CS ENERGY LIMITED

ERARING ENERGY

MACQUARIE GENERATION

ORIGIN ENERGY

SNOWY HYDRO LIMITED

STANWELL CORPORATION LIMITED

TARONG ENERGY LIMITED

19 November 2008

Dr John Tamblyn
Chair
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Dear Dr Tamblyn

CS Energy Corporation Limited, Macquarie Generation, Origin Energy, Snowy Hydro Corporation, Stanwell Corporation and Tarong Energy Corporation Limited (the Group) welcome the opportunity to respond to the Review of Energy Market Frameworks in Light of Climate Change Policies Scoping Paper (the Scoping Paper) put forward by the Australian Energy Market Commission (AEMC). While individual businesses may put forward separate views addressing the broader issues discussed in the Paper, this submission focuses on the question of generation adequacy and NEM design.

We specifically consider the Scoping Paper request for comments on what adjustments to market frameworks, if any, would be desirable to ensue that investment is forthcoming at least cost. To assist the Group in responding, Synergies Economic Consulting (Synergies) was engaged to assess the need and impacts of shifting from the "energy only" market design. Capacity mechanisms have been mooted as a likely alternative and as such are examined.

In other words, this study examines whether there is a basis for considering capacity markets as a transitional mechanism to manage the outcomes of the Carbon Pollution Reduction Scheme (CPRS) and the expanded Renewable Energy Target (RET).

The Synergies Paper suggests that changes to the National Electricity Market (NEM) design are not an appropriate way of addressing current uncertainties in relation to future investment. Evidence from other jurisdictions seriously questions whether they are an

effective means of ensuring generation adequacy. In fact, they have the potential to create more problems than they solve, including distorting market signals.

The key points raised in the paper include:

- The issues raised by the AEMC are transitional in nature and mitigating measures should be treated as such. They need to address timing, information and uncertainty. These issues will not be addressed by a fundamental redesign of the market. Mechanisms are probably more appropriately addressed under the CPRS and expanded RET scheme;

- There is no international evidence to suggest that capacity mechanisms deliver optimal levels of generation adequacy at least cost;

- Capacity mechanisms are not a transitional measure. Apart from the fundamental concerns regarding their effectiveness and the problems they can create, there would be considerable lead time involved with the design and implementation of such a mechanism in the NEM; and

- A lack of demand-side participation is identified as one of the failures contributing to concerns regarding generation adequacy. Capacity mechanisms will almost certainly substantially reduce the role of demand-side participation. This seems contrary to the overall objective of reducing emissions.

On this basis, the Group does not support any further consideration of capacity mechanisms as an alternative to the "energy only" market design by the AEMC as part of the Energy Market Frameworks Review.

Yours faithfully

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Review of Energy Market Frameworks in light of Climate Change Policies

Response to AEMC Scoping Paper

November 2008

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Disclaimer

Synergies Economic Consulting (Synergies) has prepared this advice exclusively for the use of the party or parties specified in the report (the client) and for the purposes specified in the report. The report is supplied in good faith and reflects the knowledge, expertise and experience of the consultants involved. Synergies accepts no responsibility whatsoever for any loss suffered by any person taking action or refraining from taking action as a result of reliance on the report, other than the client.

In conducting the analysis in the report Synergies has used information available at the date of publication, noting that the intention of this work is to provide material relevant to the development of policy rather than definitive guidance as to the appropriate level of pricing to be specified for particular circumstance.

Contents

1 Overview

The Australian Energy Market Commission (AEMC) is currently conducting a review of the potential impact of the Government's climate changes policies on the energy markets. The focus of the review is on two key policies – the Carbon Pollution Reduction Scheme (CPRS) and the expanded Renewable Energy Target (expanded RET). A key purpose of the review is to determine whether any adjustments to energy market frameworks are required to ensure that their objectives can continue to be met, particularly in terms of the security and reliability of supply.

This paper responds to the AEMC's Scoping Paper, *Review of Energy Market Frameworks in Light of Climate Change Policies* (the Scoping Paper). In particular, the paper focuses on the potential implications of the Government's climate changes policies on generation adequacy and whether it might warrant any changes to the market design.

The key conclusion of this paper is that capacity mechanisms – which would involve a fundamental change to the market design – are not an appropriate way of addressing current uncertainties in relation to future investment. Evidence from their application in other jurisdictions seriously questions whether they are an effective means of ensuring generation adequacy.

Some of the key concerns that have been raised regarding capacity mechanisms include:

- mixed evidence as to whether they have been successful in stimulating new investment in generation capacity;
- if they are successful in stimulating investment:
    - they will not necessarily encourage the 'right' investment (for example, it could lead to further investment in inefficient generation capacity or the retention of inefficient and/or unreliable plant beyond its economically justified retirement date);
    - it could lead to over-investment;
- there are significant issues associated with their design and implementation, including setting the key parameters (for example, at what level should a capacity payment be set);
- they have a limited ability to constrain the use of market power. Capacity markets themselves may be susceptible to the use of market power by incumbents.

What is evident is that they have the potential to create more problems than they solve. A fundamental issue is the distortion of market signals.

The issues raised in the Scoping Paper are transitional (albeit over a lengthy period due to the nature of the industry) and therefore should be treated as such – they relate to:

- timing (due to the need to transform the generation capacity in the NEM);
- information (concerning the future timing of decommissioning and refurbishment of existing generators); and
- uncertainty - the current climate change policies are creating considerable uncertainty in the market. This uncertainty could undermine one of the key policy objectives underpinning the Scoping Paper – namely to create an environment which is facilitates the timely investment in generation capacity.

None of these issues will be addressed by fundamental redesign of the NEM – indeed, such redesign will only exacerbate these difficulties. This is especially the case if the market redesign is contemplated on a transitional basis.

Capacity mechanisms are not a transitional measure. Apart from the fundamental concerns regarding their effectiveness and the problems they can create, there would be considerable lead time involved with the design and implementation of such a mechanism in the NEM. Once it was in place, there is further lead time involved in the development of new investment, assuming these mechanisms were successful in stimulating this. This timeframe is likely to well exceed the timeframes for investment necessitated by the climate change policies, even if a reasonable transition period is allowed.

