D Outlook for future trends in congestion

D.1 Introduction

This appendix discusses a range of issues related to the future trends in congestion:

As discussed throughout this Final Report, while the evidence indicated that the level of congestion had not been significant in the past, it is likely to differ in the future. There are many factors that can influence future trends in congestion. In this appendix we provide information on:

- forecast changes in demand and supply in each of the NEM regions (section D.2);
- changes to the dispatch of intermittent generation, like wind farms (section D.3); and
- key aspects of Australia's policy response to climate change, like the Garnaut Review, design of an Emissions Trading Scheme (ETS) and Mandatory Renewable Energy Targets (MRETs) (section D.4).

In addition, in section D.5, we also present a summary of three proposals presented in submissions to the Draft Report that seek to address the dis-orderly bidding problem, a congestion-related policy challenge arising for the NEM's regional pricing design. We describe these proposals, as presented by their proponents, because while they may not be proportional responses to the past level of congestion in the NEM, there may be scope in the future to consider options like these.

They are presented in this appendix to provide an information resource for future reference. We do not provide any commentary on or support for any of the proposals.

D.2 Forecast changes in demand and supply

In its 2007 Comprehensive Reliability Review (CRR) Report, the Reliability Panel observed that the NEM had historically performed well at meeting demand reliably. It commented, however, that historically, this was supported by surplus generation capacity in some regions.[321] NEMMCO projections for the NEM's supply-demand balance are not as generous going forward.

In the 2007 Statement of Opportunities (SOO), NEMMCO estimates supply shortfalls for Queensland in 2009/10, Victoria and South Australia (combined) in 2010/11, and NSW in 2013/14. NEMMCO does not project any shortfalls for Tasmania over the next ten-year period.[322]

In addition, the Reliability Panel noted that the nature of supply and demand in the NEM had undergone a significant change since the NEM started in 1998. It noted, for example, an increasingly peaky demand profile and a shift in the mix of generation plant including an increased contribution from intermittent sources like wind generation.[323]

These projected shortfalls along with the need to supply greater levels of peak demand will directly affect the type (both technology and fuel) and timing of new generation investment. The location of this new generation can affect the prevalence of congestion on the network. The existing location pricing signals for generation will facilitate the efficient investment and locational decisions of the new supply.

The below sections present a summary of regional supply and inter-regional transfer conditions.

D.2.1 Intra-regional supply conditions

D.2.1.1 Queensland

In the 2007 SOO, maximum energy demand in Queensland is forecast to increase by an average of 3.3% in winter and 3.6% in summer (under a medium growth scenario) per year over a 10 year period, which is higher than any other region in the NEM. Over the same period, the scheduled energy is projected to increase by an average of 3.6% per year (medium growth scenario).

In the Queensland region, there are a number of proposed generation projects which are expected to be commissioned between 2008 and 2009. In the Southwest region, there are proposed generation plants in Spring Gully (1 000 MW), Chinchilla (242

321 AEMC Reliability Panel 2007 (Reliability Panel), Comprehensive Reliability Review (CRR), Final Report, December 2007, Sydney, p.xi.

322 NEMMCO, 2007 Statement of Opportunities, pp."2-9", "2-10", "2-12", and "2-13".

323 Reliability Panel, 2007 CRR, p.x.

MW) and Braemar (up to 480 MW). In the Central West region, there are projects for new generation in Stanwell Energy Park of up to 640 MW.

There are a number of existing areas within Queensland where transfer capability is tight, and this increasing demand and new generation will place more pressures on the Queensland network. In response to this, Powerlink have been given a total capital expenditure over the next five years of $2.6 billion.

The staged Central to North Queensland (CQ-NQ) transmission project due for completion between 2007 and 2009 will improve transfer capability to meet forecast electricity demand in North Queensland.

The Central Queensland to South Queensland (CQ-SQ) limit bound for 4.7% of the time over the summer period due to the capacity across this grid section being fully utilised during opportunities to export electricity to NSW. Commissioning of new generating plant in Southern Queensland since the 2006/07 summer is expected to reduce flows on this grid section in the 2007/08 summer; however this may be affected by reductions in generation due to water shortages.

The Tarong limit in South Queensland experienced minor binding over the 2006/07 summer. To keep pace with the high load growth in South East Queensland, the Middle Ridge to Greenbank transmission reinforcement along with additional shunt compensation has been committed for the 2007/08 summer.

In 2006/07 the Gold Coast limit bound for around 11% of the time during winter and 0.7% of the time during summer. Even though Powerlink completed a project, in late 2006, to increase the transfer capability of the Gold Coast grid section, binding events on this grid section occurred during periods when spare capability across this grid section was fully utilised by the Terranora interconnector transferring power into NSW. Powerlink has committed projects underway that increase the transfer capability of the Gold Coast grid section to meet forecast load growth in the Gold Coast and Tweed Heads areas.

