14 November 2008

The Australian Energy Market Commission
PO Box A2449
Sydney South, NSW 1235

Re: Review of Energy Market Frameworks in light of Climate Change Policies

Pacific Hydro welcomes the opportunity to submit to the Review of Energy Market Frameworks in light of Climate Change Policies. This review is timely given the imperative to affect real change in energy markets to decouple emissions growth from economic growth in Australia. While strong and clear policy is integral to achieving emissions reductions, regulation and market rules are critical in enabling policy outcomes to be delivered in the most timely and efficient manner.

The primary role of regulation is to underpin the delivery of policy. With this in mind we urge the AEMC to make all changes necessary to facilitate maximum penetration of renewable energy projects in the NEM. This will have direct implications for the ability of government and industry to achieve the National Renewable Energy Target (NRET), which will be the strongest contributor towards achieving short- to medium-term targets under the Carbon Pollution Reduction Scheme (CPRS).

In line with this we believe it is critical to the adequacy of the Review to include in the terms of reference a review of the NEM Objectives, with the purpose of formally including emissions reduction in the Objectives. This single action would underpin the shaping of revised regulations and guide regulators and industry to move forward in a manner consistent with government policy on emissions reduction.

In order to achieve the objectives of the CPRS and the NRET Australia needs to move toward a new national approach to energy market regulation. It is imperative that the Review recognises the need to remove inconsistencies in state-based regulation, as these currently introduce unnecessary cost and complexity to renewable energy generators, preventing least-cost development of renewable energy projects in Australia.

Please find attached Pacific Hydro's submission to the Review of Energy Market Frameworks in light of Climate Change Policies. The submission is a summary of our experience in developing and connecting new renewable energy projects to the NEM. Over the coming months, Pacific Hydro will seek quantify the economic and technical constraints created by the issues presented in this submission on selected projects within the Australian energy market. We have provided some initial calculations but would be happy to provide further analysis towards the next stage of the review as it becomes available.

Yours sincerely

Lane Crockett

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Submission from Pacific Hydro Pty Ltd

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Executive Summary

Achieving emissions reduction in Australia will require a transformation of our energy market, facilitating the entry and uptake of a range of new energy technologies. This transformation will be dependent on three central planks: Policy, Regulation and Infrastructure. While the policy to support the transition to a low carbon future has been announced in the form of the Carbon Pollution Reduction Scheme (CPRS) and the 20% National Renewable Energy Target (NRET), a step change in regulation is now required to support achieving the objectives of these policies.

The primary role of regulation is to underpin the delivery of policy. With this in mind, we urge the AEMC to make all changes necessary to facilitate maximum penetration of renewable energy projects in the National Electricity Market (NEM). New or amended regulation needs to focus on removing all barriers to renewable energy development.

To facilitate this, the scope of the Review should be adapted to include emissions reduction considerations, and a key recommendation of the Review should be to formally include emissions reduction in the NEM Objectives. This single action would underpin the shaping of revised regulations and guide regulators and industry to move forward in a manner consistent with government policy on emissions reduction.

In the short-term, renewable energy can meet the majority of the NEM's projected additional demand if the appropriate regulation, infrastructure and markets are in place. This would avoid the need for investment in new emissions-intensive fossil fuel generation, which is directly in line with the objectives of the CPRS and demonstrates the valuable contribution of NRET toward guarding against generation shortfalls and meeting emissions reduction targets.

Increased penetration of renewable energy presents unique challenges to network system management as it introduces greater volumes of generation from potentially intermittent sources into the supply mix. However the initiatives that have been undertaken by the National Electricity Market Management Company in consultation with both market participants and the wind industry, place Australia in a leading position to deal with large volumes of intermittent renewable energy. These initiatives include the semi-scheduling requirement for wind farms from March 2009, the introduction of the Australian Wind Energy Forecasting System, and the review of the technical standards to incorporate renewable energy technologies. These measures will create a step change in the ability to manage a larger percentage of wind generation in the NEM.

The few system operation issues that have been raised as possible problems since 2004 have been largely addressed through the implementation of the initiatives mentioned above and can be further dismissed when considered in a strategic partnership with gas generation. The CPRS will increase the investment case for gas generation in Australia in the near term, which we believe will form a critical partnership with the development of new wind generation to meet growing demand in the NEM reliably.