This will only lead to further uncertainty and distortion to the NEM. Such an outcome would not be in the long term interests of consumers.

The AEMC's process should result in a greater understanding of the nature and implications of the policies and hence reduce uncertainty.

If it is concluded that there are potential failures that will need to be addressed which are transitional in nature, the solutions need also to be transitional measures that are specifically targeted to that failure. Some of these initiatives, for example, might best be addressed under the Emissions Trading Scheme, rather than changes to the NEM. A fundamental issue for this review is the potential interaction between climate change policies and the energy-only design of the NEM.

In our view, addressing some of the issues associated with the climate change policies should not interfere with the fundamentals of the energy-only market design or detract from its long-term objectives. Intervention in any form needs to be carefully targeted given its potential to distort market signals or produce unintended consequences that could compromise the market objectives.

2 Review Process

2.1 Identification and assessment of the issues

The Scoping Paper canvasses some of the ways that the climate change policies might impact the market (which have been categorised under a number of key areas) and considers some of the risks that could arise as a consequence. In our view, before any possible strategies to address these risks can be selected, it is necessary to attempt to identify the most likely risks that could arise as a consequence of the climate change policies, and then for each risk, consider:

- the possible causes (that are consequences of the climate change policies);
- any other condition/s that might be necessary for the risk to be realised;
- what the impact of that risk could be;
- who it would impact;
- whether there are any existing strategies that could be employed to manage the risk; and
- whether intervention is needed to avoid or reduce the risk and if so, how that intervention should be pursued.

Some criteria could be established to evaluate each risk and determine whether intervention is necessary. Fundamental to this is whether the materiality of the risk and whether it has the potential to compromise the market objectives, both in the short-term and the long-term. Consideration also needs to be given as to whether the intervention could create distortions in the market or produce unintended consequences.

One of the key issues that has been raised in the Scoping Paper is generation adequacy. There are a number of possible causes of inadequate generation capacity that could be linked to the climate change policies.

An example of one cause of inadequate generation capacity is that the portfolio of renewable and non-renewable generation capacity that might ultimately be achieved is sub-optimal, leading to reliability problems. This could occur, for example, because of the premature retirement of older plant accompanied by a significant change in the generation portfolio mix with an increase in intermittently operating generating capacity. Exploring the possible causes and consequences of this issue necessitates

forming a view on what that an 'optimal' or 'acceptable' portfolio of generation capacity might look like (there are likely to be a number of alternative scenarios here), considering whether there are any impediments to the market achieving this in the required timeframe and if so, identifying what those impediments are.

It is not proposed to evaluate these issues here. However, we believe such a process will facilitate a more detailed and comprehensive understanding of the full implications of the climate change policies on the market. An important part of this is understanding the interaction between the policies, including the Emissions Trading Scheme, and the energy-only NEM. This is of fundamental importance to ensuring any interventions are correctly targeted.

This would then culminate in the development of a transitional strategy that may include further intervention to address specific areas where there is a key risk of failure (that in turn could have a material impact on the market). Any interventions that are included in this strategy are only recommended on the basis that the benefits of the intervention outweigh the costs and risks and it can be shown that they would not compromise the fundamental integrity of the market design.

For example, the Scoping Paper identifies the challenges to the market presented by more intermittent generation, such as the heightened importance of ancillary services in the market.

Similarly, the risk that the market will see a surge in plant retirements is likely to be driven predominantly by poor information concerning the timing of plant closures. Hence, where issues of generation capacity adequacy arise, we are of the view that they are more likely to be symptomatic of information and coordination problems, rather than flaws in the market design.

Again, we are of the view that any such problems are transitional in nature and are therefore best addressed by a clear, cohesive transitional strategy, which includes a plan to monitor and review any specific market interventions and contemplates when and how they will eventually be removed. A key component of such a plan is to ensure appropriate targeting of instruments to address identified policy objectives linked to failures in market design.

2.2 Instruments and targets

A key issue for the AEMC to consider is the effect that the CPRS and the RET has on the alignment of policy instruments and targets. A well known general rule of

economic policy, developed by Tinbergen[1] is that the number of instruments must equal the number of targets.[2]

The theory was developed to prove the existence of a policy solution to maximise social welfare.[3] The benefit of the rule is that it ensures policy-makers give explicit consideration to the ability of an instrument to achieve a policy objective. It also suggests that at least in theory there is an optimal response to any policy problem.

The rule reminds policy makers to explicitly identify the relevant policy objectives and the instruments to achieve these objectives when contemplating a change in policy. Each instrument should be assigned to only one objective. If there are several policy options that can achieve the objective then an evaluation framework should select the instrument that best achieves the policy objective.

Applying this framework to the Scoping Paper there appears to be at least three policy objectives:

- efficient operation of energy markets;
- efficient investment in energy generation;
- optimal emissions from greenhouse gases.

However, there are a large number of potential instruments to apply to these targets:

- energy market design (including instruments such as capacity mechanisms);
- market conduct rules;
- price regulation;
- carbon taxes;
- CPRS;
- subsidies and incentives (eg RET);
- emissions quota system; and
- other State-based policies.

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1 Tinbergen. J. (1956). *Economic Policy: Principles and Design*. Amsterdam, North Holland.

2 Targets are numerical values of variables appearing in a social-welfare function and are supposed to be the values that maximise social welfare. Instruments are quantitative values of means controllable by the policy-maker.

3 Tinbergen. J. (1998). 'Target and Instruments'. in Eatwell. J, Milage. M, Newman. P. (1998). *The New Palgrave Dictionary of Economics*. P 584.

There are already a greater number of potential instruments than targets. For example, the CPRS will be introduced to achieve a defined reduction in GHG emissions. However, the RET and other schemes are also aimed at delivering the same objective albeit indirectly through encouraging a specific generation type.

This submission does not address the appropriateness or otherwise of the design of Australian Government's greenhouse policy, except to the extent that its violation of the above economic policy principle has relevance to the AEMC's current review.

