

4 February 2011

Attn: Troy Forward, General Manager Development
Independent Market Operator
PO Box 7096
Cloisters Square
PERTH WA 6850

Dear Mr Forward,

**RE: Wholesale Electricity Market
Rule Change Proposals RC_2010_25 (IMO) and RC_2010_37 (Griffin Energy)**

Pacific Hydro is pleased to be able to provide a submission in relation to the above Rule Change Proposals and is supportive of the management of system security and reliability within the Western Energy Market (WEM).

Pacific Hydro has been an active participant in the Renewable Energy Generation Working Group (REGWG) and we have been pleased to be able to share our experiences as a developer and operator of wind generators over the last decade in the National Electricity Market (NEM), with the WA industry as part of this working group.

As noted in the introduction of the Griffin Energy proposal, Rule Changes must “*enable the Market Rules to better contribute to the achievement of the wholesale electricity market objectives*”. In relation to both Proposals being considered, Pacific Hydro would like to stress the importance of the market objectives; sub points (b) and (c):

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

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

Unfortunately, the proposed rule changes fall down in relation to new entrants, and in avoiding technology discrimination particularly for renewable technologies.

While the main basis for the proposed rule change appears to have merit – to improve system security and reliability – the proposed rules do not, in our view, adequately address the concerns of system security and reliability that have been raised by System Management. Specifically, we believe that setting a higher or lower quantity of Capacity Credits assigned to wind farms will not resolve the system security and reliability concerns if wind generation continues to be adopted by WA as part of its future energy mix.

Further, the proposals put forward in this Rule Change process are actually contrary to the recommendations of independent, expert advice provided to the REGWG and the Independent Market Operator (IMO) in its review of the current Capacity Credits allocated to intermittent wind generation in the SWIS.

In a further concerning development, from a developer (new entrant) perspective, we believe that the proposals would introduce greater uncertainty in the ability to predict revenue flows from wind projects. A consequence of this will be increased uncertainty in relation to Capacity Credit revenue and this will translate to greater risk and lower value for retail customers. As costs and risks incurred by wind developers are passed through to retail customers, the result of the proposed rule change could ultimately drive higher charges and volatility. Again, we emphasise that this is entirely contrary to the market objectives; sub-point (d):

(d) to minimise the long-term cost of electricity supplied to customers from the SWIS.

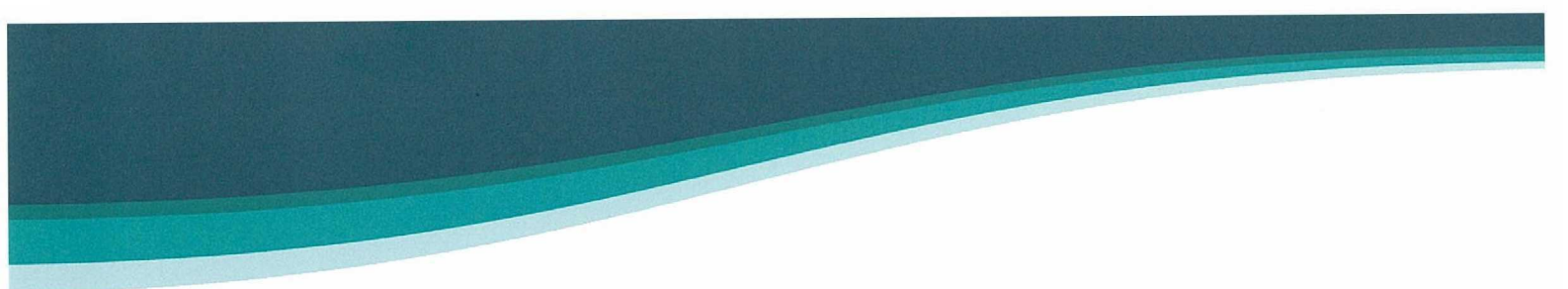
We are currently developing a wind farm near Nilgen and are particularly cognisant of the impact the uncertainty inherent with the market design changes proposed by the IMO and Griffin Energy. In our view, this project will be impacted by the proposed changes unless we are able to incorporate long-term contracting arrangements where the retailer assumes the risks of revenue variability and investment hurdles are still achieved.

These proposals also raise broader issues on the ability of WA to remain competitive and attract renewable investment, particularly where the risks and costs associated with these proposals become the marginal factor influencing the project's viability. These marginal projects will not proceed as developers seek to ensure hurdle rates required by investors are met. Where projects do proceed the additional risks and lower returns from Capacity Credits will ultimately be borne by all energy consumers in WA.