Furthermore, if regions of the NEM are adequately interconnected through expanded and augmented infrastructure, large proportions of renewable energy generation in any one region will not be unmanageable. In Victoria, VENCorp estimates that approximately 40% of installed capacity could be provided by wind, given Victoria's strong transmission network.

It is anticipated that an energy market based on the levels of renewable energy generation required under the CPRS and NRET will not require any greater intervention from system operators than is currently required in the market.

The major barrier that remains to new generation capacity in Australia is the need for investment in new transmission infrastructure. In some areas of the network where there are excellent renewable resources, there is a lack of transmission infrastructure or inadequate transmission capacity, which creates significant risk to new connections. There is currently no mechanism available to address the deeper augmentation issues or to enable strategic development of new transmission in remote areas, which adequately shares the high cost and risk between project developers and governments. The current open access arrangements create a system based on piecemeal expansion in which congestion and inefficiency is endemic. There is a strong role for government in establishing a strategic national approach to infrastructure development, aimed at identifying and streamlining routes based on strategic renewable energy resource zones.

Regulation and capacity constraints introduce uncertainty and unnecessary cost into the system for project developers and investors. This increases the risk that new energy investments will not be made, or will be made at higher cost, increasing the cost of emissions abatement. This compromises the ability to achieve the goals of the CPRS and NRET and is contrary to the NEM Objective of efficient market operation.

Summary of Recommendations

Based on this analysis we urge the AEMC to:

1. Formally include emissions reduction as a key NEM Objective to conclusively integrate the policy objectives of the CPRS and NRET. This single action would underpin the shaping of revised regulations and guide regulators and industry to move forward in a manner consistent with government policy on emissions reduction. The AEMC Review should then be undertaken in light of these revised Objectives;
2. Undertake an independent and thorough assessment of the effect of increased intermittent generation and its true effect on the reliability of the energy market, involving specialists from all parts of the industry, system operators and market participants;
3. Remove inconsistencies in energy market regulation by streamlining all current state-based arrangement to create a new national approach to regulation; and
4. Develop, through bodies such as Infrastructure Australia, a strategic national approach to infrastructure planning and investment, aiming to address risk sharing between Government and industry.

Introduction

Pacific Hydro welcomes the opportunity to submit to the Australian Energy Market Commission (AEMC) review of Energy Market Frameworks in light of Climate Change Policies (the Review). This review is timely given the imperative to affect real change in energy markets to decouple emissions growth from economic growth in Australia. While strong and clear policy is integral to achieving emissions reductions, regulation and market rules are critical in enabling policy outcomes to be delivered in a timely and efficient manner.

Policy and regulation are the first two of three planks which will be essential in bringing about the transition of Australia's energy markets to enable decoupling of emissions from energy generation and economic growth. The third plank in enabling change in the National Energy Market (NEM) is the provision and accessibility of infrastructure for new energy generation capacity including renewable energy projects. Like policy, efficient investment in good public infrastructure is also critically dependent on market rules.

Without recognition and development of these three planks, investment in new low-emissions technology will not occur and the policy objectives of both the Carbon Pollution Reduction Scheme (CPRS) and the expanded 20% National Renewable Energy Target (NRET) will not be achieved.

The primary role of regulation is to underpin the delivery of policy. With this in mind we urge the AEMC to make all changes necessary to facilitate maximum penetration of renewable energy projects in the NEM. This will have direct implications for the ability of government and industry to achieve the NRET, which will be the strongest contributor towards achieving short- to medium-term targets under the CPRS.

The current National Energy Law and National Energy Regulations (NER) were established to support provision of least-cost energy to market, and continue to work well for incumbent conventional thermal plant. However, as recognised in the recent Garnaut Review, Australia now needs to reduce emissions from the energy sector, which will require a diversification of energy supplies from large centralised coal and gas generation to more distributed renewable energy projects. The current regulations are prohibitive to achieving this as they were established under a range of state and federal jurisdictions and make little allowance for the differing requirements of new renewable energy technologies.

The lack of consistency between regulations within the NEM creates a system which can impose unnecessary costs on renewable energy projects. For example, Pacific Hydro estimates the cost of building 100MW of new generation capacity in South Australia is approximately $10.7 million greater than building the same 100MW in Victoria. This is due to additional jurisdictional license regulation that mandates certain technical standards on wind farms in South Australia, circumventing the negotiation platform in the NER performance standards. This prevents least-cost development and increases the cost of project delivery, therefore driving up renewable energy costs to the market.

