- a location-based Use of System charge (TUOS) calculated by multiplying the applicable $/kW/annum price at the relevant connection substation by the declared sent-out capacity (DSOC). The substation-based TUOS charges provide a capacity-based sunk cost recovery price based on location. The rate is reset annually based on system load flow analysis;
- a capacity-based Control System Service Charge calculated by multiplying the generator nameplate rating by a specified (common) control system price;
- a fixed Metering Charge per revenue meter; and
- an Excess Network Usage Charge, that applies where the peak half hourly output exceeds the nominated DSOC during a billing period.

Of these charges, the Connection Charge (together with any capital contribution) is intended to cover connection costs, which we covered in section 3. The Control System Service charge, Metering Charge, and Excess Network Usage Charge are each relatively small.

TUOS is the main tariff-based charge to generators. As stated in the Access Arrangement Information, generator TUOS is calculated from a cost pool that comprises 20% of the system costs. It results in charges which range (other than for Geraldton GT) from $4.701/kW/year to $10.376/kW/year[31]. Therefore, a 100MW generator would be charged in the range of around $470,000 to $1m per year[32] for network access.

[31] The charge at Geraldton is $1.823/kW/year.

[32] As indicative context, we would expect that the capital costs of a wind farm of this size would be around $250m to $350m.

Capital contributions

The capital contributions that Western Power can seek in its Access Offers are calculated as the difference between the estimated cost of the network augmentation that is assessed to be required to provide access to the prospective generator and the NPV of the revenue that Western Power estimates that it will receive from that generator.

In regard to network augmentations, the relevant incremental revenue is largely that obtained from the TUOS charges described above. It can be seen that these amounts are relatively modest in comparison with the capital cost of the generation and the likely costs of typical network augmentation[33].

Western Power's capital contributions policy recognises a range of possibilities and allows for Western Power to make adjustments in determining charges to include in its Access Offers, following system studies and costing of augmentation projects. These include:

- Apportioning only Western Power's assessment of the minimum required asset(s), regardless whether Western Power builds to a higher level;
- Apportioning costs between current applicants, and also between these applicants and Western Power's assessment of future applicants who might utilise the same assets;
- Where Western Power had already planned to build such assets, only charging the cost the cost of "bringing forward" those assets.

While Western Power calculates capital contributions as described in its Capital Contributions Policy, these calculations are in effect based on assumptions regarding the amount of the augmentation cost that will pass the NFIT.

4.4.2 Implications – why is this issue important?

Locational signals in charging new generators

Western Power's TUOS pricing includes a locational charge to generators. Because this is based on sunk costs (allocating proportionate use of the existing network) it does not provide a forward-looking economic locational signal; rather, it can be considered more as an equity-based charge which reflects the relative usage of the current system.

[33] While this would vary considerably and is totally situation-specific, we would expect this to typically amount to tens of millions of dollars for a moderate-size or larger wind farm.

The generator TUOS tariffs lie in a relatively narrow range and we consider it unlikely that they produce significant economic distortion. EMCa considers that they are typically likely to be less than is required to cover the costs of augmentation, and therefore (under Western Power's capital contributions methodology) the forward-looking economic costs of augmentation will tend to dominate and therefore provide appropriate locational signals.

EMCa considers that, in principle, charging for specific augmentation costs does provide an appropriate locational signal in a scenario where a single new generator is seeking access and making a locational decision. Our concerns relate to the way in which multiple prospective generators are charged for augmentation. These issues relate to the interaction between the capital contributions policy as described below and the queuing policy, as described in section 3.

Capital contributions policy

Western Power's Capital Contributions Policy sets out how network augmentation costs are allocated between parties connecting to the network. The policy is produced by Western Power and approved by the ERA. From a new generator's perspective, there is uncertainty and therefore risk concerning establishment of the level of contribution that is required to be made and how future rebates will be applied. Given that the amounts at stake could be considerable, such uncertainty can present real challenges and therefore barriers to the development of new generation projects.

The uncertainty regarding calculation of the level of capital contribution is due to the lack of clarity as to how the NFIT is applied in practice. In particular, it is not clear how benefits arising from the connection of a new generator can be established accurately and used as an input to the net benefit test. If the inputs to the NFIT are not accurate, then the cost allocation made to the generator for a capital contribution may be inappropriate. It is difficult to see how a project proponent could predict the outcome of the NFIT and determine the basis for any challenge that could be made on the outcome.

As noted in section 4.4.1, capital contribution requirements are calculated as a residual after taking account of incremental revenue derived from TUOS. Because TUOS tariffs are calculated based on load flows, future TUOS charges may change radically as a result of the new generation being connected. It is not clear whether, or how, Western Power takes account of this or, if so, whether a consistent policy is applied.

In its Capital Contributions Policy, Western Power sets out the intention that a fair allocation of capital contributions will be made where there are multiple users of transmission assets. This may provide the current generation project proponent with some possibility that, if others connect at some point in the future, a rebate of a proportion of the original capital contribution will be made. However, there is no certainty that this will occur and the basis for calculating such a rebate is not set out clearly.

Moreover, it appears that capital contributions policy relating to multiple users of augmentations (namely, that the costs of such augmentations are shared between affected applicants) may be inconsistent with the application of the queuing policy in which augmentation costs are attributed incrementally to each applicant based on their position in the access queue. EMCa considers that the Capital Contributions Policy in regard to augmentations is not clear on how the issues described above are resolved and the considerable impact of discretionary factors provides little certainty for a prospective generator as to how the network-related charges in its Access Offer will be determined.

Risk and inefficiency

The above issues produce uncertainty and risk for prospective generation projects and may present particular challenges to renewable generation that is located in remote areas and is likely to be closely located to other generation projects.

In addition, the value of being a first mover in advance of the queue may be beneficial to the proponent if rights to existing transmission capacity are secured.

In our view, these issues are brought into focus by the size of the queue and the relative ease with which project proponents can obtain a place in the queue. It seems most unlikely that any more than a modest proportion of the projects in the queue will proceed within the foreseeable future, since in aggregate, they exceed the entire current demand in the state. This means that offers are being made based on what is, in effect, a notional commissioning sequence that is most unlikely to occur; therefore it would appear most unlikely that the offers reflect the true costs as they will turn out to be.

Further, it would be only by chance that the applications queue was ranked in increasing cost order. Therefore the augmentation charging process may well be leading to high cost generators receiving low-cost (or zero cost) augmentation offers because they are higher in the applications queue. This is likely to lead to an inefficient generation development sequence, for the same reasons as were described under “shared connections” in the previous section.

In short, while the current policy is intended to provide direct cost signals to generators through charging on a causal “user pays” basis, the way that this policy is operated through the queue mechanism is most unlikely to be leading to economically efficient generation developments.

4.4.3 Suggested solution options for consideration

Clarifying the capital contributions policy for deep network augmentation

EMCa understands, from discussions with Western Power, that the rebate scheme applied to capital contributions for shallow connection is also applied to deep connection. This means that any capital contribution made by a proponent towards network capacity over and above that required by the project, would be rebated in a way that charges future new connections to the network (if and when they arise) for their share of the use of that capacity.

Having reviewed Western Power's Capital Contributions Policy, we consider that it is unclear how the rebate scheme is consistently applied in the case of deep connection. Establishing the rights to rebates, how they are calculated and applied in practice is important information for prospective generators.

EMCa recommends that Western Power's Capital Contributions Policy is reviewed and the rebate arrangements for capital contributions for deep network augmentation are set out formally and clearly.