Pacific Hydro considers that the potential impacts of the proposed rule changes should be fully explored before such a change is implemented. Until that assessment is completed, we believe that the current capacity credit arrangements should be retained. Any review should, in our view, ensure a holistic approach is taken for all stakeholders in the WEM.

Our responses to the proposed rule changes, herein, provide comment on the following issues:

1. Development of the WEM and market design
2. Impact of Capacity Credit certainty on wind developers
3. System security and reliability
4. Renewable Energy Generation Working Group process
5. Expert consultants reports
6. Solar energy
7. Commentary on rule change proposals
8. Conclusions



Please feel free to contact me or our Market Operations Manager, Mr John Vendel to discuss any aspects of this submission.

Yours sincerely

Lane B. Crockett

Lane Crockett
General Manager, Australia

1. Development of the WEM market design

It is the aim of all energy markets to strive for technology neutrality whilst ensuring that local network issues are managed appropriately. The Western Energy Market (WEM) has reached a point where it needs to more efficiently address intermittent generation technologies such as large wind and solar farms. Traditional day ahead markets in Europe recognise and acknowledge real time dispatch and forecasting is required to better manage intermittent generation dispatch.

Additionally demand side management initiatives and changing energy consumption patterns resulting from increased air conditioning use at residential and commercial sites and increasing mining and resource activities are key considerations for WA's energy market design.

Pacific Hydro welcomes the direction taken by the IMO in establishing the Market Evolution Program but believes this exercise should not be limited in its review but consider broader market design changes necessary for developing best practice renewable generation integration within the WEM.

[Integrating Renewable Generation into the SWIS](#)

Pacific Hydro was actively involved in the development of market rules established to manage the control and forecasting of wind generation in the NEM. This process recognised the technical capabilities of current and future wind generation technologies and utilises world class wind forecasting tools. This resulted in a range of market rules and procedures developed in conjunction with industry that have provided world best practice in integrating wind generation into the National Electricity Market. European electricity markets using the NEM as a benchmark have recognised the benefits of adopting similar real time control and forecasting systems to improve intermittent control and penetration.

Our Clements Gap wind farm in South Australia was the first generator to be designed and operated as a semi-scheduled generator. This project has operated successfully and economically on a 24/7 basis under 5 minute dispatch control by AEMO system management. Our planning for all future wind farms incorporates these control philosophies as we consider them to constitute best practice.

Based on this experience Pacific Hydro recommends that the WEM:

- Adopt wind forecasting practices to improve the efficient management control and design of its electrical control systems; and
- Explore real time market dispatch controls for demand and wind generation plant, including the dispatch obligations for wind generators during periods of high wind and low demand, or during other periods where system reliability or security is at risk.

[Market design signals](#)

The design of the SWIS market where Capacity Credits and Energy Payments use separate market signals results in cross subsidies between existing generators. Peaking gas plant and base load coal plant are paid at the same capacity rate but operate their plant during different demand conditions utilising different response times and technology capabilities.

Wind generation has its own capabilities and response that require supportive market arrangements in order to operate efficiently and economically.

The WEM design includes the planning and operation of a firm transmission network. Generation and load capacity determines the sizing of the transmission lines in order to ensure all generation and load has access to transmission capacity 100 per cent of the time. This design can result in intermittent generation inefficiently utilising the network and higher network charges than would otherwise be the case. To illustrate, wind and solar generators operate on average at 30-40 per cent capacity, resulting in transmission capacity being under-utilised at 60-70 per cent of the time. Coal plant typically operates at 80 per cent, however gas plant can operate at lower levels and is dependent on gas pricing (or contract arrangements).

An alternative dynamic approach could optimise existing capacity and share the underutilised network promoting efficiency and cost savings. With this in mind, Pacific Hydro recommends that the IMO further investigate market design alternatives to better reflect a diversified electricity generation system that enables effective integration of renewable energy with the SWIS.

2. Impact of Capacity Credit certainty on wind developers

Most wind developers require a bundled energy, capacity and renewable certificates power purchase agreement with a Retailer. Under these arrangements the risk of variability to the quantum of capacity credits will be borne by the Retailer once the bundled price is set. The bundled price will reflect a national competitive price that will determine if wind generators are built in a particular area or not. Once the Retailer accepts the bundled price, variability to Capacity Credit payments over time will be reflected in the tariffs charged to business and residential customers.

Both the IMO and Griffin proposals recommend an increase in uncertainty and value of Capacity Credit arrangements for intermittent generation

Reducing the Capacity Credit price or introducing uncertainty about future cash flows from Capacity Credits will not impact the wind developer unless the developer chooses to take on the market risks and operate against the spot market. In our experience this type of arrangement is less likely to be supported by financiers who seek certainty, prior to putting forward capital to invest in such projects.