New regulation, or amendment to existing regulation, needs to focus on removing all barriers to renewable energy development, including addressing transmission planning and where possible, removing transmission constraints. The review should aim to establish a new national approach to regulation and transmission planning which promotes the development of new low emissions plant, including scheduled generation from gas, geothermal and solar thermal as well as semi-scheduled sources such as wind and solar.

An effective response to climate change will necessarily involve a fundamental change in the way in which energy is produced and consumed, leading to new forms of energy and associated supporting infrastructure. In many cases this will result in energy being sourced from locations that have limited, if any, transmission infrastructure and will require changes to energy market operation.

Presently wind energy – being the most commercially viable renewable energy technology and therefore the first non-thermal technology to achieve any meaningful level of penetration – is faced with a number of transmission and market operation issues that have been outlined in the AEMC Review. However while wind energy is the first, it will by no means be the last new to market technology that will encounter these issues. While wind may be used as a current example, we encourage the AEMC to consider a much broader suite of climate change mitigation solutions that will encounter similar issues in the years to come.

Over the coming months, Pacific Hydro will seek quantify the economic and technical constraints created by the issues presented in this paper on selected projects within the Australian energy market. We have provided some initial calculations within this submission but would be happy to provide further analysis towards the next stage of the review as it becomes available.

Limitations of the Review

We have presented below responses to the issues raised in the Review scoping paper, using the questions outlined in the paper as discussion points. However we believe there are some inadequacies in the Review approach which warrant discussion.

The Review was asked by the Ministerial Council on Energy to determine necessary adjustments to the existing energy market frameworks with regard to the overarching NEM Market Design and Electricity Objectives – to deliver efficient, safe, secure and reliable energy supplies in the long term interests of consumers.

As the objective of both the CPRS and NRET is ultimately to lower greenhouse emissions in Australia, we believe that the framework employed within the Review is contradictory to the objectives of these policies, and supporting the national objectives of both reduction of emissions and efficient delivery of energy must be considered hand in hand. Specifically, the scope of the Review should be adapted to include emissions reduction considerations, and a key recommendation of the Review should be to formally include emissions reduction in the NEM Objectives.

This single action would underpin the shaping of revised regulations and guide regulators and industry to move forward in a manner consistent with government policy on emissions reduction.

Furthermore, we would like to bring to your attention the energy sector's limited ability to respond to the questions posed in the scoping paper with the depth of analysis appropriate to underpin a comprehensive review of Australian energy regulation. The questions posed are complex and technical in nature and in other parts of the world (notably Britain[1] and parts of America[2]) have been addressed through in-depth industry research, modelling and analysis to

[1] UKERC, The Cost and Impacts of Intermittency: An assessment of the evidence on the costs and impacts of intermittent generation on the British electricity network. March 2006

provide robust conclusions and recommendations on the effect of increased renewable energy generation on the energy market. Informed responses to these questions cannot be adequately answered for the Australian situation in the absence of this research. Responses received will therefore in the main be opinion rather than the informed study outcomes required to make the recommendations necessary for the Review to be truly effective. We believe that a key outcome from the Review must be to undertake an independent and thorough assessment; involving specialists from all parts of the industry, system operators and market participants; of the effect of increased intermittent generation and its effect on reliability. In other countries, such collaborative efforts have led to enlightened approaches and acceptance of new technologies in their energy regulations.

Generation capacity in the short term

The 2008 National Electricity Market Management Company (NEMMCO) Statement of Opportunities predicts that Australia will require an additional 8,094MW of generation capacity out to 2018 to satisfy NEM demand requirements[3]. This translates to an average installation of 809MW per year, which is comparable to the 500MW per annum of new renewable energy capacity required until 2020 required to meet the expanded NRET. In the short-term, renewable energy can therefore meet the majority of the NEM's projected additional demand – if the appropriate regulation, infrastructure and markets are in place – thereby avoiding investment in new emissions-intensive fossil fuel generation.

This is directly in line with the objectives of the CPRS, and demonstrates the valuable contribution of NRET toward both guarding against generation shortfalls and meeting emissions reduction targets. Wind energy generation is a proven technology and Australia's wind energy industry already has the resources and skill base necessary to develop generation capacity in the short term.