Reviewing policy of charging based on assumed augmentation causality

A further option to consider would be to move away from charging for network augmentations on an incremental project causal basis and, instead, to develop charges to apply on a common basis to all potential beneficiaries of a particular augmentation. This approach would be most suitable when applied to large, lumpy network investments which could not be justified on a project-by-project basis. This approach is similar to the NERG process that the Commission has already proposed for shared connections: there would need to be an independently-verified assessment of need for a project and a set of charges (which may be a published schedule of capital contributions or ongoing tariffs or some combination) that would be offered to all potential generators that the augmentation would enable. Access security levels would also be made clear in the published schedule.

As with the NERG concept, it is likely that Western Power or, through agreement with the regulator, its customers would effectively underwrite a manageable and recognised level of risk in regard to the level of generation development that then arises to utilise the augmentation. The underwriting risk could be reduced by waiting until a certain level of augmentation capacity was subscribed, before committing to the augmentation.

This option would considerably reduce risk to generation proponents and would provide more transparent information to the marketplace, allowing potential generators to better assess their viability. Most importantly, by providing access offers on a common basis to generators that are equivalent in terms of location, an efficient generation development sequence is

facilitated as those more viable generators proceed to develop and less viable generators would not enter the commitment process.

A further extension of this option is the "Generation Park" concept that Western Power has put forward, and which we comment on below.

Locational capacity credits as a possible mechanism for signalling locational cost implications

The quantity of capacity credits allocated to generators is currently adjusted to reflect the likely availability of that generator and the contribution that will be made to the security margin. Wind generation, for example, is adjusted downwards to reflect the intermittency of its output[34].

As discussed in section 4.2.3, if constrained access is granted to individual new generators, or if a potentially constrained planning standard is applied to generators, then a review of the allocation of capacity credits will be required. If, as a consequence, adjustments were made to reflect potentially constrained generation, then by implication, the capacity credits would contain a locational signal because generators located in a constrained part of the network would see a reduction in their allocation of capacity credits.

If a constrained (N-0) planning standard were not adopted, consideration could still be given to the implementation of a regionally based capacity credit allocation. Such a scheme would provide either increased quantities or increased value for capacity credits in a region with plenty of free network capacity. Regions with tightening capacity would have reduced quantities or a reduced value applied to the capacity credits available to generators located there.

A regionally based capacity credit scheme would be a significant modification of the current capacity credit mechanism in the market and there would be significant scheme design and administrative challenges to be addressed. Essentially, the RCM has been designed as an energy capacity market mechanism and it would be a significant, but not impossible, change to use this to also signal the availability of transmission network capacity.

On balance, we consider that introducing a regionally based capacity credit scheme while still maintaining an N-1 planning standard would be a somewhat artificial means of attempting to introduce locational signalling. The preferred route would be to create a more open planning standard for access, with adjustment of capacity credits then being required as a natural outcome of any constraints that arise. EMCa considers that this approach is likely to produce a more effective solution than using centrally-assessed

[34] It is noted that the current adjustments made to wind generation are considered to be generous and there are indications that the IMO will be revising adjustments for future applications for capacity credits from wind generators.

regional adjustments to capacity credits as a proxy for incremental transmission costs.

Generation parks

Western Power is considering an option to make capital investments to avoid potential future constraints in its network in regions where a significant primary energy resource has been identified. For example, an area of high potential for the establishment of multiple sites for wind generators would qualify. Western Power is calling such a region a Generation Park.

A Generation Park can be seen as a means of grouping projects by location and building transmission capacity to connect them.

In order to facilitate the swift development of Generation Parks, Western Power would build transmission capacity into a region on the anticipation that the generators would build if transmission capacity was available.

The regulatory framework under which Western Power would make capital investments to support Generation Parks is set out in the Regulatory Test and the NFIT (see section 4.3.1). Under the NFIT, Western Power would need to demonstrate that the investment was paid for under incremental revenue, or required to meet reliability standards, or have a net benefit. It is likely that proposed capital investments for Generation Parks would need to demonstrate net benefits before the assets could be included in Western Power's Regulatory Asset Base (RAB). If the capital investment project did not demonstrate net benefit then all, or a proportion of the capital costs, would need to be charged as contributions from the prospective generators.

It is difficult to see how Western Power would be able to invest in augmentation for a Generation Park if it could not demonstrate that a net benefit would be delivered. While this is an appropriate outcome for the economic limb of a regulatory test for network investment, as noted (in section 4.3) there are significant challenges in Western Power assessing net benefits for generation-driven projects in particular, given the net pool-based design of the WEM.

The development of the Generation Park concept will be dependent on Western Power's desire and capability to undertake planning and produce submissions for approval.

Regulatory transparency and consistency across all aspects of Western Power's Access Arrangements and Capital Contributions Policy would be helpful. If inconsistent approaches in making approvals occur, then the perception of increased regulatory risk will produce a more conservative approach from Western Power and may reduce its appetite to take on innovations such as the Generation Park concept. It may be desirable for the ERA and Western Power to consider working on the development of a pilot Generation Park project that will establish how the regulatory approvals framework would apply in practice.

EMCa considers that the Generation Park option is worthy of further consideration. There is potential for net benefits and increased connection of renewable generation to be realised.

4.5 Summary of suggested measures for closer consideration

4.5.1 Managing generator access constraints

Allow for constrained connection

Allowing the connection of potentially constrained generation is likely to realise significant benefits in terms of making better use of existing network capacity, allowing economic generation to be built and reducing queue length, thus improving economic efficiency. If constrained connections are more generally allowed then the quantity of energy available to the market will be increased and this should place downward pressure on prices, to the benefit of consumers.

EMCa considers that the basis on which potentially constrained generation is currently connected is not clear and that the implications for the RCM have not been fully considered. As the connection of constrained generation is occurring (e.g. using run-back schemes), it is important that these arrangements are formalised and fully integrated into policy and market rules. It is particularly important that the potential implications for the RCM are understood and accommodated; changes made to this subsequent to significant investment by generators could have a considerable risk and wealth transfer effect.

EMCa recommends that a review is undertaken to ascertain the current and future potential to connect generation on a potentially constrained basis and the implications of this for System Management and for elements of the market, such as the RCM.

Reassess application of planning standard in relation to generation access

EMCa considers that relaxing Western Power's planning standard of N-1 for generation has the potential to release significant additional transmission capacity without the need for major capital investments, thus reducing Western Power's funding requirements and the significant augmentation costs currently imposed on new generators. The current N-1 standard for generation appears to be the most significant constraint on the connection of new generation including renewables.

This option also represents a change to the basis on which existing generation has access to the existing network. It therefore has implications for how these parties operate in the market, including their contracting and dispatch strategies. It would place existing and new generators on an equivalent footing and would provide genuine "open" access.

There are upfront and ongoing cost implications for this option due to the need to develop a more proactive real time approach to constraint management. There is also the need to consider the implications of the revision on the RCM. A full cost benefit analysis will be required prior to any changes being implemented. However, given the scale of network augmentations that are currently being assessed and the amount of registered interest in renewable generation, we consider it likely that the extra cost and complexity of managing the system on a constrained basis would be justified.

EMCa recommends that the current planning standard is reassessed with a view to reducing the standard to N-0 for generation. A full cost benefit analysis should be completed before implementing any changes to the planning standard.

4.5.2 Augmentation approval processes

Reviewing regulatory test and cost allocation processes

To the extent that regulatory and investment return risks exist, these would be significant barriers to developing network augmentation solutions. They are also therefore a barrier to the connection of renewable generation and the achievement of the MRET in WA.