Pursuing a target with multiple instruments raises a number of problems:

- policy evaluation is more complex because multiple instruments need to be assessed;
- policies can be reinforcing – which can cause overshooting of a target. They can also be opposing, leading to failure to achieve a target; and
- the multiple instruments create greater uncertainty among target firms.

Similar problems arise when different instruments actually result in multiple targets being pursued – the achievement of a subsidiary objective (say, renewable energy penetration) may well come at the cost of a failure to achieve a primary objective (such as a reduction in GHG emissions at minimal economic cost).

Accordingly, when considering the complexities associated with the impact of the CPRS and RET on energy markets, the AEMC should clearly articulate the objectives it is pursuing. From the Scoping Paper, the key issue appears to be to ensure that price signals from the NEM are sufficient to encourage timely, future investment in generation capacity – having regard to the interplay between the ETS and the NEM. The instruments then need to be evaluated for their effectiveness in achieving that objective. In this regard, it is preferable to select the instrument that targets the objective directly.

One such instrument that has been mentioned in this and other forums is capacity payments. Capacity mechanisms will now be examined in more detail.

3 Generation Adequacy and Capacity Mechanisms

One strategy that has been mooted (and not only in the context of climate change policies) is the introduction of capacity mechanisms to provide incentives for future investment in generation capacity. This section will:

- provide an overview of capacity mechanisms;
- examine the experience with their application in other jurisdictions; and
- consider their implications for the NEM, particularly in the context of the climate change policies.

3.1 Overview of capacity mechanisms

3.1.1 Perceived source of market failure

One of the key issues facing deregulated markets is ensuring appropriate ongoing investment in generation capacity. In a deregulated energy only market it is assumed that market prices will provide an appropriate signal to investors to deliver the right amount of generation investment at the right time at the right location, thereby ensuring adequate supply.

When capacity is constrained price spikes will be experienced. This in turn could signal the need to invest in new capacity. However, the situation that has emerged in most markets is that when capacity is constrained prices are administratively determined, typically via the application of price caps. Apart from concerns regarding the impact of price spikes on consumers, this has also emanated from concerns regarding the exercise of market power. As a consequence, the price signals are distorted as the price spikes can be too short, too infrequent, or too low (via operation of a price cap) to encourage new investment.

If prices are not high enough to provide a return of and on capital (allowing for the risk in the investment), as well as cover operating costs, investment incentives will be diluted. This has been termed the 'missing money' problem. To the extent that the market does not deliver what is considered to be a socially efficient mix of generation capacity, it can be said to have failed.

A closely related problem is the lack of demand-side participation in energy markets. Most consumers cannot see the real-time price and even if they could, they may lack the ability to respond by altering their consumption. Larger customers can and do

participate directly in the electricity market, but most consumers are not able to do so. This means that overall system demand is highly inelastic.

This also means that during periods of known capacity constraints, generators can exercise market power by say, withdrawing capacity from the market and forcing prices to rise even further. Hence, the conditions that encourage higher spot prices can also lead to market power issues, which in turn can lead to intervention. However, as noted above, these price spikes may purely be a price signal, rather than a consequence of the exercise of market power.

3.1.2 Types of capacity mechanisms

Capacity mechanisms attempt to address this problem. There are two main types of capacity mechanisms, being:

- capacity payments or price adders (price-based); and
- reserve margins (quantity-based).

The alternative to capacity mechanisms is to rely upon the market to ensure generation adequacy, which is termed an 'energy-only' market design. This is the current design underpinning the National Electricity Market (NEM) in Australia.

Capacity payments

Capacity payments tend to be based on adding a specific component to the energy price that is charged to customers. It is designed to provide compensation to generators for making capacity available during peak demand periods. A typical design feature is for these payments to be made irrespective of whether or not that capacity is called upon. It is seen as a means of replacing the 'missing money' and providing incentive to invest in new capacity. An overview of the implementation of capacity payments in Spain, Argentina and Chile is summarised in the Attachment.

Reserve margin

Reserve margin mechanisms seek to control the quantity, rather than the price, of reserve capacity. This typically involves the system operator setting a permanent margin for reserve capacity (such as 10% of peak demand) and then procuring this capacity in the market via an auction process. Alternatively, retailers or large customers may be required to contract for capacity in excess of their expected demand, where the excess equates to a specified reserve margin. Again, a typical design feature

is for successful bidders to be paid for making this capacity available even if is not called upon, although this can vary.

This type of mechanism has been applied in the US and is examined in more detail in the Attachment.

Energy-only

An energy-only market design is an alternative to capacity mechanisms. In theory, intervention is minimised and the price and quantity of generation capacity is determined by the market. This also means that reliance is placed on the market to assess and deliver an appropriate level of reliability to consumers.

In practice, energy-only market designs retain some scope for intervention.[4] For example, in the NEM, the Reliability Panel sets certain reliability standards for market participants to achieve, and reserves the right to intervene to procure necessary capacity in times of emergency. However, the intention is that such a mechanism is only rarely called upon, which contrasts with the compulsory reserve markets where the right to call upon reserve capacity is procured, whether it is used or not. Furthermore, if NEMMCO does intervene, the rules require that it does so in a manner that minimises the distortionary impact on prices.

Other examples of energy-only market designs include Great Britain, the Nord Pool and New Zealand. Reference is made to the Attachment for a brief summary of these jurisdictions.

3.1.3 Assessment of capacity mechanisms

There is a large volume of literature evaluating the effectiveness of the various capacity mechanisms, including energy-only designs.[5] Overall, concerns regarding generation

[4] There are a number of other mechanisms that have been included as part of an energy-only market design, including the contract adequacy approach, option portfolio approach, call option obligation approach and reliability option approach. Refer: P. Cramton & S. Stoft (2006), "The Convergence of Market Designs for Adequate Generating Capacity (with Special Attention to the CAISO's Resource Adequacy Problem)", A White Paper for the Electricity Oversight Board.