The reliability of renewable energy sources is consistent with the NEM Objectives. Increased penetration of wind energy from a wide geographic area acts to smooth the effect of intermittent generation, and historical issues with intermittency will be further mitigated by the Australian Wind Energy Forecasting System (AWEFS) and the recent introduction of semi-scheduling requirements for all wind farms from March 2009 (see *Investing to meet reliability standards with increased use of renewables* below). Other renewable energy sources, such as geothermal energy, are constant sources of energy and can be developed as base-load capacity.

The ability of the renewable energy industry to meet these requirements for new generation capacity is, however, dependent on policy certainty. Australia has world-class renewable energy resources and the 20% NRET will drive more than $25 billion in clean energy investment. Further delay in introducing legislation risks a downturn in the renewable energy industry, making it less likely that sufficient generation capacity will be installed to meet short-term generation

[2] Enerex Corporation, Final Report – 2006 Minnesota Wind Integration Study Volumes 1 and 2 published by the Enerex Corporation for The Minnesota Public Utilities Commission

[3] NEMMCO, Statement of Opportunities 2008

shortfalls. International experience shows that clear renewable energy policies have driven the development of significant wind generation capacity regardless of the quality of natural wind resources[4].

The renewable energy industry in Australia needs certainty in the commencement and mechanics of the NRET to facilitate development of the industry, and legislation must be in place by 1 July 2009 at the latest to avoid stalling investment.

Furthermore, there are several critical barriers to renewable energy development to meet generation requirements in the short term. These include:

- access to transmission infrastructure;
- regulatory inconsistency and complexity across jurisdictions;
- insufficient resources to process connection applications;
- high connection costs due to monopolistic influences in connection charges for transmission services and lack of competitive pricing for negotiated services; and
- supply constraints due to strong global competition for technology.

Streamlining the regulatory environment toward a single national approach to the regulation and connection of renewable generators will minimise the complexity and inconsistency in current state-based access requirements. This streamlining must be undertaken to achieve a national benefit and must therefore not be allowed to be influenced by jurisdictional bias.

It is anticipated that an energy market based on the levels of renewable energy generation required to meet the objectives of both the CPRS and NRET will not require any greater intervention from system operators than is currently required in the market.

Investing to meet reliability standards with increased use of renewables

It has not been formally established that the increased intermittent generation in the NEM has had any impact on reliability. As wind generation has increased in the NEM, reliability standards have continued to be met.

Increased penetration of renewable energy presents unique challenges to network system management as it introduces greater volumes of generation from potentially intermittent sources into the supply mix. However the initiatives that have been undertaken by NEMMCO in consultation with both market participants and the wind industry place Australia in a leading position to deal with large volumes of intermittent renewable energy. The combination of national wind forecasting, inclusive performance standards, semi-dispatch, provision of real time data and modern wind turbines will enable Australia to forge on to meet its emission reduction targets.

[4] Regulatory Policy Institute, International Approaches to Transmission Access for Renewable Energy, March 2008

The *National Electricity Amendment (Central Dispatch and Integration of Wind and Other Intermittent Generation) Rule 2008 No. 2* requires that from March 2009 all wind farms greater than 30MW must be semi-scheduled. This will lead to the ability to control wind generation during periods when the amount of generation in an area is greater than the physical capacity of the network, thereby reducing congestion and the risk of damage to networks. Additionally, in 2008 NEMMCO implemented the Australian Wind Energy Forecasting System (AWEFS). The AWEFS provides forecasts of generation potential from wind based on weather forecasts to assist in the NEM dispatch system's ability to meet reliability standards.

Furthermore, the Technical Standards Reference Group of NEMMCO spent more than 18 months debating and structuring technical standards that were inclusive of both wind generation and other forms of renewable energy. These standards have been in place for several years and all new projects are in accordance with them. It is crucial to the ongoing evolution of the market in light of climate change that there remains an ability to study the system and work cooperatively with the Transmission Network Service Providers (TNSPs) to negotiate and design appropriately sized projects for particular connections to the network.

These measures will create a step change in the ability to manage a larger percentage of wind generation in the NEM, provide a mechanism for management of network congestion and improve the information necessary for the market to respond.