It is our view that the Regulatory Test and the NFIT provide a generally appropriate framework for assessing network investment proposals. However EMCa has concerns that the application of these tests may be leading to uncertainty which may be delaying development and submission of investment proposals. In particular, we have concerns with the Net Benefits arm of both tests; its interpretation; and the difficulties that Western Power must face in undertaking such assessments for augmentations that are driven by new generation access requests.

EMCa recommends undertaking a review of the Net Benefit arms of the Regulatory and New Facilities Investment tests, with respect to their application to generation-driven augmentation requirements. EMCa suggests that this review should be open to changes to the tests themselves but, at a minimum, we suggest that there needs to be greater transparency in their application through the development of regulator-approved guidelines as to how they function for the purpose of assessing generator-driven augmentations.

4.5.3 Charging for augmentation and other deep connection costs

Clarifying the capital contributions policy for deep network augmentation

EMCa recommends that the Western Power Capital Contributions Policy is reviewed and that the rebate arrangements for capital contributions made for deep network augmentation are set out formally and clearly.

Reviewing policy of charging based on assumed augmentation causality

EMCa recommends that a reassessment is undertaken of the current method for universally assessing transmission augmentation requirements for each project incrementally, and making connection offers which include capital contributions based on the assessed incremental augmentation costs that relate to each generation project. EMCa recommends that consideration is given to an approach of making published access offers, based on selected augmentation projects proceeding, such that all new generators that used those facilities would be charged on a common basis.

Network development could proceed on a "subscription" basis or this concept could be further extended to the "Generation Park" concept of proactive network augmentation, such as Western Power has proposed. Such projects would be subject to independent planning and regulatory assessment; some review of the current processes would be warranted, to ensure that they provide the appropriate disciplines on speculative investment, and the appropriate allocation of risk between Western Power, initial and subsequent generators.

Locational capacity credits as a possible mechanism for signalling locational cost implications

The RCM is an energy capacity market mechanism and does not appear to be ideally suited to signal the availability transmission network capacity. Complications that are likely to arise if locational based capacity credits were introduced may compromise the effectiveness of the RCM and its role in the energy market.

EMCa does not consider that further work should be undertaken to develop a regionally based capacity credit mechanism.

However, we considered that a locational dimension to capacity credits will emerge if non firm generator connection is adopted. Consideration will need to be given to the changes that would be required to the RCM to accommodate potentially constrained generation.

Generation Parks

The development of the Generation Park concept will require consideration of the risks and incentives on the different parties, and the development of regulatory processes to provide an independent assessment of projects and of the proposed charging and risk allocation.

EMCa considers that the Generation Park option is worthy of further consideration. There is potential for net benefits and increased connection of renewable generation to be realised.

4.5.4 Solution development and implementation responsibilities

The proposal to apply an N-0 planning standard to generation would require the greatest solution development and implementation effort of any of the options proposed. However we consider that the benefits are also the most substantial.

This work would need to involve all stakeholders in the WEM, since it has implications for Western Power (both Network and System management), the IMO, existing and future market participants. It does not appear to require changes to the Code, since it appears that Western Power can change the Technical Rules with the agreement of the regulator.

EMCa suggests that the first step would be to undertake a preliminary cost benefit and feasibility assessment. This would include defining the issues that would need to be addressed (with stakeholder input) and developing a work program to consider and resolve those issues.

Reviewing the Regulatory Test and NFIT are largely matters for Western Power and the regulator, with input from stakeholders.

EMCa envisages that changes to augmentation charging and, in particular, developing the concept of Generation Parks, would be largely driven by Western Power, though we consider that it would be useful for the regulator to provide initial input to the scope and objectives of this work. EMCa considers that the concept would lead to the development of a new regulator-approved Western Power policy and may require some changes to the Code.

5 Conclusions and next steps

5.1 Introduction

In this section we summarise the main areas where we consider that network-related aspects of the Western Australian electricity market framework are creating a barrier to the deployment of increased renewable energy resources. We summarise the series of measures that we propose for consideration in this market, as discussed in the body of this report. EMCa considers that measures such as these would significantly assist in reducing generator entry barriers and would facilitate efficient development of all new generation, in conjunction with making most efficient use of existing generation.

Main issues and their inter-relationship

Much has been made of the length of the applications queue that Western Power administers and the delays to generation proponents that this implies. While EMCa considers that there are ways in which the connection applications process could be revised to better support the connection of generators in an efficient sequence, to a large extent we consider the queue to be a symptom of more fundamental issues related to the recognition and treatment of constraints in the WA transmission network. We consider that the most beneficial measures will be those that address this underlying cause.

EMCa considers that Western Power's unconstrained planning policy can be viewed as being at the centre of connection queuing and access issues. We consider that a change to this policy, which would align Western Power with other jurisdictions in the region, would free up a considerable amount of existing network capacity at minimal cost. This would clearly facilitate the provision of access to renewable generators, while also allowing Western Power to make best use of limited capital funding resources. It would also

effectively place new and existing generators on the same footing, which is not the case at the moment.

Implications of this change would need to be considered and addressed: this would include ensuring that implications for existing generators are well-understood and considering some market-related changes (such as to the RCM) and some system management-related changes.

Summary of proposed measures for consideration

In section 5.2 we outline three measures that can be taken in regards to the connection process. These measures address issues that were broadly categorized as "B5" in the Commission's 1st Interim Report:

- Improving market information, including information on the applications queue itself, on constraints and on augmentation costs;
- Modifying certain aspects of queuing policies and procedures;
- Reviewing the approach to allowing for shared connections.

In section 5.3 we outline the measures that we consider would best address the underlying causes of application delays, namely improving the basis on which access to the transmission network is provided. These broadly relate to the "B6" issues previously identified by the Commission. The measures are:

- Releasing free capacity from the existing network. We recommend that three measures are considered:
  - Allowing new generators to connect on a constrained basis;
  - Relaxing the unconstrained planning criterion;
  - Taking steps to optimize line ratings;
- Improving the augmentation regulatory approvals processes;
- Reviewing methods for charging for augmentation.

5.2 Improving connection processes

EMCa considers that the first come, first served methodology for queue prioritisation is leading to the inefficient application of network planning resources and significant delays in bringing new sources of renewable energy to market. By improving project prioritisation, the number of projects in the queue can be reduced and planning resources can be better targeted at the highest value projects in the queue.

EMCa has considered three measures that would assist in reducing the time taken to assess and connect new generation projects that are lodged in the queue, and would assist in dealing with shared connections, opportunities for which are likely to be more prevalent with renewable generation.

5.2.1 Improve market information

When generators apply for connection of a new project they face uncertainty regarding both the timing and final costs they will face. Improvements and additions to the information provided to potential project proponents could assist in reducing the number of speculative projects entering the queue. This could include improvements to make the queue visible to prospective applicants. Providing details of system constraints, augmentation timeframes and indicative capital contribution costs would assist proponents to assess the viability of their projects at an early stage.

5.2.2 Modify queuing policies and procedures

A combination of disaggregating the queuing process on a regional basis, assessing project value and restructuring the application charging regime could prove valuable. The addition of an annual maintenance application maintenance fee could provide an incentive for projects that are making slow progress to be removed from the queue by the project's proponent.

5.2.3 Review approach for shared connections

It is logical to consider areas where multiple generator projects are likely to occur on an aggregated basis. Undertaking network studies on a generator by generator basis is likely to lead to inefficient outcomes. Undertaking such studies and calculating capital contributions for shared connection and deep network augmentation will lead to more efficient outcomes if undertaken on an aggregated basis rather than on the basis of individual generation projects. Project timing differences may present a challenge but understanding and managing these issues is core business for an electricity network provider.

