30 August, 2016

Mr. Ben Noone
Adviser
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Dear Mr Noone

Re: Submission to the Consultation Paper National Electricity Amendment (Five Minute Settlement) Rule 2016

Wärtsilä welcomes the opportunity to provide comments on the consultation paper for the proposed Five Minute Settlement Rule change.

Wärtsilä is a global leader in advanced technologies and complete lifecycle solutions for the marine and energy markets. In 2015, Wärtsilä's net sales totalled EUR 5 billion. The company has operations in over 200 locations in more than 70 countries around the world.

Wärtsilä Energy Solutions is a leading global supplier of ultra-flexible power plants of up to 600 MW operating on various gaseous and liquid fuels. Our portfolio includes unique solutions for baseload, peaking, reserve and load-following power generation, as well as for balancing intermittent renewable energy. Wärtsilä Energy Solutions also provides utility-scale solar PV power plants, as well as LNG terminals and distribution systems. As of 2016, Wärtsilä has 60 GW of installed power plant capacity in 176 countries around the world

Wärtsilä has a strong interest in proposed changes to national electricity market arrangements and we have put together our views regarding the 5 minute settlement interval.

The submission is in three parts. First, we have shared our comments regarding change to 5 minutes settlement interval. In the second part we have discussed about the similar changes done in a similar energy-only market in the USA. Finally, we discuss some technological considerations that must be taken into account when assessing the merit of the 5-minute rule.

Please contact me if you would like to discuss this submission further.

Yours Sincerely

Suraj Narayan

Response to AEMC's Consultation Paper on "National Electricity Amendment (Five Minute Settlement) Rule 2016

Section 1: Wartsila's view.

1.1 The current arrangement and the historical reasons

The current rules in the NEM, to quote from the consultation paper are:

Under the current arrangements, some generators and other wholesale market participants submit bids or offers to the market operator, signalling their willingness to generate, consume or transport electricity. The dispatch price is the bid of the most expensive generator that needs to be dispatched in order to balance demand and supply in each five minute period.

While a dispatch price is determined for each five minute dispatch interval, settlement - the transfer of money for electricity supplied to the market and consumed by end users - is calculated on a 30 minute basis. The settlement price is the time-weighted average of the six dispatch prices that occurred during any given 30 minute trading interval.

It is important to understand why this misalignment of despatch interval and settlement time came into force. To quote the consultation paper again:

These arrangements have been in place since the start of the NEM in December 1998.

A five minute dispatch interval was chosen since, relative to a longer interval, it more closely matches the dynamic nature of the power system. A shorter interval reduces the potential for supply and demand to deviate from their expected levels within the dispatch interval, resulting in lower costs to keep the system in balance.

The 30 minute settlement interval reflects limitations in the technology available at the time. It was thought that a five minute settlement interval would require significant additional

computational resources, and that metering equipment was not sophisticated enough to handle any finer detail than half hourly pricing

A third reason, though not spelt out in the paper, was that very few options were available to generators to respond and despatch power within the time interval of 5 minutes, if a spike event happened. Should the generator respond to a price signal and miss the spike (unless there were consecutive ones), the revenue opportunity was lost. This would have been a disincentive and could have led to reliability issues when demand exceeded the supply. The 30-minute settlement time gave the bidders more leeway to start their peaking plants and benefit from the price hike, even if on a weighted-average basis.

Thus the 5/30 formula was accepted as the best possible compromise under the circumstances and given the technology limitations.

1.2 Is there a problem?

As Sun Metals, the proposer of the rule change, has observed:

> *Sun Metals submits that the mismatch between the dispatch and settlement intervals leads to inefficiencies in the operation and generation mix of the market. Specifically, this aspect of the market design:*
>
> - *accentuates strategic late rebidding, where generators have been observed to withdraw generation capacity in order to influence price outcomes; and*
>
> - *impedes market entry for fast response generation and demand side response. Sun Metals notes that batteries, some loads and some transmission systems are capable of responding in a single five minute dispatch interval. It submits that the capability of these technologies is not appropriately recompensed under the current arrangements and will therefore not be properly utilised.*

In a 5/30 system, there could be a serious misalignment between the price hike event and the response. For instance, if a price spike occurs in the first 5 minute period of 30-minute settlement, technologies such as gas turbines with response time of 20 minutes, can still run in the last 5 minutes of the settlement block and take advantage of the weighted-averaging, although they would be providing energy 25 minutes later than when it was really needed. This time lag could result in a serious distortion in wholesale market pricing signalling.