It is too early to quantify the effect of these recent wind management initiatives; however all of the consultative work undertaken in their development and implementation will ensure that the investment in wind energy will not lead to decreased reliability of supply.

Studies of overseas systems with high wind energy penetration have shown no reliability issues while acknowledging a small cost increase in regulation services[5,6].

The increased gas generation likely under the CPRS will become more important under increased penetration of wind. We anticipate that a strong relationship in the near term between the development of new wind and gas generation capacity will be required to ensure reliability standards are maintained across the NEM as reliance on coal-based solutions decreases. The challenge for policy makers is to ensure the permit price under the CPRS is attractive enough to stimulate the investment in gas technologies into the market as coal-based plant is withdrawn or retired.

Furthermore, there are exciting opportunities for development of other more constant renewable energy resources under the higher energy prices created by the CPRS and NRET. These will include geothermal energy, predominantly from the Cooper Basin in South Australia, and other emerging technologies such as solar thermal and wave energy.

Studies of overseas systems with high wind energy penetration have shown no reliability issues while acknowledging only a small cost increase in regulation services[7].

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[5] UKERC, The Cost and Impacts of Intermittency: An assessment of the evidence on the costs and impacts of intermittent generation on the British electrical network March 2006

[6] Enerex Corporation, Final Report – 2006 Minnesota Wind Integration Study Volumes 1 and 2 published by the Enerex Corporation for The Minesota Public Utilities Commission

The remaining major barrier to generation projects within the NEM is the need for investment in transmission infrastructure. This includes expanding infrastructure to new areas of nationally significant renewable energy potential (see *Connecting new generators to energy networks* below) and deep augmentation of existing networks. The CPRS and NRET will require development of a range of distributed energy sources which will require access to transmission infrastructure to enable development. However congestion of existing networks has the potential to prohibit project development if not addressed. Investment should focus in particular on upgrading the interconnectors between Victoria and South Australia and improving the South Australian transmission backbone, allowing development and export of South Australia's world-class wind and geothermal energy resources. By way of illustration of the seriousness of this constraint, NEMMCO recently revealed the number of hours the South Australia to Victoria interconnector was constrained has increased from a three year average of 10 hours between 2003 and 2006, to 564 hours in 2007/08[8].

The CPRS and NRET will lead to changes in the geographic location of production and is likely to lead to production of large volumes of clean energy in areas of high resource potential that are, in the case of geothermal and some wind, remote from major demand centres. This will need to be supported by a complementary move to an integrated national approach to regulation and infrastructure investment.

Operating the system with increased intermittent generation

As identified in the Scoping Paper, the CPRS and NRET will improve the economic viability of intermittent forms of renewable energy generation. However the paper does not go on to highlight the increased investment case for gas generation to meet future demand requirements or replace existing coal plant as it is retired or withdrawn. Few system operation issues that have been raised as possible problems since 2004 with increased wind energy generation have not materialised in Australia and can be further dismissed when considered in a strategic partnership with increased gas generation.

International experience shows that the effect of intermittency is minimised when wind energy generators are installed over a wide geographic area. Given the increased competitiveness of renewable energy projects under the CPRS and NRET, wider installation of wind projects across eastern Australia is highly likely, improving the diversity and contributing to stable generation from wind power. Small generators placed deep in distribution networks also relieve local network congestion and avoid excessive transmission losses due to energy flows over vast distances.

Modern wind farms include technology with reactive or power factor control capabilities. These attributes, together with active power control for semi-scheduling requirements, provide system operators with the ability to manage wind power contributions to network congestion. It has been estimated that in some managed systems where loads coincide with wind patterns, wind penetration can be in the range of 30-40% without compromising the reliability of the system[9]. If

[7] Ibid

[8] NEMMCO, Statement of Opportunities 2008

[9] Regulatory Policy Institute, International Approaches to Transmission Access for Renewable Energy, March 2008

regions of the NEM are adequately interconnected through expanded and augmented infrastructure, large proportions of renewable energy in any one region should not be unmanageable. In Victoria, VENCorp estimates that the transmission network can support up to 4,000MW of wind generation, which represents approximately 40% of installed capacity, due to Victoria's strong transmission network[10].