D.2.1.2 NSW

Maximum energy demand in NSW is forecast to increase by an average of 2.1% in winter and 2.5% in summer (under a medium growth scenario) per year over a 10 year period. Over the same period, the scheduled energy is projected to increase by an average of 1.6% per year (medium growth scenario). Over the period 2004/05 to 2008/09, TransGrid has a fixed capital allowance of $1.188 billion. Proposed expenditure for the period post 2008/09 has not yet been announced.

Throughout NSW, there are a number of gas turbine generation projects planned, such as Munmorah (600 MW, expected to be operational between 2009 and 2010) and Tomago (500 MW) on the NSW Central Coast. Also in this area, there are plans for an upgrade and development of the Eraring Power station (up to 3 040 MW, operational in stages from 2009). In the South East of the state, there are planned gas turbine developments for Bamarang (300 MW by 2010/11) and Marulan (300 MW by 2010/11). An upgrade to the existing Mt Piper power station in the Central West area (to 750 MW each for Unit 1 and 2) is planned for 2008 and in the South West,

there is a proposal for a gas fired plant at Uranquinty (640 MW, by summer 2008/09).

TransGrid are proposing to progressively complete a high capacity ring linking the Sydney, Newcastle and Wollongong load centres with major generating centres located in the Central Coast, Western coalfields and Hunter Valley. To date the Eraring – Kemps Creek 500 kV line has already been developed. TransGrid are currently committed to the process of converting the existing Bayswater – Mt Piper and the Mt Piper – Marulan lines, which presently operate at 330 kV, to operate at their design voltage of 500 kV. For the summer of 2008/09 Transgrid has proposed to develop up to 350 MW of network support capability for the Newcastle-Sydney – Wollongong area.

The mid-north coast area of NSW has a number of current and emerging constraints primarily as a result of population growth and therefore high load growth. TransGrid is proposing a project to relieve this concern. These works are expected to cost around $62 million and to be completed by mid 2009.

Central Western Sydney is also experiencing high load growth. TransGrid has proposed a new transmission line between Wollar and Wellington to meet this increasing demand. This project is expected to cost $30 million and could be completed by 2010.

D.2.1.3 Victoria

In Victoria, maximum energy demand is forecast to increase by an average of 0.8% in winter and 1.8% in summer (under a medium growth scenario) per year over a 10 year period. Over the same period, the scheduled energy is projected to increase by an average of 1.0% per year (medium growth scenario). SP AusNet proposes that its capital expenditure for the 2008/09 to 2013/14 period will be $928 million. A final decision by the AER regarding this proposal has not yet been made.

There are three major generation projects planned for this region. In the Northern corridor a 130 MW hydro station is planned for the Kiewa area. In the Eastern corridor, an upgrade to the Loy Yang A station is planned and will result in increases up to 100 MW. In the South West corridor, a 1 000 MW gas-fired station is planned near Mortlake.

To support load growth in and around the Melbourne metropolitan area, VENCorp has committed projects underway which will improve the reliability of supply to this region. In its 2007 APR, VENCorp indicated that the committed development of the South Morang Terminal station (expected to be completed early 2009) would help to meet these requirements.

There are a number of constraints that can occur in the Northern corridor, which comprises the Victorian side of the Victoria to Snowy-NSW interconnection. However, in the 2007 APR, VENCorp states that the market benefits associated with the management of the constraint over the next 5 years are insufficient to justify augmentation. Though not yet formally proposed, VENCorp has identified options,

such as line up-rating, new transmission lines or wind monitoring schemes, that may become justifiable in the longer term (between 6 and 10 years).

In the Greater Melbourne and Geelong areas, there are a number of smaller constraints as a result of transmission element outages, increased load and changes to generation. In the short term, VENCorp is seeking to economically manage these risks, at least until approximately 2011/12.

Throughout regional Victoria, there are a number of constraints as a result of transmission element outages, high load and bulk power transfer. However, VENCorp states that the market benefits from the alleviation options, such as line up-rating, are insufficient to justify augmentation and that they believe the constraints can be economically managed for the next 4 to 5 years.

D.2.1.4 South Australia

Maximum energy demand in South Australia is forecast to increase by an average of 1.8% in winter and 2.1% in summer (under a medium growth scenario) per year over a 10 year period. Over the same period, the scheduled energy is projected to increase by an average of 1.5% per year (medium growth scenario). Over the next five years, ElectraNet has forecast a capital requirement of $778.1 million. Growth in demand is driving the need for significant transmission investment to meet mandated reliability standards specified in the Rules and the Electricity Transmission Code (ETC).[324] A final decision by the AER regarding this proposal has not yet been made.

There are a number of conventional generation projects under consideration in South Australia. The most advanced of these is the 120 MW gas-fired power station announced recently by Origin Energy for construction adjacent to Quarantine Power Station on Torrens Island, which is expected to be operational prior to the 2008/09 summer.

Three new wind farms are currently being built in the State: Lake Bonney Stage 2, the Bluff at Hallett, and Snowtown. These wind farms are all at various stages of construction and, when complete towards the end of 2008, will lift the total wind capacity in the State to 742 MW.