[5] For example, refer: Botterud, A. and Korpås, M. (2004), "Modelling of power generation investment incentives under uncertainty in liberalised electricity markets", Paper presented at the 6th IAEE European Conference: Modelling in Energy Economics and Policy, Zurich; Creti, A. & Fabria, N. (2003), Capacity Markets for Electricity; DeVries, J. (2004), "Securing the Public interest in Electricity Generation Markets: the Myths of the Invisible Hand and the Copper Plate", PhD thesis, Amsterdam; Lijesen, M. (2004), "Increasing the Reliability of Electricity Production: A Cost Benefit Analysis", CPB Netherlands Bureau for Economic Policy Analysis, the Hague; Cramton, P. & Stoft, S. (2005), "A Capacity Market that Makes Sense", in the Electricity Journal, August/September 2005; Meade, M. (2005), "Electricity Investment and Security of Supply in Liberalised Electricity Systems", in Mielczarski, W. (ed), Development of Electricity Markets, Series: The European Power Supply Industry; Nieto, A.D.

adequacy have been raised across most jurisdictions (including in jurisdictions that have already implemented capacity mechanisms). However, there is no clear evidence to suggest that capacity mechanisms are an effective way of addressing the problem, which is fundamentally about attracting the 'right' amount of investment at the right time. Some of the key concerns that have been raised regarding capacity mechanisms include:

- evidence that they have not necessarily been successful in stimulating new investment in generation capacity in some jurisdictions;
- if they are successful in stimulating investment:
    - they will not necessarily encourage the 'right' investment (for example, it could lead to further investment in inefficient generation capacity or the retention of inefficient and/or unreliable plant beyond its economically justified retirement date);
    - it could lead to over-investment;
- there are significant issues associated with their design and implementation, including setting the key parameters (for example, at what level should a capacity payment be set);
- they have a limited ability to constrain the use of market power. Capacity markets themselves may be susceptible to the use of market power by incumbents.

The main difficulty with capacity mechanisms is their potential to create more problems than they solve. Apart from the difficulties associated with their design, more fundamentally, there are concerns regarding the unforeseen or undesirable distortion of outcomes in the spot and forward energy markets.

Energy-only is the desirable long-term goal in most deregulated markets and remains the goal in the NEM. In the meantime, intervention via capacity mechanisms could compromise this long-term goal. As a result, it is highly questionable as to whether the benefits of this form of market intervention outweigh the costs.

It is also possible that the source of market failure (if in fact such a failure is able to be demonstrated) lies outside of the spot market design, and other reforms are required, such as institutional change or reviewing the role of government. The prospect of *ad hoc* government intervention and/or decisions that are not transparent and consistent

& Fraser, H. (2007), "Locational Electricity Capacity Markets: Alternatives to Restore the Missing Signals", The Electricity Journal, 20 (2); Roques, F. (2007), "Market Design for Generation Adequacy: Healing Causes Rather than Symptoms", EPRG Working Paper 0801, Electricity Policy Research Group, University of Cambridge.

over time is identified as an issue in a number of jurisdictions. These can have a dramatic and detrimental impact on investor confidence, so that the very threat of Government intervention can exacerbate capacity shortfalls.

The lack of demand-side participation has been identified as one of the failures that have contributed towards concerns regarding generation adequacy. Increasing demand-side participation is therefore considered a necessary part of any successful market design and will certainly be needed if a market is to achieve the long-term goal of an effective and competitive energy-only market. Demand-side participation in the NEM is currently being reviewed by the AEMC. In our view, the introduction of capacity mechanisms will almost certainly substantially reduce (and potentially completely supplant) the role that demand-side participation can play in energy markets.

3.2 Implications for the NEM

3.2.1 Current market framework

As noted above, the NEM is based on an energy-only market design, retaining some scope for intervention to ensure the security and reliability of supply. The reliability settings are based on the Reliability Standards, which are contained in the National Electricity Rules and are set by the Reliability Panel. The current standard of no more than 0.002% of unserved energy was set back in 1998.

Price mechanisms include a price cap (Value of Lost Load, or VoLL) of $10,000 per MWh and a market floor price of -$1,000 per MWh. The key intervention mechanism is the reliability safety net. This intervention is triggered if reserves are expected to, or do, fall below the minimum reserve level periodically set by NEMMCO. The two main ways that NEMMCO can intervene are:

- By acting as a "Reserve Trader" and purchasing ahead of time the additional reserve generation and/or demand side response (DSR) it forecasts will be needed at the time the market is dispatched to meet the minimum reserve levels. Twice now NEMMCO has contracted for, but has not in fact been required to dispatch, reserve capacity in order to meet forecast summer peak demand.

- By requiring generators to provide additional supply at the actual time of dispatch to meet those minimum reserve levels using its short-term direction power.[6]

Under the reliability and emergency reserve trader arrangements, any actions taken by NEMMCO must be those which it expects will have the least distortionary effect on the market.[7] In terms of the utilisation of the reserve trader provisions, the AEMC noted that it has been used twice so far:

> In two separate years, reserve capacity has been contracted for under the reserve trader safety net but it has not been dispatched, although the use of the reserve trader provisions must be regarded as a market failure, whether dispatched or not.[8]

NEMMCO also produces a number of reports. Each quarter it produces its Projected Assessment of System Adequacy, which indicates projected generator availability relative to demand for out to two years. This is used to make decisions on matters such as plant maintenance. Its *Statement of Opportunities* includes ten year forecasts of generator availability and demand. This projection of the supply-demand balance is used to assist with investment decision-making.

Comprehensive Reliability Review

The Reliability Panel (the Panel) undertook a comprehensive review of the NEM's reliability settings in 2007.[9] This was the first comprehensive review undertaken of these settings since the market was established (noting that components had been reviewed in isolation). The AEMC also noted that:

> ...the nature of supply and demand in the NEM has undergone significant change with, for example, an increasingly peaky demand profile and a shift in the mix of generation plant including increasing contribution from wind generation.[10]

The Panel concluded that to date, the reliability settings had performed satisfactorily against the reliability standard. However, it also noted that there are risks to ensuring future investment in generation capacity to meet the standard going forward, with one

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6 Australian Energy Market Commission (2007), AEMC Reliability Panel, Comprehensive Reliability Review, Final Report

7 National Electricity Rules, clause 3.20.2 (b)(i).

8 Australian Energy Market Commission (2007), op.cit., p.xi

9 ibid.