Frequency control ancillary services within the NEM have been greatly reduced in recent years, in the same time that the amount of wind generation has increased. As variability occurs from many sources on the system and is not solely derived from wind generation, it should be expected that NEMMCO as system operator would continue to review the amount of frequency control regulation services that are dispatched into the market.

The reliability issue most frequently raised by "too much wind generation" is the concern of excess generation during the overnight low load. As this is caused by having too much total generation on the system, and all generation at that point is likely to be at market floor, the question becomes one of which generator should not be operating. If we simply say that the thermal plant must remain connected lest tomorrow's demand may not be met, we are placing thermal technical limitations ahead of the emissions reduction objective, limiting the ability to fulfil the objective of the CPRS and NRET. In this case there is a cost to the environment. As wind generation is more flexible and much faster starting than thermal plant it could provide a reduction service during the system trough, however the cost to the environment must be considered.

Reserve levels in the NEM have also been adjusted as the market evolved. For example since market start, the reserve level in Victoria has gone from 500MW (the size of the largest single generating unit) but is now considered a combined reserve with South Australia totalling 615MW[11]. The large increase in wind generation in South Australia has not impacted these reserve levels as they are based on the contingent failure of the largest generator plant which will never be a wind generator.

Connecting new generators to energy networks

There is a lack of transmission capacity in the NEM infrastructure, in some areas creating significant risk to new connections. There is currently no mechanism available to address the deeper augmentation issues or to enable strategic development of new transmission in remote areas.

Existing market rules require that generators seeking to connect to the network must pay for any new infrastructure up to the point of connection or any immediate augmentation of the network required to safely deliver the extra capacity into the NEM. This creates a situation in which there is no regulatory mechanism available to develop or extend to the extra high voltage transmission backbone in areas with little or no load yet rich with renewable resources. The costs are prohibitive for the private sector under the conventional monopoly rate of return regulations that persist in Australia that effectively creates a first mover disadvantage, while the Government has been reluctant to build infrastructure where it

[10] VENCorp, Capacity of the Victorian Electricity Transmission Network to Integrate Wind Power. December 2007

[11] NEMMCO, Statement of Opportunities 2008

believes it may crowd out more efficient private investment. This stand-off has resulted in continual under-investment in grid maintenance, upgrades and expansion.

It is not reasonable to expect that private companies will invest in a public good, and these resources will not be developed to their full potential without access to the transmission network.

If left to private investment it is reasonable to expect that a single company will only invest in extension to the network sufficient to meet its own generation output, or a group of co-investing companies to meet their combined output.

That such an investment would only service the needs of a single company or small group of companies necessarily means that infrastructure will grow haphazardly, decreasing the likelihood of harnessing the full resource potential, increasing the likelihood of a less secure and reliable connection and creating certainty that development will not happen at least cost to the market or with regard to future capacity increases. The Australian Government has committed to achieving emissions reductions of 60% of 2000 levels by 2050, and the recent Garnaut Review put forth a range of options for interim targets in 2020 based on potential international mitigation efforts. As outlined in the Garnaut Review, the level of emissions abatement required is not likely to be based on a single solution, and a range of technologies must be supported.

Wind energy will be an important part of the solution, being the only zero-emissions technology to be proven and commercially ready. However other potential renewable energies will have their contribution limited without adequate well-planned transmission infrastructure available within the NEM.

This situation is notable in the case of development of geothermal energy in central Australia. It is estimated that geothermal energy could provide 2,200 MW of clean base-load power by 2020, while stimulating investment of approximately $9 billion and creating in the order of 1,000 jobs in regional Australia. Developed to its full potential, geothermal energy in central Australia could provide up to 25% of Australia's base-load power for 100 years, reducing our emissions by 10% from current levels. However this area is currently outside of the existing NEM infrastructure and no solutions to share the risk of such a large transmission investment have yet been provided[12].

Augmenting networks and managing congestion

As stated above, a major barrier to renewable energy development is lack of access to transmission infrastructure, created through regulations which introduce a first mover disadvantage in the development of new infrastructure. This remains a key threat to the efficient and least cost development of the renewable energy industry, and creates a situation where congestion is endemic to the system. Without a strategic national approach to transmission planning and investment, access to networks has the potential to prohibit renewable energy project development.