While still a net importer of electricity, South Australia has imported less, and exported more electricity than ever before over the 2006/07 year. Increasing volumes of wind energy and higher interstate forward contract prices, the latter as a result of capacity risks associated with the drought, are the two primary causes of the change in import/export balance.

---

324 New reliability standards resulting from a recent review of the ETC by state regulator ESCOSA also require additional investment. For example, the mandated reinforcement of the Adelaide CBD is expected to cost approximately $138 million during the forthcoming regulatory period. This is a major project and the most significant single reason for the higher capital expenditure requirement in the forecast period (there has been no project of this significance or magnitude in the current regulatory period).

D.2.1.5 Tasmania

In Tasmania, maximum energy demand is forecast to increase by an average of 1.5% in winter and 1.6% summer (under a medium growth scenario) per year over a 10 year period. Over the same period, the scheduled energy is projected to increase by an average of 1.6% per year (medium growth scenario). Transend has a fixed capital expenditure allowance of $306.8 million for the five and a half year period 2004 to 2008/09. The major capital expenditure project for this period is the works being completed in the south of the state, including the Waddamana and Risdon Vale line (see below), estimated to cost $55 million. Proposed expenditure for the period post 2008/09 has not yet been announced. In the recent SOO[325], NEMMCO noted that there were no new generation projects planned for Tasmania.

The most common constraint in the Tasmanian region is that of thermal constraints. To alleviate this problem, Transend use real time measurements to give dynamic real time line ratings.

One of the major problems in the Tasmanian region is the high demand in the Hobart area. This problem has previously been managed by using a number of NSAs. A major project currently being undertaken by Transend is that of the replacement of the existing transmission line between Waddamana and Risdon Vale with a new higher capacity line to improve power supply to Hobart and Southern Tasmania. This project is due for completion mid 2009. This project will lessen the need for the use of NSAs to meet demand in the south.

D.2.2 Inter-regional transfer conditions

D.2.2.1 Queensland—NSW (QNI and Directlink)

It is recognised that the current transfers of 500 MW north and about 1 100 MW south on QNI will be impacted by the imminent opening of Kogan North Power station, with NSW exports being reduced.

The commissioning of the NSW 500 kV ring upgrade should help to relieve congestion on QNI through increasing capability in the Northern NSW network.

A QNI upgrade is expected to improve reliability in both states, enable higher interchange when the supply/demand balance is tightening, and reduce the occurrence and size of constraints on QNI. Options being considered range from line series compensation and voltage support at a cost of $100-$120 million with a 300-400 MW increase in capacity to new line development at a cost of $600-$800 million and a capacity increase of up to 1 000 MW.

In its APR,[326] Powerlink says it expects that studies on the possible augmentation of the QNI interconnector will have progressed to the stage where Powerlink and

---

[325] NEMMCO, Statement of Opportunities for the National Electricity Market, October 2006.

[326] Powerlink, Annual Planning Report, 2006.

TransGrid will report the outcomes of the detailed technical and economic studies within the later part of this year. Currently the optimal timing for the QNI upgrade is 2011 (compared to the 2009 timing indicated by earlier pre-feasibility studies). Commitment of additional new generation in NSW (or further south) may further defer the timing of a QNI upgrade. Conversely, the commitment of new generation within Queensland may bring forward the optimum upgrade timing.

D.2.2.2 Snowy—NSW

The transfer limit on the Snowy to NSW interconnector was increased by 200 MW during daylight hours in January to April. This increase is the result of a NSA put in place by Snowy Hydro, industrial loads, and Transgrid. This arrangement is an Automated Control scheme whereby loads and generation can be rapidly offloaded in the event of a trip in a transmission line making up the Snowy to NSW interconnector.[327] This should help to relieve the increasing congestion on the flow northwards from Snowy.

D.2.2.3 Victoria—Snowy

VENCorp has recently committed to an augmentation of the South Morang terminal station. These works at South Morang will improve Victorian export transfer capability hence improving flows between the Victorian, South Australian and Snowy regions. Work is currently being undertaken to develop the South Morang Terminal Station including the establishment of a switchyard and the installation of two transformers. This work will see the transfer of load from Thomastown terminal and Somerton power station. This project will help to meet Melbourne's long term supply requirements and is planned for completion early in 2009.

In the 2007 APR, VENCorp indicated that there was no justifiable solution to the loading on the Dederang – South Morang line in the short term (i.e. 5 year outlook). While options exist to solve this problem, such as the uprating of the lines or the installation of a third line between Dederang and South Morang, the market benefits associated with these options are insufficient to justify augmentation. VENCorp believes that the system normal constraints associated with this line can be economically managed until at least 2011/12.

[327] NEMMCO Communication No. 2356 – Change in SNOWY1 Interconnector Transfer Limit.

D.3 Wind farm generation

The amount of intermittent generation participating in the NEM has grown rapidly over the last few years, particularly wind farm development in South Australia. This trend is expected to continue, supported by the financial incentives made available through various government renewable energy initiatives. The increasing penetration of intermittent generation affects NEMMCO's ability to efficiently manage power system security, and hence can influence the incidence of binding constraints in the NEM. Evidence suggests that the wind farm development in South Australia has lead to increased binding on the Heywood Interconnector.