The "Bidding in Good Faith" rule change that came into effect from July 1, 2016 will, to some extent, inhibit the potential of participants to deliberately delay the rebids to withhold information from the market, but as the AEMC acknowledged in its final determination that "*the incentives on some generators to engage in strategic late rebidding were exacerbated by the mismatch between dispatch and settlement.*"

This mismatch was perhaps viewed as inevitable when the 5/30 rule was first framed, owing to the limitations and unavailability of adequate technology options to respond within the time interval so as to coincide with the demand spike. This concern is no longer valid, as – apart from hydro-electric plants- instantly-despatchable "smart power generation" options are available today, to provide precisely such a rapid response. We will highlight the features of smart power generation (SPG) later in this paper.

1.3 Is there a need to change the status quo?

Volatility in demand has always characterised electricity grids, due to variations in hourly and seasonal consumption patterns. But, since the 5/30 rule was formulated nearly 20 years back, NEM has witnessed additional volatility on the generation side as well, due to increased role and higher installed capacity of renewable energy sources such as wind turbines and solar PV plants. NEM is committed to increasing the share of RE in the future too. This impact of RE variability has not been highlighted in the consultation paper and has an important bearing.

Despite the higher accuracy of the forecasting tools and the better scheduling it enables, RE increases the probability of a sudden drop in generation (or increase) and, therefore, the

volatility in the system. This makes it even more important to provide price signals that reflect real-time (or as close to it) imbalance between supply and demand.

With more technology options available today to respond more rapidly to such price signals, it is no longer necessary to accept the status quo as sacrosanct. In fact, this can lead to undesirable outcomes, given the combined volatility in both generation and demand.

Section 2: FIVE MINUTE SETTLEMENT INTERVAL IN USA

By way of benchmarking, NEM should also look at best practices elsewhere in the world, especially where similar, energy-only markets operate. We provide below an extract from a recently issued "Final Rule"

Federal Energy Regulatory Commission, USA has issued guidelines dated June 16, 2016 on "Settlement Intervals and Shortage Pricing in Markets Operated by Regional Transmission Organizations and Independent System Operators", ruling that each RTO/ISO should settle energy transactions in its real-time markets at the same time interval it dispatches energy. In short, both the despatch interval and trading interval should coincide in 5.minute time blocks.

The reasoning provided by FERC was:

- *Some current RTO/ISO settlement practices fail to reflect the value of providing a given service, thereby distorting price signals and failing to provide appropriate signals for resources to respond to the actual operating needs of the market. One such practice occurs when RTOs/ISOs dispatch resources every five minutes but perform settlements based on an hourly integrated price, or when RTOs/ISOs schedule intertie transactions every fifteen minutes, but perform settlements on an hourly integrated price. This misalignment between dispatch and settlement intervals distorts the price signals sent to resources and fails to reflect the actual value of resources responding to operating needs because compensation will be*

based on average output and average prices across an hour, rather than output and prices during the periods of greatest need within a particular hour.

- *We also find that a second problem occurs if there is a mismatch between the time when a system experiences a shortage of energy and operating reserves and the time when prices reflect the shortage condition. This can be particularly problematic when, for example, an RTO's/ISO's market rules require a shortage to last a minimum time period before triggering shortage pricing. In this instance, short-term prices fail to reflect system conditions and potential reliability costs, as well as the value of both internal and external market resources responding to a dispatch signal. In addition, inaccurate price signals are provided to market participants if shortage pricing is still in effect after the shortage has been resolved.*

- *…….In this Final Rule, we are amending the Commission's regulations to improve the operation of organized wholesale electric power markets operated by RTOs and ISOs. We require that each RTO/ISO align settlement and dispatch intervals by: (1) settling energy transactions in its real-time markets at the same time interval it dispatches energy; (2) settling operating reserves transactions in its real-time markets at the same time interval it prices operating reserves; and (3) settling intertie transactions in the same time interval it schedules intertie transactions. We also require that each RTO/ISO trigger shortage pricing for any interval that prices both energy and operating reserves in which a shortage of energy or operating reserves is indicated during the pricing of resources for that interval*.