Coordination of connection and augmentation of transmission capacity under the current open access arrangements can lead to a barrier for the first mover into a resource rich area that has limited transmission capacity, and a piecemeal

[12] MMA (2008). Installed capacity and generation from geothermal sources by 2020. Report to the Australian Geothermal Energy Association.

approach to network development. In South Australia the expansion of the network to Mount Millar, and the subsequent generation connected into the area, resulted in a physical constraint on the network leading to generation being withheld from the market. Transmission constraints can also drive the project capacity; Challicum Hills wind farm was planned as a 75MW development, however was reduced to 52MW to accommodate the local limits in the distribution network.

The negotiation with TNSPs has resulted in delays and increased costs to connection due to the monopoly power of the TNSP to dictate the connection options, the scope of the infrastructure and to a larger extent what is determined to be contestable. Some options that have been implemented, for example a "T" connection rather than "dual cut in", are limited, expensive, require additional switching and communications and do not provide for redundant connection for the generators or the reliability of the network, but are required by the TNSP as they protect what is defined as the shared network.

TNSPs have a desire to maximise their revenue and see the connection arrangements as having high profitability with little risk. In most instances this transfers all risks relating to the connection arrangements and ongoing network access to the generator. The approach to connection varies greatly between states however the fundamental principle on all generation connection should be that the TNSP employ a duty of care to ensure generation projects are fully informed of proposed connections that are fundamentally fraught with existing constraint issues.

There is a strong role for government in establishing a strategic national approach to infrastructure development through bodies such as Infrastructure Australia. This should aim to streamline or fast-track routes for transmission augmentation based on areas of strategic national resource potential. Overseas, governments have realised the strategic significance of their renewable energy resources for attracting investment and lowering emissions. The Garnaut Review[13] outlines examples in Britain and California where public contributions are being made to new energy infrastructure projects. We would also like to bring to your attention less conventional approaches to this issue already in place in Texas. Exhibit A to this submission provides an alternative viewpoint into how transmission investment is handled in other parts of the world, in this case, the largest US State of Texas where an excellent wind resource is located in remote areas with no connection to existing grid infrastructure.

Financing new energy investments

The 20% NRET is expected to drive more than $25 billion in clean energy investment and create tens of thousands of new jobs. The bulk of this investment will be on behalf of renewable energy developers. However without certainty about the timing or design of the policy, and removing regulatory and capacity constraints, this investment will not occur. These uncertainties introduce significant risk to project developers, reducing the likelihood of investment.

[13] See Garnaut Review Final Report, chapter 19

Regulatory Certainty

The ability of renewable energy developers to finance new investment toward achieving NRET is contingent on transparent and consistent national regulation. Current overlaps and inconsistencies in regulation through the regions of the NEM create administrative and cost burdens for renewable energy developers. As stated above, this increases the market price required per megawatt-hour of renewable energy produced. In the current economic climate where both debt and equity are harder to secure, this introduces significant risk that new investment will not occur as developers face increased competition for finance. In addition, it is contrary to the NEM Objective of efficient market operation.

Further issues arise as a result of Western Australia adopting a completely different market structure and a complex local regulatory regime that has been overlaid throughout the state, capturing all the small remote electrical islands.

These issues create a situation where regulatory uncertainty or complexity lowers the likelihood of achieving the objectives of the CPRS and NRET. As stated in the introduction to this submission, regulation should support, not hinder, the delivery of policy.

Capacity Constraints

Limited capacity in the transmission network and lack of transmission networks in areas of high renewable energy resource is a key limitation to new renewable energy investment. However arrangements for financing new investment in transmission infrastructure are such that all risk is borne by the project developer, significantly increasing the cost of a project.

This also creates a situation which introduces risk to the network. To return to the example of Mount Millar, poor planning of the network expansion to accommodate this project, and a competing project in the area, led to a physical constraint in the network and generation being withheld from the market.

Current transmission planning generates a piecemeal approach to infrastructure investment and expansion, creating a system where congestion and constraint is endemic, thereby increasing the likelihood of further limiting investment in new generation. There is a key role for government however in providing investment solutions for expanded transmission infrastructure to allow new renewable energy projects to proceed. As outlined above and in Exhibit A, strategic intervention by government in this critical matter will facilitate least-cost network development, reducing the cost to the economy.

We believe that a new national approach to infrastructure planning, investment and regulation will be required to enable the delivery of the CPRS and NRET objectives.