Since the start of the NEM all generation with an intermittent output has been able to be classified as non-scheduled under the Rules. Non-scheduled generation is hence exempted from control by NEMMCO's central dispatch, on the basis that its electrical output cannot be controlled "on demand" as its available energy source is inherently uncontrollable. Non-scheduled generation therefore effectively has firm network access and dispatch priority over scheduled generation unless and until directed by NEMMCO or its agents to operate otherwise. This leads to the risk of non-scheduled generation overloading a network element. To mitigate against this risk of violating network limits, NEMMCO may be required to increase the operating margin for network limits in order to create more spare transfer capacity. This will reduce the allowed flow on the network limit which will increase the probability of the constraint binding.[328]

At the moment, wind farms with an aggregate nameplate rating of ≥ 30 MW accounted for 611 MW of the total installed wind farm generation in the NEM, with 388 MW in South Australia, 83 MW in Victoria, and 140 MW in Tasmania.

In addition there is a further 5 185 MW of significant wind farm generation across the NEM that is either under construction, with or seeking planning approvals or subject to feasibility studies, as follows:

- South Australia: 344 MW under construction, 610 MW with planning approval, and 890 MW in feasibility stages (total 1 844 MW);
- Victoria: 357 MW under construction, 725 MW with or seeking planning approval, and 667 MW in feasibility stages (total 1 749 MW);
- Tasmania: 130 MW with planning approval, and 190 MW in feasibility stages (total 320 MW);
- NSW: 581 MW with or seeking planning approval, and 515 MW in feasibility stages (total 1 096 MW); and
- Queensland: 124 MW with planning approval and 52 MW in feasibility stages (total 176 MW).

328 Network operating margins are generally implemented as a static value on the RHS of the constraint equation, and apply at all times that the relevant network constraint equation is invoked.

In South Australia alone, the currently installed plus future committed wind farm projects (those under construction or with planning approvals) would amount to a total installed capacity of 1 342 MW, or around 40% of the total South Australian generating capacity of 3 260 MW assumed available for summer 2006/07.

Generation from wind farm developments is likely to have a significant and growing influence over the operation of the NEM in the foreseeable future, and is therefore likely to have an increasing influence on the level of binding constraints in the NEM.

However, the market is aware of these issues. On 23 April 2007, we received a Rule change proposal from NEMMCO that attempted to address the problems of intermittent generation on network limits. The Rule change proposal sought to require significant intermittent generators (such as wind farms) to participate in the central dispatch and Projected Assessment of System Adequacy (PASA) processes, and limit their output at times when that output would otherwise violate secure network limits.

In its Rule change proposal, NEMMCO presented evidence on the incidence on binding network constraints equations involving significant intermittent generation for the six month period from 1 March 2006 to 31 August 2006 in the South East area of South Australia. NEMMCO concluded that in this area, wind farm generation has materially contributed toward the MW amount of network congestion in that area, resulting in constraining off interconnector flows into South Australia and (to a lesser extent) constraining off local scheduled generation involved in those constraints.

On 1 May 2008, we published our final Rule determination on this proposal and made the *National Electricity Amendment (Central Dispatch and Integration of Wind and Other Intermittent Generation) Rule 2008 No. 2*. Scheduled 1 of the Rule commenced on 1 May 2008. Scheduled 2 of the Rule will commence on 31 March 2009.

In making this final Rule determination, we largely adopted NEMMCO's proposal with some modifications to simplify the Rules applying to intermittent generators to reduce the regulatory and compliance costs on those generators. The key elements of the Rule as made are to:

- require new intermittent generators to register under the new classification of Semi-Scheduled Generator;
- require Semi-Scheduled Generators to participate in the central dispatch process, including submitting offers and limiting their output to below a dispatch level whenever the generation is limited by the central dispatch process; and
- include grandfathering provisions for intermittent generators registered at the date the final Rule determination is published and projects considered committed at 1 January 2008.

D.4 Australian policy response to climate change

Australia is investigating how it can best respond and adapt to climate change. The following sections summarise what Australia's climate change policy objective is, why it is important, and how it intends to meet the objective.

D.4.1 What is the climate change policy objective?

The policy objective is for Australia to respond effectively to the consequences of climate change (or an enhanced greenhouse effect) by implementing a mixture of mitigation and adaptation strategies along with international collaborative efforts.

D.4.2 Why is this objective important?

Among the developed world, Australia is one of the most vulnerable to the impacts of climate change. This reflects Australia's already variable climate, poor soils, vulnerable ecosystems and high proportion of population living in coastal areas. Thus the potential impacts of climate change and the need to develop appropriate adaptation strategies are now important considerations in the context of national, state and local government responses to the issue.

According to the federal government, there is little doubt that Australia will face some degree of climate change over the next 30 to 50 years irrespective of global or local efforts to reduce greenhouse emissions. The scale of that change, and the way it will be manifested in different regions is less certain, but climate models can illustrate possible effects.[329]

Climate change will alter climatic variables such as mean temperature and the likelihood of extreme climactic events. The climate change variables may directly or indirectly impact upon government and business. The risks (both the likelihood of occurrence and the extent of consequences) need to be strategically managed to successfully adapt to the impacts of climate change.