Ultimately if Retailers prescribe too great a discount to the value of Capacity Credits and the wind developers bundled rates cannot be met, developers will defer investment in WA and establish projects in other jurisdictions.

Accordingly Pacific Hydro considers that the proposed rule changes increase uncertainty for wind farm viability and is discriminates against renewable energy in contradiction of market objective (c).

3. System Security and reliability

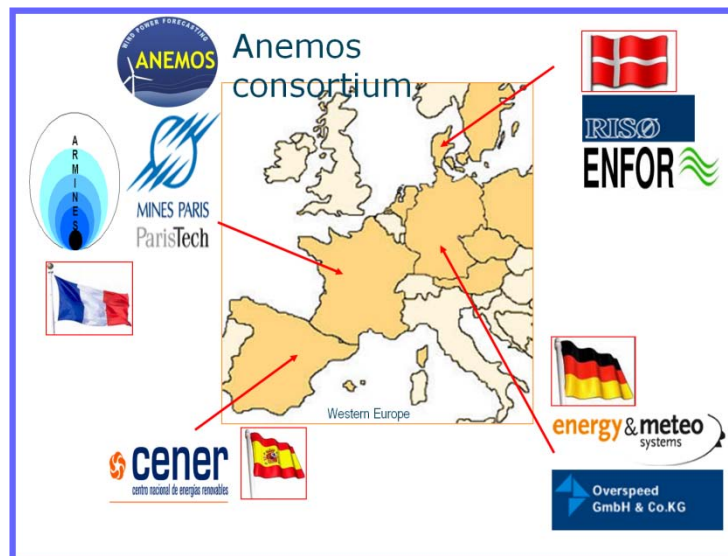
The WEM relies on operating within certain parameters to ensure the electrical system is maintained in a safe, secure and reliable state. The criteria for those parameters can be traced back to policy settings for the reliability criteria (due for review in 2012).

System reliability should be primarily managed through re-setting the system reserve margin and/or the expected shortfall limits. The current .002% unserved energy and 8.2% reserve margin should be reviewed to reflect the system security concerns of stakeholders in the market with and without additional wind generation. Such periodical reviews are warranted to enable new technologies and consumption patterns to be adequately considered.

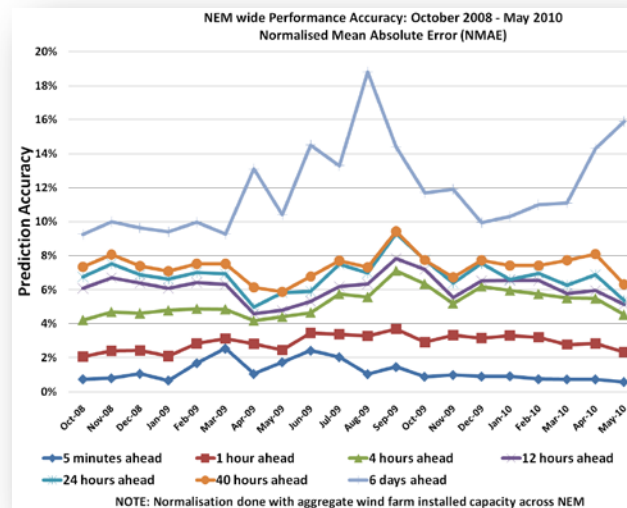
Pacific Hydro considers that existing solutions are available which could enhance the capacity of the WEM to manage and operate the network with additional wind generation. It is our experience that a key element in managing energy output relating to wind generation is the utilisation of an accurate wind forecasting tool.

In order to manage expected increase in intermittent generation the Australian Energy Market Commission (AEMC), with industry consultation (from 2004), developed National Electricity Amendment (Central Dispatch and Integration of Wind and Other Intermittent Generation) Rule 2008 No. 2 (Semi-scheduled Rules). This resulted in the Semi-Scheduled Rules for the NEM which were legislated as effective in May 2008 and in March 2009.

The NEM wind forecasting tool (Australian Wind Energy Forecast System or AWEFS) was developed with federal funding by the Anemos Consortium. The consortium comprises of the following international partners:



Since its operation, AWEFS has produced levels of forecast accuracy that are world class. The chart below shows NEM wide forecast accuracy over 20 months of operation. The forecasts for five minutes and for one hour ahead have accuracy performance of at least 96 per cent. In our view this forecasting tool enables AEMO system management sufficient time to manage system security and reliability.



The introduction of the AWEFS will enable accurate management of system security and reliability concerns over the critical 5 minute/1 hour dispatch period.