10 ibid., p.x.

of the key drivers of this being the uncertainty associated with the Government's climate change policies (hence the AEMC's current review).

The Panel considered a range of options for amending the reliability mechanisms, including:

- options involving no changes to the roles of the existing reliability mechanisms;
- options introducing additional new mechanisms and revenue for plant providing reserve capacity;
- options involving payments for availability.

The Panel determined that the level of the reliability standard would remain unchanged. However, it identified concerns regarding the clarity of the standard and hence undertook to more clearly specify its measurement and targeting. It also proposed an increase in VoLL to $12,500 per MWh and recommended that the floor price remain unchanged.

The Panel concluded that as options involving payments for availability would involve a fundamental change to the market design, this would be a matter for consideration by the Ministerial Council on Energy.

Previous reviews of the energy-only design

Australia has often been used as an example of a successful energy-only design. Oren observes:[11]

> That success is often attributed to the scarcity pricing policy that allows electricity prices in Australia to rise to US$8,000/MWh, to the absence of market mitigation and to market rules that allegedly promote liquidity. However, there are also unique aspects such as ownership structure, technology mix, absence of market power, and a set of not-well-defined "good faith" constraints on bidding behaviour, that have contributed to that success.

There is a view that investment in Australia has largely occurred due to 'non-market' factors, such as the fact that (some) generators are still government owned and investment planning is centrally co-ordinated.[12]

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[11] Oren, S. (2005), "Generation Adequacy via Call Option Obligations: Safe Passage to the Promised Land", The Electricity Journal, vol.18, Issue 9. p.29.

[12] Cramton, P. & Stoft, S. (2005), "A Capacity Market that Makes Sense", in the Electricity Journal, August/September.

A number of reviews of the market design have already been conducted. A report commissioned by NECA in the very early days of the market's development examined the introduction of capacity mechanisms and their potential impact on the market and the achievement of its objectives.[13] It concluded that each of the various approaches has benefits, as well as serious flaws. Market-based arrangements, with limited reliance on the use of directional powers by NECA, remained the preferred approach.

COAG undertook a review of the market in 2002.[14] Concerns had been expressed regarding the ability of the NEM to lead to appropriate investment at the right time, particularly in generation. It maintained the view that consistent patterns of price spikes will encourage investment in peaking plant, and there is evidence that this is occurring. It believes there is evidence of the NEM providing appropriate capacity signals. The contract market is also providing these signals, as evidenced by the increases in prices for standard contracts in 2001 and 2002.

COAG noted that timely investment in new generation capacity appears to be an issue in most jurisdictions, irrespective of the market design. It concluded that capacity mechanisms that were designed to incentivise timely investment in generation capacity had generally not been successful.[15] For example in the UK, capacity payments did not lead to new investment. Instead, the 'dash for gas' was largely responsible. It was of the view that an energy-only design will provide sufficiently strong signals to encourage new investment:[16]

> …provided that measures that serve to distort the operation of the market are removed and the demand side is enabled to respond more adequately at times of high prices and system stress.

3.3 Do the climate change policies warrant a change in design?

3.3.1 Defining 'the problem'

The Scoping Paper notes that the climate change policies will necessitate large investment in generation capacity (renewable and non-renewable). It notes that while

[13] Putnam, Hayes & Bartlett – Asia Pacific Ltd (1999), "Capacity Mechanisms in the National Electricity Market", A discussion paper prepared for NECA, Wellington, p.58.

[14] Council of Australian Governments Energy Market Review (2002), "Towards a Truly National and Efficient Energy Market", Commonwealth of Australia.

[15] ibid., p.108.

[16] ibid., p.117.

the current energy market frameworks have been successful in attracting investment to date (noting that some of this has been facilitated by government):

> There is a risk that they will be less successful in attracting the large amount of additional investment that will be required, or that investors will seek higher returns in response to the risks they face.[17]

In this regard, it also notes that the NEM does not provide capacity payments (whilst the WEM does).

This is therefore a different type of 'missing money' problem. It is not necessarily a consequence of the market failure outlined above, but rather concerns regarding the significant amount of investment required in a relatively short time frame. This in turn is largely a function of the size and depth of the Australian market (in the context of an international market with competing demand for cleaner generation sources). The current uncertainty in relation to climate change policies could also stifle investment incentives.

From the outset, there are therefore questions as to whether capacity mechanisms are an appropriate response to this given they are intended to address clear cases of failure in the energy market.

3.3.2 Identifying solutions

The fundamental question here is whether the current concerns regarding the adequacy of future investment in both renewable and non-renewable generation capacity warrants some form of intervention by Government or whether it requires fundamental change to the NEM market design such as would be the case if a capacity mechanisms were introduced.

As noted in section 2, the first step in the process is to identify the risks that could arise as a consequence of the climate change policies. For example, two key risks include:

- the rapid decommissioning of plant or the extended and contemporaneous unavailability of plant whilst carbon reduction measures are taken; and
- a fundamental change in the generation portfolio constituting the market.

[17] Australian Energy Market Commission (2008), Review of Energy Market Frameworks in Light of Climate Change Policies, 10 October, p.36.

Lack of plant availability

There is the potential for a rapid decommissioning scenario to cause disruption to the NEM. The extent of this disruption is fundamentally a function of the carbon reduction trajectory that is adopted. Measures that have already been contemplated to manage some of these impacts include:

- as proposed in the Green Paper, a prolonged period of price caps being applied to GHG emissions (at a level which is unlikely to cause significant change in the existing merit order); together with
- the measures floated for strongly affected industry in general (and the electricity sector in particular through the Electricity Sector Adjustment Scheme).

It is quite possible if a cautious trajectory is initially established following on from the period of carbon price caps that are already foreshadowed, there will be sufficient time for an informed energy only market to efficiently and effectively clear.