The Australian government's view is that the cost to business for failing to act will be far greater than if responsible action is taken now.

D.4.3 How will this policy be implemented?

The Australian government proposes three pillars in climate change policy- helping to shape an international solution, reducing Australia's emissions, and adapting to the climate change we cannot avoid.[330]

---

[329] Australian Greenhouse Office, Department of the Environment and Heritage, Climate Change: Risk and Vulnerability, Promoting an Efficient Adaptation Response in Australia - Final Report, March 2005.

[330] Senator Hon Penny Wong, It's official- Australia is now part of the Kyoto Protocol, 11 March 2008.

To achieve the policy objectives, the Australian government has committed to the following:[331]

- to reduce emissions to 60 per cent of 2000 levels by 2050;
- implementing a comprehensive emissions trading scheme by 2010;
- setting a 20 per cent renewable energy target by 2020; investing in research and development of low-emissions technologies;
- helping households and businesses to use energy more wisely; and
- managing land to reduce emissions.

The Australian government intends to use a market mechanism to lower emissions at the lowest cost to the economy and to households

The Australian government proposes to devise measures to assist households, particularly low-income households to adjust to the impact of carbon prices.

D.4.3.1 What is the Garnaut Climate Change Review?

On 30 April 2007, the Australia's State and Territory Governments commissioned Professor Ross Garnaut to conduct an independent study on climate change (the Garnaut Review). In January 2008, the Prime Minister of Australia confirmed the Commonwealth Government's participation in the Garnaut Review.

The Terms of Reference requested Professor Garnaut to report on:[332]

1. the likely effect of human induced climate change on Australia's economy, environment, and water resources in the absence of effective national and international efforts to substantially cut greenhouse gas emissions;
2. the possible ameliorating effects of international policy reform on climate change, and the costs and benefits of various international and Australian policy interventions on Australian economic activity;
3. the role that Australia can play in the development and implementation of effective international policies on climate change; and
4. in the light of 1 to 3, recommend medium to long-term policy options for Australia, and the time path for their implementation which, taking the costs and benefits of domestic and international policies on climate change into account, will produce the best possible outcomes for Australia. In making these recommendations, the Review will consider policies that: mitigate climate change, reduce the costs of adjustment to climate change (including through the

[331] www.climatechange.gov.au

[332] Garnaut Climate Change Review, Terms of Reference, 30 April 2007. Available: http://www.garnautreview.org.au/CA25734E0016A131/pages/about.

acceleration of technological change in supply and use of energy), and reduce any adverse effects of climate change and mitigating policy responses on Australian incomes.

The Garnaut Review final report is due on 30 September 2008.

Interim Report – February 2008

In his February 2008 Interim Report, Professor Garnaut stated that mainstream scientific opinion and the Garnaut Review's own work:

> suggest that the world is moving towards high risks of dangerous climate change more rapidly than has generally been understood. This makes mitigation more urgent and more costly.[333]

Australia must start to put in place effective policies to achieve major reductions in emissions. Professor Garnaut places an ETS at the centre of an Australian emissions mitigation strategy.[334] An ETS places a cap on total emissions, issues permits for those emissions, requires participants to hold permits for any generated emissions, and allows trading of permits.

D.4.4 What are the emissions mitigation strategies?

The Australian government proposes to implement an emissions trading scheme to commence in 2010. Emission trading will place a limit or "cap" on the emissions allowed to be produced.

Australia signed the Kyoto Protocol in December 2007 and it would take effect on March 2008. Under Kyoto, Australia is obliged to limit its greenhouse gas emissions in 2008/12 to 108 per cent of its emissions in 1990.

According to a report titled "Tracking to the Kyoto Target", by 2020, Australia's emissions will be 120 per cent of 1990 levels. That is a reduction of 38 million tonnes on the 2006 forecast of 127 per cent.

D.4.4.1 Mandatory Renewable Energy Target (MRET)

To help ensure the Government achieves its goal of a 20 per cent share for renewable energy in Australia's electricity supply by 2020, the Government committed to increasing the MRET from 9 500 gigawatt-hours to 45 000 gigawatt-hours in 2020.[335]

---

[333] Professor Ross Garnaut, Interim Report to the Commonwealth, State and Territory Governments of Australia(Interim Report), Garnaut Climate Change Review, February 2008, p.4. Available: www.garnautreview.org.au.

[334] Garnaut, Interim Report, p.5.

[335] Australian Government, Department of Climate Change, 20% Renewable Energy Target. Available: http://www.climatechange.gov.au/renewabletarget.

The aim of the renewable energy target is to increase the production of renewable energy. Under the target, all electricity retailers and wholesale buyers have a legal liability to contribute towards the generation of additional renewable energy. They are called "liable parties", and meet their legal obligation by acquiring Renewable Energy Certificates (RECs). Each REC represents on MWh of eligible renewable energy.[336]

The expanded measure will be phased out between 2020 and 2030 as emissions trading matures and prices become sufficient to ensure that an MRET is no longer required to drive deployment of renewable generation technologies.