Wartsila believes that the same considerations that applied to the US electricity market are equally valid for the NEM as well and it would be appropriate and timely to bring about the same alignment.

Section 3: Technology considerations:

As cited in Sec 1.1 above, when the 30-minute trading interval was fixed in 1998, "it *was thought that a five minute settlement interval would require significant additional computational resources, and that metering equipment was not sophisticated enough to handle any finer detail than half hourly pricing"*

Wartsila believes that computational capabilities have evolved exponentially since 1998 and the constraint cited above is no longer relevant. As has been discussed in the Consultation paper, the use of operational data from SCADA system to allocate or profile the existing 30-minute metered energy to 5-minute periods will reduce the implementation costs. As this is outside our area of expertise, we refrain from elaborating on the merits of this system, except to state that these were not viewed as constraints by the FERC, while implementing the 5-minute rule, and it is Wartsila's sincere belief that this will not be a limiting factor.

We had mentioned in Sec 1.1 that one of the reasons for accepting the compromise of 5/30 rule was the limited number of fast-response options available then. In the last decade, however, technology options such as "Smart Power Generation" have emerged and gained wide acceptance as a fast-response solution to more closely match the demand in real-time.

The characteristics of "Smart Power Generation" **(SPG**), in brief are:

- Based on IC Gas Engine technology.
- Can be installed in unit sizes up to 20 MW. Can be scaled up to any plant size in a modular manner. Can be despatched in smaller chunks, to suit load.
- High efficiency is maintained at any part load (no derating for part-load, as in the case of gas turbines)
- Can start from idle condition and ramp up to full load in 2-5 minutes.
- Can stop instantly.
- Can start/stop any number of times, without maintenance penalty
- Negligible water consumption.
- Does not require high-pressure gas- unlike gas turbines

In 2014, Wartsila had commissioned ROAM Consulting (now merged with Ernst & Young) to carry out an analysis of the value that SPG's fast-response capability would add to a gentailer's portfolio, by way of additional opportunities and revenues. The conclusion of the report was that the gentailer benefited both from the higher efficiency and the higher flexibility that SPG offered. The flexibility of SPG to ramp up or down within a 5-minute interval enabled the gentailer to maximise opportunities both by preventing a disadvantageous price hike as well as to capture a price hike.

The simulation was done with the 5/30 rule in mind, and the value of SPG would be even greater if the 5-minute rule comes into effect.

Wartsila has published a white paper that summarises the results of the study carried out by ROAM Consulting, and we invite you to peruse that by clicking this link. We also recommend this short video (link) that captures the benefits of a fast-response generating solution in a 5-minute market.

Will the rule change be disadvantageous to certain incumbent plants/technologies? Baseload plants such as coal or nuclear may not be impacted, but it could affect other peaking technologies such as Open-cycle gas turbines, for example, that cannot respond and ramp-up within 5 minutes. Without the comfort of the 30-minute weighted-averaging that is available to them in the 5/30 dispensation, they will not find it expedient to start the plant unless they foresee consecutive spikes coming up. Therefore, the rule change could meet with some resistance from vertically integrated utilities, who benefited by the 5/30 rule.

However, we believe that this will motivate them to improve their forecasting accuracy so that they can start their plant well ahead and be online to capture the spike, and this will benefit the system.

Also, the larger question to be answered is "***What is the objective of AEMC to propose the rule change?***" It is to secure long-term reliability of supplies by ensuring fair competition and creating incentives for new capacity and new players to enter the market. While the 5/30 rule

is beneficial for existing technologies and vertically-integrated Utilities, we do not see new investments coming in. The existing rules of the legacy system create a false sense of complacency as incumbent players can continue to deploy slow-response plants by taking advantage of the longer settlement period. This would have a serious impact on system reliability, in the long run. The rule change, on the other hand, would open up the market for new players and investment in new flexible technologies that are urgently required to complement the growing RE generation.

The 5 minute settlement would reduce price spikes caused by gaming and increase transparency which are both good elements of market design. With the 5 minute settlement there is no need for the “bidding in good faith” rules, as the pricing events are caused more by system requirements instead of bidding strategies.

Wartsila believes that the rule change would send out the right signals to incentivise investments in flexible technologies that will ensure long-term reliability and improve the efficiency of NEM, and also enable full absorption of RE to meet its goal of carbon reduction.