For connection asset augmentation where multiple generator connections are likely, a common approach in both the WEM and NEM is considered to be possible. EMCa recommends that a common approach is considered.

5.3 Improving access to the transmission network

5.3.1 Release 'free 'capacity from the existing network assets

EMCa considers that there are three opportunities to release what is in effect "free" capacity from the existing network. Western Power has already applied the first of these – connecting new generation on a constrained basis - and we suggest that there is a need to address the implications of doing this if it was to be established as a part of policy. The second and much more significant measure, in terms of benefit and also in terms of its implications, would be to relax the current unconstrained planning approach and to coherently address mechanisms for signalling and managing constraints in the WA market. A third measure would be to review the methods by which line ratings are set and managed.

Allow new generators to connect on a constrained basis

Recent wind generator connections have been made on a potentially constrained basis through the use of generator run-back schemes that protect against network circuit overloading if constraints occur. Such schemes can enable some new generators to be developed and to access the network sooner and at somewhat lower costs than they could in the absence of such schemes.

We consider that there is merit in considering formalising policy in relation to such connections. However there are also implications, such as for system management and for the RCM, which we believe have not yet been fully addressed and would need to be if this was to become a policy.

EMCa remains concerned about the differentiation between new and existing generators that is inherent in such schemes and the lack of economic signals for any inefficient existing generators to be displaced. These issues would be addressed by the next measure, as below.

Relax the network planning criteria as they are applied to generators

As the Commission noted in its 1st Interim Report, Western Power applies a conservative security standard (N-1) to network planning for generation access. In effect this is the same standard that is applied to loads. This policy applies a higher security standard than is applied for example, in the transmission networks in the NEM and in New Zealand.

EMCa considers that if the network planning criterion for generation below 600 MW was reduced to N-0, significant levels of additional transmission capacity would become available for new renewable generation projects.

This change would also represent a step towards providing access to all generators (existing and new) on the same basis.

It is important to note that relaxing the network-imposed planning standard does not mean that generation is then necessarily provided with less secure access; rather, it places the onus on generators to consider the economic trade-off between the cost of being sometimes constrained and the cost of augmentation, and to negotiate access at the level of security that is most viable for them.

Review line rating procedures

EMCa also notes that, when planning for generator connection, the worst case (summer peak) line ratings are applied. A more dynamic approach to line rating, for example taking account of wind chill that is likely to increase line ratings when wind generation is at greatest output, and greater dynamic monitoring of the network (e.g. “smart grid”) may unlock further “spare” capacity and thus further facilitate access by more renewable wind generation without significant cost to them.

Implications for dispatch management and for the energy market

The release of the free network capacity as described above will require attention to be given to two main components of the WEM. These components are:

- the dispatch management process; and
- the RCM.

Connection of potentially constrained generation and the relaxation of the planning criteria will lead to constraints being seen on the network in certain circumstances. System Management will need to develop processes and tools for the management of constraints and there will be costs in developing these capabilities. EMCa recommends cost benefit analysis so as to fully understand the implications, but with potential benefits from deferral of capital investments approaching $1 billion and the benefits of renewable generation, we would expect there to be a net benefit.

EMCa understands that some hold the view that normally unconstrained network access is a prerequisite for the operations of the RCM. EMCa disagrees with this view and considers that there is an opportunity to enhance the accuracy and value of the RCM by implementing appropriate changes to account for the operation of the RCM in a potentially constrained network environment.

5.3.2 Improve augmentation approval processes and incentives

Improve aspects of the Regulatory Test and the NFIT

As loading on a transmission network increases and more remotely located generation is connected, it is inevitable that capital investment in transmission augmentations will continue to be required. Decisions on capital investment are subject to the Regulatory Test (for regulatory assessment of larger projects) and the NFIT (for inclusion of the investment in Western Power's capital asset base and to endorse the level of capital contributions). EMCa considers that the Regulatory Test and the NFIT provide a broadly appropriate framework for the evaluation and regulatory approval of transmission capital investment projects. However, we consider that some aspects of the tests, which are most relevant to augmentations that are driven by new generation, do not seem to be appropriate or easily workable. Most notably, this involves the assessment of net benefits to market participants.

EMCa also considers that there is a lack of clarity in regard to some aspects of these tests; for example, whether the Regulatory Test requires the net benefit to be positive or whether it is only a relative assessment of options, and how the apportionment of costs is calculated between those that meet the NFIT and those to be recovered through capital contributions and between current and potential future connectees. We understand that guidelines in respect of these tests are being considered or are in development and we strongly endorse this in the interests of facilitating smooth and efficient assessment of projects, regulatory consistency and transparency for renewable developers.

Incentives for proactive approach to meeting economic benefit targets, including CPRS and MRET

Incentives could be introduced for Western Power to actively develop and champion capital investments that would produce net economic benefit and remove barriers to the connection of renewable generation. EMCa recommends that options be considered for placing targets and incentives on Western Power to be proactive in perusing capital investments in their network that produce net economic benefit to Western Australia. The net benefits considered should include the wider benefits envisaged under the CPRS and the MRET.

5.3.3 Review methods for charging for augmentation

All generators are charged Network Access Charges as set out in Western Power's Access Code. New generators may face additional charges for the cost of any network augmentations Western Power deems as being required in order to accommodate access by the new generator (based on the planning criteria, as discussed above).

Review the application of the capital contributions policy for charging generators for network augmentations

EMCa considers that, in principle, charging for augmentation costs provides an appropriate locational signal in a scenario where a single new generator is seeking access and making a locational decision. Where there are a number of generators, then we consider it more appropriate to assess and charge for the incremental cost of a particular network augmentation than to charge for the assessed incremental network impact of each such generator. The latter approach involves a set of rules about the way in which queue position influences a generator's assessed impact on the network, and these rules have no real basis in facilitating economically efficient outcomes.

Charging new generators for augmentations also has implications for the relative viability of new generators relative to existing generators and therefore, could considerable influence the pace of movement away from thermal and towards renewable generation. Efficient outcomes are more likely to occur if all generators have the same access rights, in regards to constraints, and if this is reflected in their capacity credits, as is described above. If those changes are made appropriately, then there should be appropriate signals for new generators to decide whether to fund an augmentation or to negotiate with an existing generator to be constrained (if it is less efficient) and thus to avoid or defer the need for the augmentation.

Where augmentations and associated capital contributions are required, under current policy, new generators face uncertainty and therefore risk concerning both establishment of the level of contribution and how future rebates will be applied. It is difficult to see how a project proponent could predict the outcome of the NFIT and determine the basis for any challenge that could be made on the outcome. Given that the amounts at stake could be considerable, EMCa considers that such uncertainty presents a real barrier to the progress of new generation projects.

EMCa recommends that the Western Power Capital Contributions Policy is reviewed in regards to its application to generators and the rebate arrangements for capital contributions made for deep network augmentation are set out more formally and clearly. EMCa also recommends a review of the policy regarding charging based on assumed augmentation causality.

Continue development of the Generation Parks concept

EMCa is aware that Western Power is considering the concept of Generation Parks which would allow for capital investments to be made to support the development of generation in regions where energy resources exist. Under the current regulatory tests, it is difficult to see how capital investments could be made to support Generation Parks and there is a clear challenge to Western Power to identify potential Generation Park locations that could demonstrate a positive net benefit.