The *National Greenhouse and Energy Reporting Act 2007* establishes a single, national system for reporting greenhouse gas emissions, abatement actions, and energy consumption and production by corporations from 1 July 2008.[337]

Australia has a National Carbon Accounting System that accounts for greenhouse gas (carbon dioxide based) emissions from land. It accounts for both greenhouse gas emissions and removals (or sinks).

D.4.4.2 Emissions Trading Scheme

As part of the framework to address climate change, the government is establishing an ETS. The purpose of the ETS is to mitigate climate change by placing a limit on rights to emit greenhouse gases. The limit is to be reduced over time to a level that prevents any net accumulation of greenhouse gases in the atmosphere.

This constraint is imposed by the government creating permits which allow the holder to emit a set amount of greenhouse gases. The government then requires the emitters to hold these permits in order to emit greenhouse gases to the atmosphere. The permit is a tradeable instrument.

The government has indicated that the ETS must be a "cap and trade" scheme, in which total emissions are "capped". Permits are then allocated up to the cap. These permits are then able to be traded and the market will find the most economical way to meet any necessary reductions in greenhouse gases.

Emissions Trading Scheme Discussion Paper – March 2008

In March 2008, Professor Garnaut published an ETS Discussion Paper. It provides a framework to help Governments consider how to develop and deliver an effective Australian ETS.[338]

---

[336] Australian Government, Office of the Renewable Energy Regulator, Fact Sheet – Mandatory Renewable Energy Target Overview, February 2008, p.2. Available: http://www.orer.gov.au/publications/mret-overview.html.

[337] *The National Greenhouse and Energy Reporting Act* 2007. Available: http://www.climatechange.gov.au/reporting/legislation/index.html.

The Discussion Paper proposes principles and design features. These included: how to set an emissions limit and vary it over time to align with international agreements; how to allocate permits; what the breadth of the Scheme from the outset should be; and how appropriate an interim support for trade-exposed, emissions-intensive industries would be.

D.4.5 Climate Change Adaptation Strategies

There were a number of greenhouse gas abatement programs initiated by the federal government. These include: improving the efficiency of generation processes, providing funding for the uptake of small scale low-emission technologies, funding for the reduction of coal mine methane and devising a national framework for Australian businesses to report on greenhouse gas emissions.

Energy efficiency initiatives have also been applied to households and communities in relation to appliances and fittings, buildings and houses, encouraging eco-friendly transport options, rebates for solar hot water systems, along with climate education activities.

The government has devised a marketing regime whereby businesses can market their products using a "greenhouse friendly" logo to demonstrate to consumers that their products and services are greenhouse neutral.

There were mitigation and adaptation measures that were the responsibility of government including: local greenhouse action, energy efficiency in government operations, solar cities initiatives.

338 Garnaut, Emissions Trading Scheme Discussion Paper, Garnaut Climate Change Review, March 2008, p.5. Available at: www.garnautreview.org.au.

D.5 Proposed NEM-wide options addressing dis-orderly bidding

As discussed throughout this Final Report, while the evidence indicated that the level of congestion had not been significant in the past, the emerging climate change agenda is likely to impact on the prevalence and materiality of congestion in the future.

While these options would not be proportional responses to the past level of congestion in the NEM, there may be scope in the future to consider options proposed by stakeholders during the course of this Review that looked to address the problems arising from congestion. While some stakeholders proposed options that would require substantial changes to the wholesale pricing and settlement arrangements (e.g. the LATIN Group's full CSP/CSC proposal), other stakeholders proposed more moderate solutions to the dis-orderly bidding problem. The dis-orderly bidding problem is a congestion-related policy challenge arising from the NEM's regional pricing design.

In this light, we present a summary of these proposals put forward in submissions to the Draft Report. We provide a description of the options, identify their characteristics, and present the proponents' reasoning as to why they consider the options would benefit the market.

The views expressed below are the proponents. We do not provide any commentary on or support for any of the proposals.

Before stepping through the various options, in February 2008, we published a framework paper by Gregan and Read on congestion pricing options for the NEM.[339] This paper set out a generic framework for describing different ways in which network congestion might be reflected in the wholesale pricing and settlement arrangements. All the options presented below can be characterised using that framework.

D.5.1 "Congestion management scheme (without allocating rights)" – group proposal

A group of generators[340] proposed this scheme late in this Review process.[341] They proposed the scheme as a means of addressing the distorted bidding incentives that the existing settlement process create in the presence of congestion. They consider this distortion is likely to increase with the rapid introduction of significant intermittent generation.

The following sections set out how the proposal is described and motivated by the proponents.

---

[339] Gregan and Read, Congestion Pricing Option for the Australian National Electricity Market: Overview, February 2008.

[340] The group includes: TRUenergy, International Power, Flinders Power, AGL, and LYMMCO.