Commentary in the IMO proposal qualifies the comparison of wind capacity in the NEM (quoted as 5% however we understand the NEM uses a value between 7-8%) for planning purposes and wind capacity in the WEM for “market purposes”. An important distinction between the NEM wind generation and the WEM is the co-incident wind generation has to periods of high system demand in the WEM.

Statistical information presented by Senergy and MMA to the IMO and the REGWG acknowledged the high correlation of wind generation to demand. The present arrangements in the SWIS actually ignore this contribution. However, with the addition of a wind-forecasting tool, this fortuitous diurnal wind speed trend can be utilised by System Management and included in dispatch required to maintain ‘reserves and system security’.

The wind resource to load correlation is a well-studied, documented and explained occurrence¹. During the summer months when WA's electrical load is reaching its maximum levels coastal wind farms are also typically operating at high outputs. This is because the large scale weather patterns that drive circulation in summer are measurably enhanced by the diurnal sea-breeze effect. The sea-breeze is a local scale circulation that is actioned by the differential heating between daytime warm land and the relatively cooler offshore waters.

It is noted that even though the NEM does not have this correlation, in that market the ability of wind generators to contribute to system security at times of high demand is not ignored.

¹ Lyons and Foster. 1988 A synoptic classification for wind power potential in the southwest of Western Australia, Aust Met Mag. 37 (1989) 47-53

The NEM incentivises generation during periods of high demand by the high energy prices (up to \$12,500/MWh). The WEM uses both Capacity Credits and energy prices to achieve this incentive. We recommend a review to determine whether the incentives for generation are adequate during high system demand as this underpins the development of peaking plant.

It is of interest to note that the combined output of Pacific Hydro's Victorian wind farms generated 122MWh during the maximum Victorian Summer System Peak of 16:00 on the 11/1/2010. This combined output was 60 per cent of the rated capacity of these projects. During the South Australian maximum Summer System Peak of 13:00 on the same day our Clements Gap wind farm generated 48MW or 85 per cent of its rated output. Clearly the planning assessments can differ when compared to actual retrospective results.

4. REGWG Process

Pacific Hydro appreciates the ability to participate in the Renewable Energy Industry Working Group (REGWG) formed as a sub-committee by the IMO. This group was formed in March 2008 to consider the impact of renewable energy adoption in WA in light of the national target of 20 per cent of renewable generation in 2020.

The REGWG scope was determined by the IMO Market Advisory Committee (MAC) resulting in limited discussion regarding the opportunities for the SWIS to evolve its market design to more efficiently manage higher wind generation.

During the following 2.5 years, statistical information and industry experts were consulted to assist in the assessment of the impact of increased renewable generation (in particular wind) and the ability of the WEM to manage. The IMO should be congratulated on its efforts to present the information and discussion in a transparent forum however, it was clear different views were held and consensus was not achieved by the IMO's deadline.

This deadlock drove the IMO to deliver the IMO Proposal, a recommendation in line with MMA option 1A, to the MAC to address the lack of consensus. This proposal does not have the support of the REGWG, nor was it consistent with the recommendations from the industry experts.

The experts, given the limited scope of their work recommended a Capacity Credit allocation methodology described as 2A. However, System Management was at odds with this view and did not consider the recommendation consistent with their operating experiences.

5. Expert consultant reports

Senergy Econnect Australia (Senergy) was contracted to the Office of Energy (OOE) to review the Capacity Credit allocation for intermittent generation and produced a report² in Oct 2009 to provide the REGWG with a statistical review of actual and forecast wind data resulting in intermittent generation in the WEM and the appropriateness of assigning capacity credits to intermittent generators. Senergy found that "in the case of wind generation, calculation methodologies that consider peak load intervals only typically result in Reserve Capacity allocations which are higher than that calculated with all intervals by a factor of ~1.2-1.4 for recorded wind generation and ~1.1-2 for

² The Treatment of Intermittent Generation in the SWIS Capacity market – Review of Certified Reserve Capacity Calculation Methodologies for Intermittent Generators" ; Synergy Econnect (Synergy) 19/10/2009

modelled wind generation where calculations are based on averages.”³ This high correlation of wind generation to peak load intervals, particularly in coastal areas was considered a function of the fortuitous diurnal wind speed trends providing late afternoon sea breezes in the south west coast coinciding with air conditioning usage.