Conclusion

Energy markets in Australia will need to transform to achieve the emissions reduction required in a low carbon future. This will require change in three central areas: policy, regulation and infrastructure. Reform to these three key areas should aim to create certainty and simplicity of the market, facilitating least-cost delivery of emissions abatement.

The CPRS and NRET will lead to increased renewable energy generation, which has the ability to meet new supply requirements in the short term. Much of this new generation capacity is expected to be from wind energy. While wind energy has historically been associated with intermittency challenges to the energy market, increased geographic penetration of wind projects in combination with technological advancements allowing greater forecasting and scheduling will effectively reduce the perceived risks to security and reliability. Furthermore, the CPRS is expected to lead to increased gas generation capacity, which can respond quickly to forecast supply shortfalls.

The CPRS and NRET will however also create exciting opportunities for a range of other emerging renewable energy technologies, including geothermal, solar thermal and wave power. These technologies do not present intermittency challenges and some, such as geothermal energy, will be capable of contributing to base-load power supply in a carbon constrained world.

The current overlay of state-based regulation in conjunction with the national regulation of the NEM introduces inconsistencies between jurisdictions which are prohibitive to efficient investment in, and operation of, new generation and transmission infrastructure. This increases the cost of renewable energy projects thereby increasing the price required per megawatt of electricity sold into the market. To facilitate efficient delivery of both the CPRS and NRET, and provide emissions abatement at least cost to the economy, a new national approach to regulation of the energy markets is required.

Investment in new renewable generation capacity is also limited by access to transmission infrastructure, which has suffered under-investment due to existing market rules. We believe that a critical outcome of the Review will be to remove regulatory constraints to efficient investment in infrastructure which currently prohibit development of distributed renewable energy resources.

Over the coming months, Pacific Hydro will seek quantify the economic and technical constraints created by the issues presented in this paper on selected projects within the Australian energy market. We have provided some initial calculations within this submission but would be happy to provide further analysis towards the next stage of the review as it becomes available.

Exhibit A: Transmission Incentives in the USA

Texas Transmission

The major wind developers in Texas locate their wind turbines in areas which are ideal for maximum wind power generation but which also are the least populated and remote areas far from load and demand centres

Senate Bill 20 includes a transmission plan for areas of high wind resource but poor grid connectivity. This was recognised as an issue when the 775MW of wind capacity in West Texas could only export a maximum of the output of 330MW of the installed capacity.

ERCOTS McCamey plan

The Electricity Reliability Council of Texas (ERCOT) are the transmission operator and traditionally offered developer friendly transmission costs to generator by running a "postage stamp" pricing scheme where all transmission costs were spread evenly amongst all customers regardless of the distances required. However the long time to build transmission lines 5-6 years was still not considered adequate enough for wind generation.

The McCamey plan in 2003 was adopted by ERCOT to construct 345kw transmission lines to the remote McCamey area at a cost of $155 million to connect with 1100MW worth of wind capacity.

The McCamey plan initially required that the transmission lines are 100% subscribed with wind interconnection agreements prior to installation of the 5 year process. This proved insurmountable.

CREZ

To overcome the shortcomings of the McCamey plan, Senate Bill 20 was modified to provide a process whereby ERCOT are able to nominate Competitive Renewable Energy Zones (CREZ).

These Zones are ways to identify the best wind resources anywhere in the state of Texas and details the transmission available in those areas.

The CREZ's will be nominated and defined by 5 July 2007. Once a CREZ passes the nomination process the grid will be paid for evenly by ratepayers.

As a result of the CREZ project, Governor Rick Perry announced that $10 Billion of investment in 10,000 MW has been promised.

On the transmission side, several companies have partnered together to form ventures to build merchant transmission for the CREZ's for the construction of around 2000 km of transmission line and also a 1500km high voltage high capacity backbone transmission system.

Federal Rule for Transmission Access

In February 2007, The Federal Energy Regulatory Commission (FERC) made a ruling to allow greater access to transmission lines for power generators of all types, including renewable energy projects.

Under this rule wind developers are exempt from excessive charges when the amount of energy deliver differs from what they are scheduled to deliver.

This new rule on open access transmission tariffs eliminates the broad discretion that transmission providers have in calculating unused available capacity on their lines.

Texas however is not subject to FERC regulation because most of its transmission lines do not cross state boundaries.