EMCa considers that development of the Generation Park concept is worthy of further consideration. This would require development of an explicit policy and a review of the Regulatory Test and NFIT to ensure the these tests are workable and will lead to efficient developments with appropriate risk allocations.

5.4 Final comments

The suggested reviews and proposed options contained in this report have the potential to produce significant economic and wider benefits for Western Australia, by supporting the development of appropriate levels of renewable energy in an efficient development sequence. They could also facilitate the deferral and overall reduction in the levels of network investment that are otherwise thought to be required.

Whilst the objective of the review was to assess implications for increased levels of renewable generation, we consider that there are likely to be wider benefits obtained from a review of network access arrangements for generators and associated WEM market mechanisms such as the RCM.

EMCa would like to thank the industry, government and regulatory stakeholders in WA who met with us and provided information and insight. EMCa would also like to thank Commission staff (particularly Andrew Truswell, Colin Sausman, Christiaan Zuur, Hannah Cole and Scott Stacey) for the information and ideas that they discussed with us and which have formed input to this report.

Glossary

Term	Definition
CPRS	Carbon Pollution Reduction Scheme
DLR	Dynamic Line Rating
DSOC	Declared Sent-out Capacity
ERA	Economic Regulatory Authority
FACTS	Fast Acting Transmission Systems
IMO	Independent Market Operator
NEM	National Electricity Market
NFIT	New Facilities Investment Test
NTP	National Transmission Planner
MCE	Ministerial Council on Energy
MRET	Mandatory Renewable Energy Targets

RAB	Regulatory Asset Base
RCM	Reserve Capacity Mechanism
SPS	Special Protection Scheme
STEM	Short Term Energy Market
SWIS	South West Interconnected System
TUOS	Transmission Use of System
UOS	Use of System
WEM	Western Australian Electricity Market

Appendices

Appendix 1: Extract from AEMC First Interim Report

Appendix 2: Illustration of security standards

Appendix 1: Relevant Extract from AEMC First Interim report

Issue B5: Connecting new generators to energy networks

Chapter Summary

This chapter considers the connection of new generators to energy networks in Western Australia. The expanded RET will stimulate investment in wind generation capacity. This is likely to be clustered in certain geographic areas, and remote from consumers and the existing transmission network. We consider that the existing model of bilateral negotiation for new connection will be unlikely to cope with large extensions to remote areas. There is significant risk of unnecessary costs and delays.

Questions

B5.1 Do you agree that the connection of new generators to energy networks in Western Australia is a significant issue and therefore should be progressed further under this Review? If not, what are your reasons for reconsidering this position?

B5.2 Should incentives be provided for Western Power to ensure the timely delivery of connections, and, if so, how should risk be most appropriately shared under such a scheme?

B5.3 Could improvements be made to the queue management process in Western Australia which do not conflict with the non-discrimination provision in the Wholesale Market Objectives?

B5.4 In a Western Australian context, would any of the models identified in Chapter A5 ensure the more efficient delivery of network connection services?

B5.5 Are there any other potential models that we should consider to mitigate this issue?

What is the desired market outcome?

The desired market outcome is that the connection of new generation to energy networks in Western Australia is efficient and timely. To achieve this, the connection process needs to promote:

- the timely consideration of connection applications by Western Power, especially if there are a large volume of connection applications, or if there are multiple connection applications in the same area;
- efficient cost-reflective pricing for new connections, so that potential connecting parties are given efficient locational signals; and
- an efficient level of investment in connection assets and network infrastructure, including building network infrastructure connecting multiple parties at the same location at the same time ("clustering") and taking into account the potential for future connecting parties in the same area as existing generation plant.

One challenge in Western Australia is that it appears likely that a large number of wind plant will seek to connect to the network. The expanded RET is likely to lead to a great deal of investment in renewable plant, principally wind plant. Modelling has suggested that there will need to be approximately 8 000 MW of new renewable plant across Australia by 2020 to meet the target of 60 000 GWh of electricity generated by renewable plant. Western Australia has many areas with good wind resources, and can be considered to have a particularly "wind-friendly" regulatory regime, with wind farms receiving firm access rights to the transmission system and being paid an administered price for "spilling" on to it.

In this context we now consider whether the current energy market frameworks in Western Australia can deliver efficient and timely connection of the forecast levels of new generation.

Will the current energy market frameworks deliver?

Likely to require amendment

There are some fundamental elements of the existing energy market frameworks that are unlikely to deliver timely and efficient generation connections. This is because the current framework for connecting new generation in Western Australia is already stressed by the number of connection applications and it is likely to be further stressed by increasing numbers of wind plants seeking connection. The key points in this assessment are that:

- Western Power has already adopted a queuing policy to assess the volume of applications, and some developers have to wait up to 12 months before their application is considered;
- the "unconstrained" network planning approach requires complex assessments of connection applications and it can take up to 18 months for Western Power to assess the application and provide a network access offer; and
- under the bilateral negotiation framework, there is a high risk of inefficient network investment extending to regions in which different parties develop generation or are likely to develop generation.

The supporting reasoning for these conclusions is presented in the following sections.

Is this an issue for further consideration?

This is a material issue

Stakeholders considered that the planning approach and connection process were material problems for Western Australia, particularly under the expanded RET. It was considered that this is a key issue for further consideration.[202]

202 Western Power, p.2; Synergy, p.13.

Planning approach

The "unconstrained" planning approach employed in the SWIS has led Western Power to connect only new generators where and when the network can accommodate the full output of the connected generator(s). The merits, or otherwise, of an unconstrained model when compared to a constrained approach (such as that used in the NEM) are considered in chapter B6. However, by linking the provision of the "local" generation connection to the deeper reinforcement required to allow for unconstrained access to the shared network, the complexity, and therefore time required, for both the assessment of the application and the construction of the resulting network augmentation is greatly increased.

Under this unconstrained approach, Western Power undertakes a number of modelling steps, a cost assessment and, potentially, an approvals process before potentially making a network access offer. This can take up to 18 months. The unconstrained planning approach can also affect the cost of the new connection, and therefore potentially also the generator's locational decision, through the "deep" connection costs charged.

In its report to the AEMC, Frontier Economics noted that the unconstrained planning approach is responsible for "causing delays to the connection process".[203] Given the current linkage between the assessment of the shared network and the generation connection, we propose to give further consideration to this issue as part of a joint progression of Issues 5 and 6 with respect to Western Australia, and this clearly could impact upon the connection process.

Connection Process

There is already a high volume of connection applications in Western Australia.[204] This is likely to be exacerbated by applications from wind farms prompted by the expanded RET, particularly because wind generators are, on average, smaller than thermal generators: new wind generation projects in the SWIS tend to have capacities in the range 80-130 MW, compared to 250-400 MW for thermal power stations.[205] In addition, wind plants tend to have relatively low capacity factors (around 30 per cent).[206]

Western Power has already adopted a queuing policy to assess connection applications strictly in the order in which they are received. Western Power has informed a number of applicants that it cannot commence processing their applications at this stage, or cannot do so for 6 to 12 months.[207] There is already over 1 300 MW of wind capacity seeking connection to the SWIS.[208] With greater numbers of applications likely from wind generators, this issue is likely to intensify.

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203 Frontier 2008, WA and NT Market Implications paper, p. 51.

204 For example, the IMO has stated that 13 new generation projects are due to connect to the SWIS before October 2011. IMO, "Statement of Opportunities", July 2008, p.9.