[341] TRUenergy, International Power, Flinders Power, AGL, and LYMMCO, Draft Report supplementary submission, Congestion Management Review, 4 April 2008.

D.5.1.1 Proposal objective

The principle objective of this proposal is to provide incentives to generators to bid efficiently by replacing the existing right to settle at the RRN with an alternative right. This has the secondary effect of eliminating the need for market intervention (e.g. clamping) while promoting inter-regional trade. The proposal works within the existing regional market design.

D.5.1.2 Proposal description

The proposal would apply universally to all binding constraints that contain generator terms. There are no prior allocation of rights. Instead, the alternative right to settlement is determined in real time has two components: the first is a share of the capability of the constraint (settlement adjustments sum to zero); and the second is a shared pro-rata based on presented capacity. The adjustment process at settlement is in three steps: the first includes existing regional settlement. The second two steps occur only if there is a binding constraint with a generator term.

The second step effectively brings the total settlement to the "local price".[342] This removes the "dis-orderly bidding" incentive. The third step effectively brings total settlement to a point such that all generators receive a pro-rata "right" to RRN settlement, plus variations at the local price.[343]

For generators, the shared pro-rata is on the basis of bids; for interconnectors is it on the basis of other limits.

D.5.1.3 Proposal characteristics

According to the proponents, the proposal allows the current dispatch process to work with more efficient bidding incentives; the adjustments are in settlement only. It treats interconnectors and generators equally. This restores inter-regional hedging capacity as well as eliminating the need for NEMMCO intervention in dispatch (e.g. clamping).

The proposal is aimed at improving operational efficiency. It does not distinguish between new generators and existing ones. A new generator can locate in a congested area and will receive an equal share of congestion to existing generators. It therefore does not improve investment locational signals, nor the level of congestion. It does address the symptoms of congestion.

[342] This step is identical to CRA's constraint support pricing (CSP).

[343] This step is equivalent to CRA's constraint support contract (CSC).

D.5.1.4 Proposed benefits

The group of generators cite a number of benefits from the proposal. According to these generators, this proposal would:

- eliminate the incentives for "dis-orderly bidding", allowing efficient operation of a regional market;
- have a low implementation cost, requiring only the development of an additional settlement process;
- fund negative settlement residues arising from inter-regional counter-price flows, thereby eliminating the need for physical intervention in dispatch to manage negative settlement residue accumulation;
- not give priority in dispatch to any participant or groups of participants;
- reduce participant incentives to distort unit dispatch targets, such as ramp rates or "inflexibility";
- not deprive participants of an existing right without equivalent compensation;
- not require an auction or ex-ante allocation of "rights", thereby providing more predictable access to the RRN and improving hedging, both intra and inter-regionally; and
- assist the AER in measuring congestion as it reveals the true constraint price.

D.5.1.5 More detailed design issues

There are several design issues identified by the group. These include:

- the time interval for the settlement process;
- the derivation of relevant energy quantities;
- the definition of availability for interconnectors;
- a pure constrained-on case; and
- a "mixed constraint" case, where a constraint simultaneously constrains-on and –off generators and/or interconnectors.

These issues are discussed in more detail below.

Time interval for the settlement process

The processes under the proposal are purely "mechanical" and are based on dispatch data. It would therefore be convenient to operate the proposal on a dispatch interval basis. This is consistent with the existing settlement arrangements for market

ancillary services. The existing 5-minute/30-minute anomaly[344] remains but the proposal would not make it worse.

Derivation of relevant energy quantities

Spot prices are calculated as a price at generator terminals, but are settled to the sent-out basis, after the internal generator use is deducted. This existing issue in settlement remains in this scheme, but is not made worse. Steps 2 and 3 of the proposal must both use either generated or sent-out energy.

The group recommends the use of sent-out energy. This would be derived from: (1) revenue metered sent out energy for a trading interval (30-minute basis); (2) generated energy for a dispatch interval (5-minute basis) based on beginning and end generated values (as used in dispatch); and (3) the relationship between generated and sent-out energy for each unit for each trading interval.

Using this definition of sent out energy would require a consequential minor change to the definition of RRN share to include this relationship between generated and sent out energy.

Definition of availability for interconnectors

Under the proposal, there needs to be a definition of availability. For a generator, the availability defines the maximum use of the constrained link that the generator could make, if it out-competed its competitors.

Interconnectors are simultaneously subject to several constraints. Each represents a limit on a different network component. The group proposes that interconnector availability be represented using the most restrictive non-binding constraint. This defines the capability of the interconnector if it out-competed its rival generators and/or interconnectors.

NEMMCO already has a tool to evaluate this.

Pure constrained-on case

Under the proposal, the incentive for a constrained-on generator to withdraw capacity remains. To resolve this issue, the proposal would incorporate a compensation payment to the constrained-on generator. As a financially-balanced process, i.e. a process equally offsets increased settlement payments to some generators using funds from other generators, this proposal cannot directly supply a constrained-on payment. Instead, the group proposes that under this case, steps 2 and 3 of the adjustment are omitted.