McLennan Magasanik Associates (MMA), recognised industry experts in economic and electrical markets, considered the current Capacity Credit regime and advised on a recommended Capacity Credit methodology. MMA found that the current Capacity Credit regime was actually consistent with a methodology to measure the coincidence of wind generation with high demand periods. However the existing Capacity Credit regime was not suitable for solar generation. MMA found *“The analysis has shown clearly that the average power method will not provide a suitable capacity measure for solar thermal and photovoltaic resources, whereas it is suitable for the incumbent wind farms in the South west, based on the available data on performance and system load.”*⁴ Following the 29/1/10 report MMA was reviewed by the Office of Energy, Verve Energy, Western Power’s System Management and the Oates Committee. The outcome of this was the issuance of a further report ⁵ addressing issues raised which, although reducing the level of Capacity Credits attributable to wind generation (by around 6%) held the original recommendations and identified that up to 1500MW of wind generation could be installed in the WEM without impacting the system reliability or security criteria. MMA *“assessed that between 1200 to 1500MW of wind could be added whilst keeping the maximum loss of load probability in any trading interval below 50% with the reserve margin of 8.2% in the period 2016/17”*⁶. MMA’s final recommendation was proposed methodology 2A, which was duly based on the system security and reliability criteria. This proposal sets an expected Capacity Credit level of a 38% capacity factor for total wind and appears to have less volatility than other options. Pacific Hydro considers that although this option was appropriate for the scope of work, the scope did not allow market design issues to be addressed and therefore could not move the market forward towards a holistic integration of intermittent generation.

6. Solar Energy

Throughout the REGWG, the current arrangements of solar energy were agreed by all to be inequitable. Pacific Hydro considers a Capacity Credit solution for solar should be adopted to provide the necessary development decisions to be supported however Capacity Credit changes across all intermittent generation should be delayed until a broader review of the market design is completed.

Solar, by its nature, is acknowledged as having excellent correlation between high demand and generation output. However solar should not drive radical changes to the intermittent energy market particularly given the relative size and future timing uncertainty of large scale solar developments.

7. Commentary on Proposals

The IMO Proposal was described as Proposal 1A⁷ by MMA and is advocated by the Office of Energy. This proposal is seen by both MMA and Pacific Hydro as too conservative and the methodology is neither simple nor transparent to the market. The use of the 12 highest LSG trading intervals may lead to increased volatility although this has been improved by using the 8 year fleet review rather than the MMA recommended 3 year determination. However

³ Ibid, Page 4 – Executive Summary

⁴ Valuing the Capacity of Intermittent Generation in the South-west Interconnected System of Western Australia – McLennan Magasanik Associates 29/1/2010

⁵ Supplementary Analysis of Capacity Valuation Metrics – MMA 12/4/2010

⁶ Ibid

⁷ Ibid – Page 6 – MMA 12/4/2010

this extended time period will place an unreasonable lead time and barrier for wind developers to fast track projects. As discussed in MMA's report the proposed 90% POE (1 in 10 year) is very conservative as compared to a 95% POE (1 in 20 year) assessed by MMA as Proposal 1. The use of a fleet metric is very conservative and arbitrarily sets a discount to the value of intermittent generation. To assign capacity credits to individual projects based on the sum of fleet capacity results in new projects being penalised for existing projects decisions to site in areas of unsuitable coincident wind conditions to Load for Scheduled Generation (LSG). These decisions were based on regulations applicable at the time of investment and should not drive new entrant's investment. This concern is due to both the actual and "modelled" data being used and the likelihood that the transparency of the calculations will be ultimately bound by confidentiality issues.

The alternative Griffin Rule change proposal appears to be based on MMA Proposal 2B however it is difficult to quantify this proposal as it differs from the MMA proposal in considering the previous 3 years of top 750 trading intervals. The MMA proposal selected 3 years based on load profiles with a peak period POE of 10%, 30% and 50% (which are currently the 02/03, 03/04 and 04/05 years). While the Griffin proposal has merit in its simplicity and transparency, both key criteria for investment certainty and avoids the use of a fleet adjustment. Neither proposal provides supports the integration of wind into the WEM.

8. Conclusion/Summary

In our view, the IMO and Griffin proposed Rule Changes may have the effect of discouraging new (renewable) technology and reduce the effectiveness of intermittent technologies, Pacific Hydro is of the view that the underlying concern around the management of system reliability and security should be addressed before considering such rule changes.

The proposals provide limited alternatives as to the most efficient and long term solution for the WEM. This results in unreasonable complexities and risks associated with future development of wind generation into the SWIS. In Pacific Hydro's experience, the efficient integration of wind generation into the market requires both market design and technologies to work together to resolve these issues.

We recommend to the IMO:

1. Retain the existing Capacity Credit methodology for the wind generators;
2. Establish a Capacity Credit methodology for Solar generators; and
3. Develop a wind forecasting system and real time dispatch control for the integration of intermittent generation within the WEM to support Federal and State renewable energy targets.