205 IMO, Statement of Opportunities, July 2008, p.9.

206 ROAM 2008 Market Impacts paper, pp.33, 38.

207 ERA, Discussion Paper: Annual Wholesale Electricity Market Report to the Minister for Energy, 5 June 2008, pp.18-19

208 Synergy, p.9.

The Reserve Capacity Mechanism impacts the connection process. New generators are only entitled to be assigned capacity credits in the capacity market if they have a network access offer. Developers may therefore apply for access for generation projects in very early stages of development. This can result in a larger number of less developed access applications being assessed by Western Power, leading to a queue. International experience suggests that, once they have been established, queues become self-perpetuating, as developers submit a larger number of projects at an earlier stage of development in order to secure their position in the queue.

There is a further impact. A developer that has obtained a network access offer and has capacity credits contingent on their plant being connected to the network bear the risk of having to make reserve capacity refunds if Western Power fails to make an actual network connection by the start of the relevant capacity year.

Although the ERA understands that there has not yet been a situation in which the operation of a new facility has been delayed as a result of a delay in the delivery of a network connection,[209] Western Power noted that locations proposed for new renewable generation tend to be in areas that would require significant capacity upgrades.[210]

It therefore seems likely that there is an increased risk that Western Power will not be able to deliver all new connections in a timely manner as a result of the renewable generation applications triggered by the expanded RET and attracted by the good wind resource and benign regulatory regime. Relevant international experiences may be informative.[211]

Stakeholders further agreed that planning additional investment in the network will be difficult, due to uncertainty surrounding the scale and timing of new renewable investments, and that this could "lead to delays in identifying the need, and obtaining planning consents, for the construction of new or reinforced infrastructure."[212]

Another significant issue was the potential for inefficient network development resulting from the bilateral negotiation regime. Essentially the same two issues identified in the NEM are also present in the SWIS:

- multiple connections in the same place at the same time, with the difficulties in co-ordinating an efficient connection between multiple parties. This is because the first generation developer would have to pay all the costs of extending the network, and all subsequent generation developers use this network at lower cost; and

209 ERA, Discussion Paper: Annual Wholesale Electricity Market Report to the Minister for Energy, 5 June 2008, p.19.

210 Western Power, p.6.

211 In Great Britain, which also has a net pool and employs a similar unconstrained planning approach, the mandatory Renewables Obligation led to a rush of connection applications from wind farms at the periphery of, or remote from, the existing transmission system, and completion dates in many connection offers far in excess of developer's aspirations, often 10 or more years in the future.

212 Synergy, p.13.

- the difficulty in predetermining the optimal size of connection assets where additional new remote generation is likely but not ready at the time of the first connection application.

What are the possible mitigation options?

Co-ordination of multiple and potential future connections

Stakeholders in Western Australia recognised the above two issues of co-ordinating multiple connections, and suggested that "Western Power needs to have effective incentives to connect new generation and develop infrastructure at an early stage, ahead of firm commitments from generators."[213] Consideration would need to be given as to how the upfront investment by Western Power would be funded, and as to how risk would be shared.

In chapter A5 we set out four potential models that could address the issues in relation to network connections: an "open season" approach (Option 1); a connection "hub" approach (Option 2); and variants of the "hub" approach with different economic test and charging features (Options 3 and 4). These options are equally as applicable to the SWIS, and we therefore intend to also consider them in a Western Australian context.

Incentives for timely connections

Given the potential for Western Power to be unable to deliver network connections in line with developers' aspirations, and the likelihood that this risk will be exacerbated under an expanded RET, it may be appropriate to consider the provision of incentives to promote the timely delivery of network connections.

Western Power has previously identified that network connection delivery risk could be dealt with through the use of liquidated damages, but noted that, if an allowance in the customer's capital contribution were factored in to cover liquidated damages, any over-recovery of revenue from the customer would be taken off Western Power's allowable revenue resulting in a tariff decrease to other customers. Conversely, any under-recovery would be made up under the revenue cap resulting in other users picking up the shortfall via network tariffs.[214]

Any incentive scheme could therefore be designed around this mechanism, such that, if it failed to meet a pre-defined target, Western Power would have some exposure to the under-recovery, but equally, in the event it out-performed the target, would retain some of the over-recovery. Clearly, careful consideration would have to be given to the appropriate target under such a scheme, together with the factors sharing risk between Western Power and its customers, along with any caps and collars.

213 Synergy, p.13.

214 Western Power, Annual Wholesale Electricity Market Review: Submission to the Economic Regulation Authority, 18 July 2008, p.4.

Queue Management

A clear sign that the connection process in Western Australia is already under stress is the fact that a queuing process has been introduced. Currently, Western Power assesses applications in the order in which they are submitted.

Under the progression of Issues 5 and 6 for Western Australia, we intend to give consideration to potential methods of queue management. This could, for instance, give greater weight to the readiness of the project, or to its size or technology employed (i.e. whether or not it was renewable). However, international experience suggests that it can be difficult to formulate rules that do not also raise concerns with regards to undue discrimination between applicants, and we note that one of the Wholesale Market Objectives is to avoid discrimination against particular energy options and technologies.

Issue B6: Augmenting networks and managing congestion

Chapter Summary

This chapter considers network augmentation in Western Australia, and the ability of the existing frameworks to promote efficient use of and investment in the network. In the SWIS, the inability to resolve congestion in a cost-reflective manner, and therefore evaluate the costs of this against network augmentation, can result in inefficient over-investment in the transmission network and consequent delays to the connection of new generators. The expanded RET is likely to exacerbate this situation by leading to a significant amount of renewable generation wishing to connect to the system at the periphery of the transmission network with low capacity factors.

Questions

B6.1 Do you agree that network augmentation in Western Australia is a significant issue that should be further progressed under this Review? If not, what are your reasons for reconsidering this position?

B6.2 Would any of the options identified in this chapter improve the efficiency of network augmentation in the SWIS? In particular, we would welcome views on:

- the practicality of including an evaluation of congestion costs in planning network augmentations;
- other assumptions made as part of the planning process (such as the capacity factor of wind generation); and
- the most appropriate locational signals for generation in the SWIS.

B6.3 Are there any other potential models that we should consider to mitigate this issue?

What is the desired market outcome?

The desired market outcome is for energy market frameworks to promote efficient use of and investment in the network. Market signals provide incentives to participants, such as generation and network businesses, and new investors, in both generation plant and merchant transmission, about how to use and invest in the network's capability to transport energy. End use customers, as the principal beneficiaries of the network, should pay transmission charges that reflect the shared network used to transport their energy.

The decisions participants make about how they use and invest in the network are decentralised under the current regime. The regulated network business in the SWIS will respond to network issues that arise from generation plant and customer (load) consumption and location decisions. The existing energy market framework signals relevant to this discussion include:

- **Generation locational signals:** costs of connection and extension assets; transmission access; transmission loss factors; and availability of fuel.

- **Network signals:** planning arrangements and responsibilities; operations; and charging arrangements.

These signals become increasingly important under the CPRS and the expanded RET. In Western Australia, the main effect of these policies is likely to be a substantial increase in wind plant and back up gas generation connecting to the network. The prevailing power flows across the network will therefore depend on the locational decisions of this new generation.

The transmission network in the SWIS is planned on an "unconstrained" basis, which means that Western Power will only connect new generation if the prevalence of network congestion is not increased or else will undertake network upgrades prior to the connection of the generation to maintain the "unconstrained" nature of the network. The amount of network augmentation required is therefore determined by the location of the connecting generation, and this augmentation is delivered at the same time as the generation connection in a co-ordinated manner.

We therefore consider whether, in light of the climate change policies, the existing framework signals can deliver efficient use of and investment in the network.

Will the current energy market frameworks deliver?