---

[344] Dispatch is on a 5-minute basis while settlement is on a 30-minute basis. Flows on interconnectors can sometimes change direction within a 30-minute period. When this happens, there may be a disparity between the 5-minute dispatch and 30-minute settlement outcomes.

Cases with "mixed constraints"

There are generators that can facilitate more network capacity for other generators or an interconnector. These generators are known as "positive gatekeepers". The option proposed defines a settlement process to reward the positive gatekeeper based on benefits conferred, and therefore, provides incentives for more efficient dispatch.

To provide such incentives, the constrained-on units would have a zero adjustment in Step 3. This leads to these units having net revenue at their local price. To fund this adjustment, the constrained-off units' adjustment would only share the network capability that would have been available without the positive gatekeeper, not the larger capability now enabled. It is important to note that the local price received by the positive gatekeeper is limited by the economic benefit in dispatch.

D.5.2 "Mechanism with registered capacity non-firm financial rights" – Hydro Tasmania proposal

Hydro Tasmania proposed a mechanism with non firm financial rights as a way of promoting incentives for more economically efficient dispatch.[345]

D.5.2.1 Proposal objective

The proposal's aim is to limit the dispatch volume for each constrained generator is guaranteed the RRP. This will provide incentives, at the margin, for generators to bid in an efficient manner. The proponent contends that it would have low costs of implementation.

D.5.2.2 Proposal description

For dispatch up to a given amount or "congestion residue" holding, a generator would receive the RRP. For any dispatched volume above the residue holding, the generator would receive the local nodal price. This would be the case independent of whether the residues were allocated or auctioned.

This proposal would apply to each constraint equation individually, with zero-sum[346] post dispatch settlement adjustments[347]. Because the adjustments to settlement are post-dispatch, the proposal does not directly impact on operational timeframes.

---

345 Hydro Tasmania, Submission to Draft Report, Congestion Management Review, 3 December 2008, pp.7-8.

346 This is the case if there are no uplift payments to constrained-on generators.

347 There is a potential 5-minute/30-minute issue, but with 5 minute market metering on all dispatchable variables, this can be resolved.

Hydro Tasmania proposes to allocate non-firm financial rights on the basis of registered capacity at the proposal's inception. Participants are free to negotiate with TNSPs to fund transmission augmentations over and above what is justified under the Regulatory Test, and would receive additional financial rights for the augmented amount.

The proposal is an automatic process. It does not rely on selecting a set of significant constraints or require continuous monitoring and regulatory action. This proposal provides a set of future processes to deal with congestion as it emerges and recedes

There is currently an allocation of "congestion residues" in the NEM today. A generator receive an allocation of congestion residues for a particular constraint equation if they are located in a "remote local" location but not if they are located in an adjacent NEM region.

An allocation based on registered capacity (or availability factor) would mean new generators would not automatically receive access to congestion residues. This means new investors would need to account for transmission costs as part of a project, as Hydro Tasmania stated as economically efficient. New generators would have options to: accept occasionally constrained output; contribute to augment the network, receiving a total congestion residue equal to the upgraded capacity; or accept a lower price than existing generators, but "winning" a share of network access.

The proposal does not attempt to firm up allocations from external funding. This creates a risk at the margins that net settlement may be at a generator's offer price.

As congestion increases, Hydro Tasmania considers the impact of the proposed measures will also increase. This proposal would provide certainty to the market as to what the response would be in the event that congestion does emerge, either as a consequence of new investment or through other events, like NEMMCO applying temporary network constraints to manage power system security.

D.5.2.3 Proposed benefits

According to the proponent, this option:

- will deliver investment certainty in relation to transmission access; and
- will help manage trading risks that can arise even if a constraint equation binds on rare occasions only.[348]

[348] This is because, the impact on the willingness to enter the contract market is based on the "perceived risk that it may bind" at some time in the future. In addition, the dispatch risk currently managed by dis-orderly bidding, like -$1 000/MW, can be a significant barrier to inter-regional trade. There is always a trade-off between dispatch and basis risk.

D.5.3 "Real time settlement adjustment mechanism" - Babcock and Brown Power proposal

In its submission to the Draft Report, Babcock and Brown put forward a proposal outline to improve dispatch efficiency.

D.5.3.1 Proposal objective

Babcock and Brown Power proposed that market mechanisms should be explored to improve the real time management of constrained power flows using real time adjustment to settlements.[349]

D.5.3.2 Proposal description

The proposal suggested a settlement adjustment for parties in a binding constraint equation based on the constraint equation coefficients and generation presented to the market. Babcock and Brown considered that unlike the current "tie break" arrangements, this approach would reduce the output of generators proportionally to their contribution to the binding constraint.

D.5.3.3 Proposed benefits

According to the proponents, this scheme would:

- create a more predictable and efficient dispatch outcome;
- remove distorted bidding incentives;
- avoid introducing additional complexity through locational pricing;
- allow for a more accurate calculation of the true cost of congestion; and
- involve minimal implementation costs.

[349] Babcock and Brown Power, Draft Report submission, Congestion Management Review, 12 March 2008, p.3.

This page has been intentionally left blank