This in turn highlights the nature of the problem. Rather than distorting the energy only market to provide incentives for new generation, the key issues relate to timing and to ensuring that information is available to the market as to future capacity availability in the market. In other words, the issues surrounding plant decommissioning or major refurbishments are expected to be largely informational in nature due to the issue being one of co-ordination in the market.

Such an approach provides a more direct mechanism to enable market participants to be informed as to the timing of plant withdrawals which in turn will provide sufficient information to the market to allow forward pricing decisions to be taken. It is recognised in the specific context of the transitional issues associated with the introduction of climate change policies that additional measures may be required to minimise the risk that generators do not inform the market of intentions regarding decommissioning or major refurbishments.

In any event, the energy market will clear. The key is to ensure that information is available to inform the forward price formation process so that market participants are able to respond to the opportunities that are presented. Such an approach is fundamentally consistent with the existing NEM design and does not risk inducing the establishment of a generation portfolio that is distorted by the incentives offered through a capacity mechanism. Moreover, the distortions induced by a capacity mechanism will be exacerbated if it is seen as transitional.

Accordingly, it is submitted that ensuring accurate information concerning the timing of proposed plant decommissioning and major refurbishments projects provides the most appropriate response to the informational challenge presented by the ETS.

The problem of intermittency

The other issue here is how the climate change policies will influence the structure of the market in supply terms. There is already a capacity for NEMMCO to define and acquire ancillary services to support the operation of the system as well as requiring generators to conform to defined dispatch requirements. The use of ancillary services reserves has already been identified by the AEMC on the spectrum of design options it considered in its Comprehensive Reliability Review.

It is submitted that enhancing the ancillary services market accompanied by clear rules around the dispatch of intermittent generators provides the most direct and appropriate initial response to the intermittency problem associated with renewable energy sources.

4 Conclusion

The challenge presented by climate change has profound implications for the electricity supply industry. However, capacity mechanisms are clearly not the solution to the issues posed by the climate change policies. Indeed, the best approach to address these concerns is to retain the fundamental structure of NEM design – which provides a stable framework to underpin the investment decisions that are required.

The first matter to consider in the context of the introduction of the Carbon Pollution Reduction Scheme is to assess what measures are contained in it to address the concerns of transition and investment in the generation sector. Irrespective of the mechanism that might be adopted to facilitate or bring forward investment in the generation sector, if there is insufficient time for such a transition, then market design can achieve little to ameliorate impacts.

Beyond transitional arrangements in the CPRS, the key issue turns to whether there is any failure in the energy market for encouraging timely investment. There is no clear evidence to show that there is a failure in the NEM in relation to adequate investment in generation capacity. The key issue is to provide information to market participants as to the future plant availability. If there is to be any change to the market design, measures should focus on information as to long term capacity availability. It is the availability of this information that will facilitate an efficient response to the challenge presented by carbon reduction policies.

There is no evidence to suggest that capacity mechanisms are successful at targeting the 'missing money' problem, with the potential costs and risks (including market distortions) potentially outweighing any benefits. Leaving aside the distortions such a mechanism can induce (especially if is it viewed by market participants as a transitional measure) changing the market design will have a number of unintended consequences. For example, quite apart from the uncertainty and additional complexity it will create for the market, a capacity mechanism will undermine the role for demand-side participation that has already been identified as a long-term goal for the NEM.

Capacity mechanisms are not a transitional measure. Apart from the fundamental concerns regarding their effectiveness and the problems they can create, the lead times involved in designing and implementing such a mechanism and then developing new investment (if the mechanism succeeded in stimulating this) could well exceed any reasonable timeframes allowed for transition.

In summary, the greatest danger to the adaptive capacity of the NEM is exacerbating uncertainty and risk. In such an environment, stability in market design is of even greater importance than it has been in the past to incentivise the investment decisions that are required with minimal risk (and cost) to market participants. A properly informed energy only market provides such an environment that will advance the long term interests of consumers.

A Capacity Mechanisms in Other Jurisdictions

Capacity payments

Spain, Argentina and Chile each use some form of fixed capacity payment to manage electricity capacity.

Spain

The Spanish electricity market is operated as a series of markets, with a day-ahead market, several intra-day markets and an ancillary services market. The day-ahead market is cleared, with units that are dispatched receiving their bid price while those that are not dispatched do not receive any payment. Participants can then adjust their positions in the intra-day markets, which operate close to real time. Again participants are dispatched in accordance with their offers.

All generators who offer capacity into the pool receive a fixed capacity payment. This capacity payment is added to the final electricity price paid by consumers.

The Spanish approach has been criticised for failing to encourage new entry and ensure generation adequacy. Issues cited have included Government intervention and a period from 1998 to 2002 of sustained lack of entry despite strong demand growth.[18]

Argentina

In Argentina, the electricity market is operated and administered by Cammesa, the independent system operator. Cammesa is responsible for ensuring there is adequate reserve capacity. The market uses nodal pricing for the calculation of two separate prices, the spot and seasonal price.

There is some demand management and distributors and large customers can contract directly with electricity supply sources. In addition to the spot price, generators receive a fixed capacity price if they are available to run during certain periods (6am – 11pm weekdays). The fixed capacity price also operates as a price floor in the spot market.

Generators are assigned to the reserve schedule in order of least cost generation. The assigned generators are guaranteed a monthly capacity payment based on the average

[18] C. Crampes and N.Fabra (2004), "The Spanish Electricity Industry: *Plus ça change…*".

capacity that would be called upon in the driest hydrological conditions recorded. This means that the payment is independent of actual dispatch, hydrology and bids. The New Zealand Electricity Commission notes that:[19]

> Being linked to actual or notional (dry year) generation has led to discounting of energy prices in the energy market, which in turn is believed to have reduced the effectiveness of the capacity price signal.

A separate payment is also made to generators that actually satisfy demand during dry periods.

Chile

There are two regional power markets, SIC and SING, operated by an ISO. Generators declare availability and the marginal operating cost of plant every hour as the basis for dispatch and setting the marginal spot price. A node peak capacity charge is added to the energy price, reflecting the annual marginal cost of increasing system capacity based on a specified reserve margin. The capacity payment is fixed by the regulator every six months, based on capital and operating costs as well as a 10% return on the latest technology in the system. The payments are independent of dispatch although depend on availability, time of start and time to reach full load.