Framework is not sufficiently flexible

The current arrangements for augmenting the shared network in Western Australia are not sufficiently flexible to deliver the desired market outcome in light of the climate change policies. This is because of:

- the inability to resolve congestion in a cost-reflective manner and therefore evaluate the costs of this against network augmentation, which can result in inefficient over-investment in the transmission network and consequent delays to the connection of new generators; and

- the fact that the situation will be exacerbated by the significant amount of renewable generation wishing to connect to the system as a result of the climate change policies, which is likely to be at the periphery of the transmission network and have low capacity factors.

We discuss the reasoning behind these conclusions in the next section.

Is this an issue for further consideration?

This is a material issue

Planning approach

As noted in chapter B5, Western Power employs an "unconstrained" approach to network planning. The precise meaning of this term is not defined in any published documents. However, based on correspondence between Western Power staff and

Frontier Economics, it derives from the requirement in the Technical Rules for Western Power to plan, design and construct its power system to ensure that power system stability and performance can be met under the worst credible load and generation patterns and the most critical credible contingency events, without exceeding any component ratings or the allocated power transfer capacity.[215] This, in turn, has led Western Power to connect only new generators where and when the network can accommodate the full output of the connected generator(s). This contrasts with the approach employed in the NEM, but to a large extent this difference is reflective of the contrasting characteristics and development of the two markets.

The NEM is a "gross pool", into which eligible generators are required to offer their output. NEMMCO dispatches the market every five minutes with the objective of minimising the cost of dispatch based on bids and offers from generators and larger load customers. Generators consequently face the risk that they might not be dispatched for their desired output. A generator's "right" to use the transmission network therefore depends on whether it is dispatched by NEMMCO or not. This is termed an "open access" regime. Importantly, if congestion is present on the transmission network, a generator may not be dispatched, even if its offer price is below the RRP that would be paid for supply. Therefore, under the "constrained" network planning approach used in the NEM, a generator may be connected to the network even though the transfer capability of the shared network may be insufficient to ensure that it is dispatched when its offer price is below RRP.

The WEM is a "net pool", where the majority of electricity is traded through bilateral contracts. Generators are self dispatched by making a Bilateral Submission to the IMO. All Bilateral Submissions must be balanced, in the sense that the total energy to be supplied to the network by the generator must match the total energy forecast to be taken from the network by customers who are counterparties to the generator. To the extent that supply does not match demand in real time, System Management is able to schedule Verve Energy plant, and, if necessary, issue dispatch instructions to other market participants, to balance the system. In this market, therefore, generators have a firm right to export onto the system to the level of their desired output.

However, the unconstrained planning approach can lead to inefficient over-investment in the transmission network, as it may be more efficient to allow some congestion to occur than to augment the network (i.e. if the costs of managing the congestion were less than the cost of augmenting the network). In its report to the AEMC, Frontier Economics concluded that "there is little doubt that the unconstrained planning approach leads to inefficient over-investment".[216] In a market with firm access rights it is possible to permit an efficient level of congestion by compensating parties required to reduce output. In Western Australia there is, however, currently no market mechanism to allow for the management of constraints in a cost-reflective manner.

In its submission to the AEMC 2008 Scoping Paper, Western Power suggested that some savings could be made over the current approach, in particular "by assuming that intermittent generators and scheduled generators are not simultaneously operating at full output". However, it further noted that:

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215 Frontier 2008 WA and NT Market Implications paper, p.9.
216 Frontier 2008 WA and NT Market Implications paper, p.51.

> this would involve the development and management of network constraints, which would require a market mechanism to determine which generator runs if both intermittent and scheduled generators were available.[217]

Given that the average capacity factor of wind generation is typically around 30%, and that wind generators very rarely operate at full output, it seems likely that there is significant scope for reviewing the appropriateness of these assumptions. The other stakeholder to address this issue in a specifically Western Australian context, Synergy, also commented on the "current requirement for 100% coverage of generation capacity… even when the plant is intermittent and will not require that network capacity all of the time". Synergy noted that there are therefore "no clear rules for sharing network access where capacity is constrained" and advocated the consideration of network access sharing arrangements.[218]

We consider that there is a need to review the unconstrained planning approach employed, and the assumptions used in planning, particularly in light of the likely entry of significant amounts of low capacity factor renewable plant under the expanded RET.

Locational signals

It is important to have market signals that promote efficient locational decisions for these significant levels of new generation forecast under the climate change policies. This is especially the case where the shared network is being reinforced on an unconstrained basis. Although it is important that the costs of network augmentation are efficiently balanced against the likely costs of congestion, it is even more important that these costs are signalled to the new generator to be taken account of in the decision as to where to locate. Some of the factors influencing generation location decisions include: the availability of fuel; the cost of connection and extension assets (see chapter B5); and transmission loss factors.

It was suggested by a stakeholder that further locational signals, over and above these, are required in the WEM. Synergy expressed concern:

> that economic efficiency in the design and construction of the electricity transmission system may not occur until the WEM and the network both send localised price signals to asset owners, which incentivise them to construct at the point where the network and the electricity market most require the generation.[219]

217 Western Power, p.6.
218 Synergy, p.15.
219 Synergy, p.14.

However, this stakeholder also believed that the recalculation of loss factors, the downwards adjustment of the gross volume produced by the generator to reflect the proportion of energy lost (e.g. as heat) in the transmission network, represented a material risk. Synergy commented that an:

> ability to lock in a loss factor at the time of investment is required to ensure adequate stability in the investment environment. Currently any project located in a network area with an attractive loss factor, is likely to have another project locate nearby soon afterwards. Investment by a second plant is likely to drive down the loss factor significantly, eroding any benefits factored in by the first project in their viability assessment.[220]

We therefore consider that there is a need to review the locational signals present in the SWIS in parallel with a reassessment of the planning approach employed, to ensure that the locational decision, as well as the network response to this in terms of the resulting amount of network augmentation, is fully efficient.

What are the possible mitigation options?

Revised planning approach, including an evaluation of congestion costs

Given that, in some cases, it may be more efficient to allow congestion to occur than to augment the network, it should be possible to move to a more efficient planning approach which includes an evaluation of congestion costs. However, this would first require the introduction of a market mechanism to allow for the management of constraints in a cost-reflective manner, and there would be significant difficulties and costs in implementing such an approach. In correspondence with Frontier Economics, Western Power noted that this would require:

- development, management and implementation of constraint equations by System Management; and
- review of the role and functioning of the Reserve Capacity Mechanism, as the IMO could not be confident that all capacity that is accredited would be able to meet load at peak times.[221]

There also appears to be scope for reviewing the assumptions made in the network planning process relating to the output of generators, and these could be specified in a more explicitly defined set of planning standards. This could reduce the amount of incremental network capacity required to connect additional wind generation, thereby facilitating the connection of additional renewable generation in a more efficient and timely manner.

The introduction of a more formal congestion management regime in the SWIS could therefore facilitate the sharing of access, as well as allowing for network investment to be avoided if the cost of doing so was greater than the costs of resolving any resulting congestion. This would potentially allow some connections to progress more quickly, and would produce savings for consumers overall (i.e. congestion management related

220 Synergy, p.15.

charges would be less than the amount by which investment related charges would have increased). However, implementation costs are likely to be significant.

A further step that could be considered would be to de-link the provision of the "local" generation connection from the reinforcement of the shared network (even if this reinforcement was more cost-effective than resolving the resulting congestion). Under this model, the generator would be permitted to generate as soon as the local connection was complete, irrespective on the status of the deeper reinforcement. The resulting congestion costs could either be socialised or targeted cost-reflectively at the generator causing them (although this would likely be a non-trivial exercise). This model would allow for the most rapid connection of generators, but may prove unattractive due to resulting costs.

Locational signals

To mitigate the lack of locational signals in WEM, a stakeholder suggested that there would be merit in assessing "the appropriateness of establishing zonal pricing in the WEM."[222] It is not clear how a zonal pricing model would be consistent with the current WEM net pool arrangements in which nearly 95 per cent of electricity is traded bilaterally.[223] However, it would be possible for locational signals to be given through transmission pricing, for instance through locational generation TUOS charges reflective of the costs of reinforcing the system.

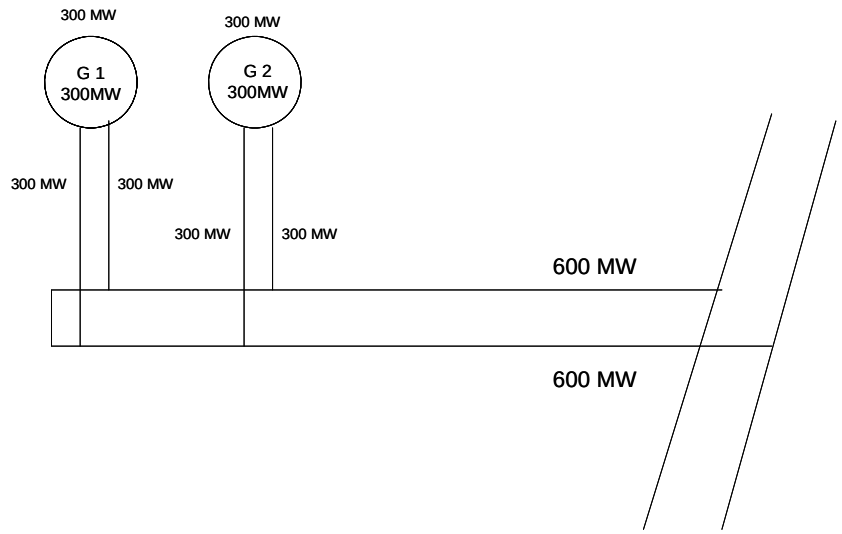
As a further development, a model in which generators paid either a locational short run marginal cost derived charge based on congestion costs caused or a locational long run marginal cost derived charge based on investment costs undertaken to provide firm access would approximate a Locational Marginal Price type market with Financial Transmission Rights.

221 Frontier 2008 WA and NT Market Implications paper, p.51.
222 Synergy, p.14.
223 IMO, Wholesale Electricity Market: Electricity Trading 2006/07, July 2007, pp.16-17.

Appendix 2: Illustration of Security Standards

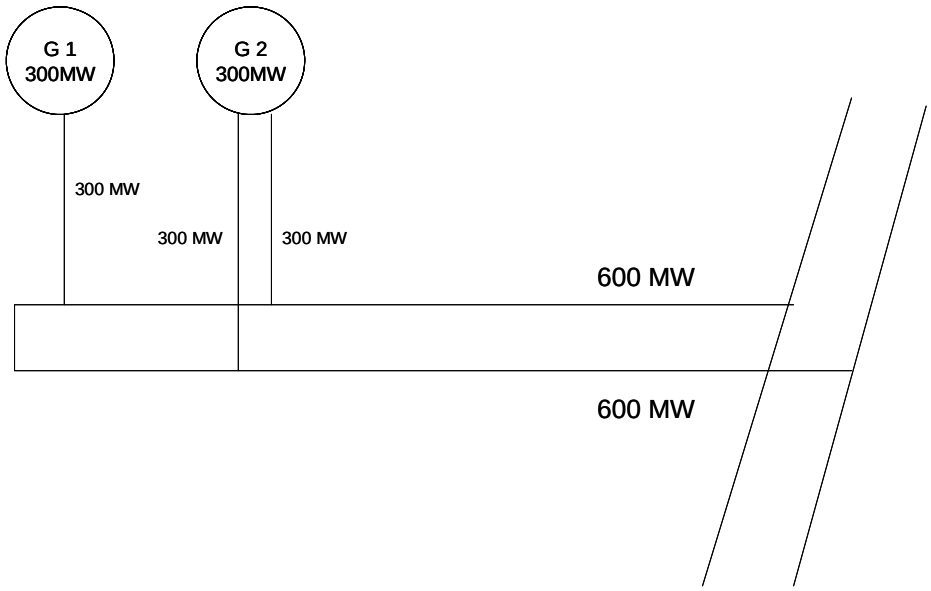
The following examples demonstrate how capacity can be increased by relaxing the security standard.

Figure 3: Example 1 - Connection with N-1 security



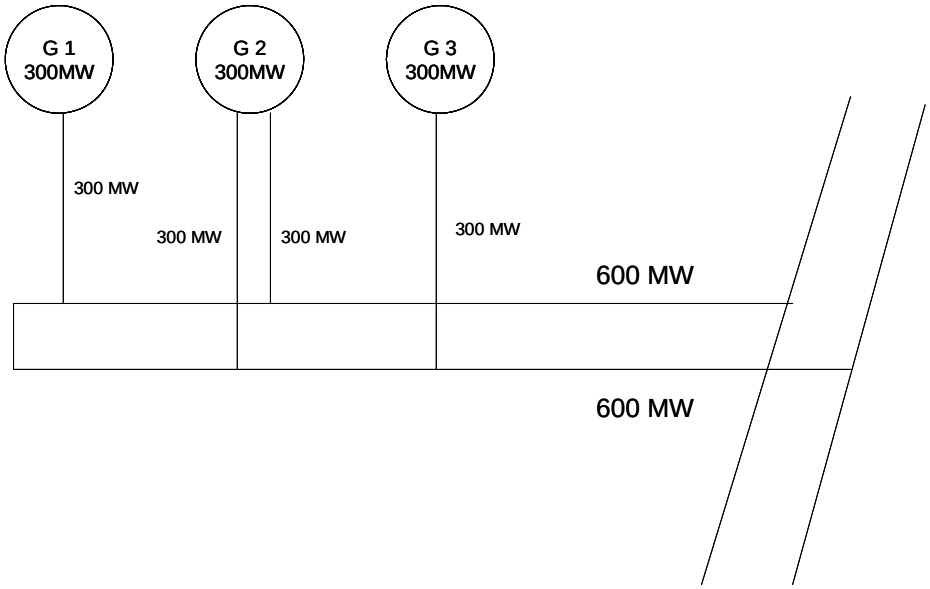
In example 1 both G1 and G2 have firm n-I connection as the full capacity output from both generators can be maintained in the event of an outage of any single line.

Figure 4: Example 2: Connection in which one generator has N-1 security



In example 2 only G2 has firm N-I connection because the full capacity output from G1 generator cannot be maintained in the event of an outage of its single 300MW connection line.

Figure 5: Example 3 - Security as a function of connection and network security



In example 3 only G2 has firm N-I connection because the full capacity output from G1 and G3 generators cannot be maintained in the event of an outage of either of their single 300MW connection line. In addition an outage of one of the 600MW transmission lines would mean that 300MW of generator capacity would have to be run-back and is therefore non-firm.

Under the current unconstrained policy only G2 would be allowed to connect to the network as G1 and G3 cannot be offered firm N-I access. The total generation connected would therefore be limited to 300MW.

However, if non-firm (N) access was offered to G1 and G3 900MW of generation could be connected. The 900MW would be available and delivering benefits at all times when there was no transmission line outage.