The following measures are used in addition to capacity payments: [20]

- Compensation payments are also paid to consumers when a generator cannot meet its obligations.
- Firm capacity transfers occur on an annual basis, resulting in payments for transfers of capacity between generators.
- As Chile is a hydro based market, there is a hydro capacity investment incentive allowing long-term (15 year) contracts to be signed based on the node price applying at the time.

Pollitt notes that the main region, SIC, has been subject to capacity constraints, whereas SING has suffered from over-capacity. Generation expansion has mostly been done by private companies, with prices kept relatively low. Financial performance of the companies has been strong, and has improved over the course of the reforms, although returns have been more modest since the arrival of natural gas from Argentina in 1997. Regulatory issues are also identified however, including regulatory oversight of crisis

[19] New Zealand Electricity Commission (2005).

[20] New Zealand Electricity Commission (2005).

management during drought periods, and the need for open, transparent and flexible regulation. [21]

Reserve Margins

United States

Three major jurisdictions in the Northeast of the US – PJM,[22] New England and New York – have implemented capacity market mechanisms in an attempt to ensure there is sufficient investment in generation capacity. These markets impose requirements on Load Serving Entities (LSEs) to procure a certain quantity of generation capacity through a centrally controlled capacity market.

Until recently, each of the three jurisdictions operated capacity markets based on an 'Installed Capacity' (ICAP) framework. New England and PJM recently implemented significant changes to the structure of their capacity markets and New York has also implemented structural reforms. These changes are the result of some perceived deficiencies in the design features of the ICAP framework, including:

- concerns over the reliability level of generation capacity;
- uncertainty over whether the scheme provided adequate incentives for sufficient investment in generation capacity;
- worsening imbalances between generation capacity supply and demand;
- concerns over the volatility of prices;
- limited ability of the schemes to constrain the misuse of market power; and
- problems relating to the design of capacity contracts under the ICAP framework.

These deficiencies have resulted in New England and PJM replacing their ICAP markets with more forward-looking and location-based capacity markets whilst New York has also looked to improve its scheme by altering the framework under which capacity prices are determined under ICAP. These features are briefly summarised below.

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[21] Pollitt, M. (2004), "Electricity Reform in Chile: Lessons for Developing Countries", University of Cambridge.

[22] PJM Interconnection (PJM) is a regional transmission organisation that coordinates the movement of wholesale electricity throughout Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. These jurisdictions are referred to collectively as 'PJM' throughout this paper.

PJM: Reliability Pricing Model

The design features of the Reliability Pricing Model (RPM) represent a significant change from the former ICAP mechanism. The RPM is based on three year forward-looking capacity auctions that recognise locational constraints (with residual auctions following the specification of self-supply and bilateral arrangements).

The design incorporates a downward sloping demand curve (the Variable Resource Requirement), which is based on historical data on the costs and revenues of new peaking plant, availability, demand and reserve requirement targets. Transmission and demand resources are also given the opportunity to participate in the RPM, providing the opportunity for incremental transmission upgrades to provide solutions to capacity import limitations.

New England: Forward Capacity Market

New England's Forward Capacity Market (FCM) was implemented in 2006 following the dissolution of the ICAP mechanism. The design is also based on three year forward-looking capacity auctions, with purchases conducted on a zonal basis. The objective is to ensure that the market purchases enough generation capacity to meet New England's Installed Capacity Requirement.

Both supply and demand resources can participate. Proposed generation capacity projects can also compete in the market with existing capacity. All participants are subject to an extensive qualification process prior to entering the market to ensure that participants are legitimate. Other features include:

- reconfiguration auctions, which are held to enable LSEs to exchange capacity obligations before and during the commitment period;
- financial assurance provisions, to ensure delivery on commitments; and
- financial obligations imposed on suppliers to ensure the provision of generation capacity during periods of high prices.[23]

New York: Modified ICAP

New York's ICAP mechanism operates in the context of pre-existing planning and operational practices of power pools in the region. Unlike the preceding jurisdictions, New York has not implemented fundamental structural reforms to the operation of its

[23] Chao, H-p (2008), Overview of the Capacity Markets in the United States, 2008 APEX Conference, Sydney.

capacity market, with the most significant change being the implementation of a new framework for determining capacity prices under the ICAP.

The generation capacity (ICAP) requirements of LSEs in New York are based on a reserve margin that is set for each 'capability year' by the New York State Reliability Council. These ICAP requirements are then converted into UCAP (Unforced Capacity) requirements.[24] LSEs are required to meet these requirements either through self-supply or bilateral transactions with suppliers. They can purchase these requirements through forward (short-term) auctions or spot market auctions. All of the generation supply available for purchase is certified and checked on a monthly basis.[25]

Evaluation

There have been widespread criticisms of ICAP mechanisms (some of the key deficiencies were outlined above). The revised designs in both PJM and New England are still in their relatively early stages, so it is difficult to draw conclusions on their effectiveness. However, a report prepared by the Brattle Group[26] for PJM suggested that the RPM has had a positive impact on the procurement of adequate generation capacity, in addition to stimulating increased competition between demand and supply-side responses.

The most significant improvement that has been made in recent times to the New York ICAP mechanism is the shift to a downward sloping demand curve. However, some of the other fundamental deficiencies of this mechanism still remain.

The full impact of the RPM and FCM are yet to be observed and there are still several concerns associated with their operation. Of the potential problems associated with forward-looking, locational capacity markets, Nieto and Fraser identified the following as the most significant:

- participants risk being exposed to changes in locational capacity prices, with the actual value of generation resources that are committed well in advance of the delivery year having the potential to be affected by changes in capacity zones from year to year;

[24] Unforced capacity is a measure of the expected supply based on the historical performance of each resource when in demand (dispatched).

[25] Chao, H-p (2008), op.cit.

[26] The Brattle Group (2008), Review of PJM's Reliability Pricing Model (RPM), Report prepared for PJM Interconnection.

- regional constraints may result in energy prices varying within a locational zone, resulting in a price structure that does not provide the investment incentives necessary in order to achieve consistency with reliability requirements; and
- inability to control the misuse of market power as new generation suppliers may be unwilling to play the role of price maker if they have secured supply contracts with another entity. This is a particular problem in New England as the small capacity market means that the addition of new entrants occurs infrequently, magnifying concerns over the misuse of market power by incumbents.[27]

A recent paper by Lein highlighted some of the fundamental concerns that remain with capacity markets:

- capacity markets fail to provide accurate marginal capacity cost signals;
- reliability targets are determined by an ISO or central authority rather than being dictated by customers' willingness to pay for reliability;
- there is a reduction in the potential benefits from market-driven investments;
- capacity markets are susceptible to the misuse of market power by incumbents;
- there remains the potential that the level of investment in generation capacity that is induced exceeds the economically efficient amount. This has negative implications both in relation to a reduction in allocative efficiency and detrimental environmental outcomes; and
- the requirements imposed by capacity markets may result in old, inefficient and unreliable generation facilities remaining in operation beyond their economically justified retirement dates.[28]

Energy-only

Nord Pool

Nord Pool is the central exchange that manages the day ahead spot market and longer-term hedge market for Norway, Sweden, Finland and Denmark. There is no explicit capacity mechanism in Nord Pool, although each country has implemented some

[27] Nieto, A.D. & Fraser, H. (2007), "Locational Electricity Capacity Markets: Alternatives to Restore the Missing Signals", The Electricity Journal, 20 (2).

[28] Lien, J. (2008), "Electricity Restructuring: What Has Worked, What Has Not, and What is Next", Economic Analysis Group Discussion Paper.

measures with respect to operating and capacity reserves. The system operator in each country operates with a minimum required operating reserve.

In Norway, the reserve margin is procured via a reserve option market. The system operator pays a premium to some generators to guarantee real-time capacity and also has arrangements with some large-scale industrial customers to agree to disconnect in the event of certain critical shortages (this load reduction is seen as an operating reserve).

In Sweden, Finland and Denmark, special measures have been taken to create a capacity reserve which is bid into the day-ahead and hour-ahead markets. Botterud & Korpås observe:[29]

> It is therefore not entirely correct to refer to the Nordic market as an energy only model, since there are operating and strategic reserves in the system that are procured in a way that can affect the system spot prices in critical situations and thereby also investments in new generation capacity. However, these measures have probably not affected the prices and investments in the market significantly so far.

The Nord Pool is heavily reliant on hydro power. It should be noted that supply adequacy in the case of predominantly hydro electricity markets is an issue of a different nature to that for other markets. Intervention has not however been taken in response to low inflows causing higher electricity prices.

Great Britain

Prior to 2000/01, the British electricity market operated under a Pool system which included a capacity payment mechanism. This system was abolished due to deficiencies in the system's pricing framework and illiquidity in the contract markets and was subsequently replaced by the New Electricity Trading Arrangements (NETA).

NETA introduced a more competitive market structure which focused on improving consumer outcomes. No mechanism for capacity payments was included. Although NETA encountered some early problems relating to excess generation capacity and price volatility, the reform was largely considered to be a success. In 2003, the UK Government considered the reintroduction of a capacity payment mechanism. It was

[29] Botterud, A. & Korpås, M. (2004), "Modelling of power generation investment incentives under uncertainty in liberalised electricity markets", Paper presented at the 6th IAEE European Conference: Modelling in Energy Economics and Policy, Zurich, p.18.

considered that the NETA market structure was sufficient at ensuring the provision of adequate capacity and the proposal was rejected.

In April 2005, the British Electricity Trading and Transmission Arrangements (BETTA) were implemented. The scheme harmonised electricity trading across Great Britain. The market structure under BETTA is as follows:

- Stage 1 involves the trading of electricity between participants in both the futures contract market (which operates up to a year ahead of 'real time') and the short term bilateral market;
- Stage 2 involves the notification of contract volumes to the System Operator at the 'Gate Closure' which is one hour before real time delivery;
- Stage 3 is the 'Balancing Mechanism' that is performed by the System Operator between Gate Closure and the half hour delivery period in which offers are accepted in order to balance system capacity requirements; and
- Stage 4 is the 'Imbalance Settlement' which involves the settlement of cash flows arising from the balancing process. This occurs after the delivery period.

New Zealand

The New Zealand market does not have an explicit capacity mechanism. At present New Zealand's market rules require n-1 security for instantaneous reserve, and two instantaneous reserve products:[30]

- FIR – fast instantaneous reserve must be capable of operating for at least 60 seconds;
- SIR – sustained instantaneous reserve must be capable of operating for 15 minutes.

Neither of these forms of reserve is intended to provide longer lasting reserves. This is because New Zealand's historical market development has been based on substantial flexible generation, with reserve measures being utilised only until this flexible generation can be mobilised.

Signals for new investment are created by spot prices and bilateral contracts for firm supply and demand of electricity. As the New Zealand market relies on hydro electricity generation for much of its needs, signals for investment are created both by supply shortages causing higher prices and by lower inflows in dry years, creating

[30] New Zealand Electricity Commission (2008), Market Design Review Options Paper, p131.

energy shortages that lead to higher prices. This is unlike Australia's predominantly thermal generation capacity.

The New Zealand Electricity Commission (NZEC) is currently undertaking a Market Design Review. Part of this review concerns the effectiveness of its energy-only market design. In its Options Paper, the NZEC states that the existing energy-only arrangements have not given rise to peak adequacy or resource commitment problems. Despite this, short term events like the retirement of the New Plymouth power station and low hydro inflows are tightening capacity margins.

In the longer term, New Zealand's energy mix is changing, with a greater proportion of intermittent and must-run generation relative to the existing plant mix which, to generalise, is characterised by flexibility.[31] This changing energy mix has been highlighted as a key factor making future capacity adequacy a greater challenge for New Zealand's electricity market than it has been in the past. As the Market Design Review is ongoing, final outcomes of the review process are not yet known.

[31] New Zealand Electricity Commission, ibid.