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Mr John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Dear Mr Pierce,

Proposed rule change: To have 5 minutes settlement pricing instead of 30 minute average settlement pricing

The purpose of this letter is to formally request a change to the National Electricity Rules (Rules) to have the implementation of 5 minute price settlement for generators and optional 5 minute price settlement for customers.

In implementing a 5 minute settlement process our proposal is to keep the implementation cost to the market as low as possible therefore we recommend that the AEMC revisits the 2002, but the proposal should be optional for customers.

Attached for your analysis and consideration is a more detailed report outline the benefits and costs of such a proposal.

Yours faithfully,

Yun Choi
CEO Sun Metals Corporation Pty Ltd

Five Minute Settlements

Statement of Issue

In the National Electricity Market (NEM) in its current form, there is a mismatch between dispatch and settlement: dispatch prices are calculated every five minutes, while the market is settled on the basis of the time-weighted average of the six five-minute dispatch prices over the 30-minute trading interval.

The disparity between dispatch and settlement timeframes creates market distortions that lead to inefficiencies in operation and composition (generation mix and demand response) of the market. The recent incidences of strategic late bidding by generators and manipulation of the market by withdrawing Queensland generation is a market distortions, which is then accentuated by the current market structure of 5 minute dispatch and the 30 minute trading.

In addition, the current market distortions represent an impediment to the entry into the market of fast response generation, and rapid demand-side response, which could otherwise provide a reduction in the cost of supply.

There are technologies available capable of responding in a single 5 minute dispatch interval, such as batteries, loads with fast control systems set up to respond to market prices, and some flexible alternating current transmission systems (FACTS) and direct current transmission systems. As solar systems with battery storage become less expensive, these systems could potentially participate in the market as energy-limited fast response generators. Some Participants are actively experimenting with fast generation response from solar-battery hybrid storage systems and fast demand response from household load management systems. Air-conditioning loads are particularly suited to short-duration demand response systems. Some large industrial loads, like Sun Metals and gas industry participants are also capable of providing 5-minute demand side response. However the current 30 pricing calculation method means that the capability of these technologies is not appropriately recompensed in the NEM, and therefore these technologies will not be properly utilised, under current pricing arrangements, to maximise the efficiency of the market.

With the current 30 minute pricing calculation, there is little incentive for fast response technologies to enter the market, because:

- Generators receive the average price of generation over a full interval. If fast generation is scheduled for one dispatch interval on the basis of a high price bid, it is paid the average dispatch price over the 30 minute trading interval, for the dispatch over the one interval in which it participated. The average price may not be sufficient for investment in fast response generation, or for operation of existing fast response generation. The current 30 minute price calculation may also be an impediment to market services, for which the market is settled also based on the average price difference between regions.

- Likewise, loads pay the average price across the whole trading interval; even if they respond to the price spike to reduce output, they are unable to reduce their output on past dispatch intervals. The overall impact of time weighted 30 minutes pricing, instead of 5 minute actual usages is that the price changes after consumption.
- Additionally, in our case, we are forced to restrict load over the whole 30 minute trading period, and even subsequent trading periods, rather than risk paying high prices for the whole period. Therefore the flow on effect of the distortionary impact of 30 minute settlement in volatile periods is a disproportionate disruption to the production of zinc and its associated economic benefit. This latter scenario is clearly a poor outcome for the market, for the customer and for the economy as a whole, since load is normally a consequence of production, not of uncertainty created by the Rules.

Description of the Proposed Rule

Sun Metals submits that it is time to revisit the 5 minute settlement option that was the preferred option considered by NEMMCO in 2002[1]. Changing to a 5 minute settlement price helps to remove the financial advantage of strategic late rebidding, as the price is only applicable for 5 minutes and does not increase the price of previous dispatch outcomes within the 30 minute trading interval. Even if no demand participants change their pricing to 5 minute dispatch, this change will help to remove an inefficient market distortion created by the market structure. It will help to create a more a competitive market where fast response generators are rewarded for the actual time they are participating in the market. The flow-on effect may be a moderation in prices and additional liquidity in the electricity market, if more fast-response generators are ready to dispatch, as they wait for a price spike where they could be remunerated many times more than they have in the past, thus competition is strengthened.

The key features of the proposed Rule, based on NEMMCO's 2002's preferred solution, are shown in the table below.

If the market were established today, ideally it would be set up with five-minute dispatch and settlement for all generation and loads, which would avoid the market distortions and make for simple pricing and settlement arrangements. However, in reality it is necessary to contend with legacy accumulation metering equipment. To reduce the cost of implementation, this proposal avoids the need to replace meters by using SCADA to profile the demand across the thirty minute trading interval, where 5-minute interval meters are not installed. This enables generation payments to be made on a volume weighted basis, rather than a simple average dispatch price over the trading interval. Participants may choose to install 5-minute interval meters at their own cost.

In recognition of the fact that not all loads are capable or willing to undertake rapid demand-side response, and not all loads have suitable metering or SCADA, the proposal provides for optional

[1] MMA "NEMMCO Issues Paper. Modelling of Efficiency Gains from Resolution of 5/30 Issue", 28 January 2002

participation in five minute settlements for loads, which should also help to reduce implementation costs.

This proposal differs from the scenario investigated by NEMMCO in that retailers are not required to offer customers the option of 5 minute settlement. It is anticipated that some retailers will choose to offer five minute settlement as an option, if they can attract customers with significant capability to respond within 5 minute dispatch intervals. Other retailers with predominantly retail load may choose not to outlay the capital necessary to implement the changes. This subtle difference between the proposed Rule and the scenario proposed by NEMMCO will have major implications for the cost of implementation, because the NEMMCO work assumed that all retailers would have to implement facilities to manage the five minute settlement option for customers, whereas this proposal anticipated that only a proportion of retailers may choose to offer this facility, if there is net benefit to their business.

The imbalance created by the continued use of 30 minute settlement for loads is recovered[2] entirely from these participants (pro-rated by energy) with a settlements levy or new ancillary service.

Table 1: Comparison of Current and Proposed Arrangements[3]

Feature	Current Arrangements	Proposed Arrangements
Settlement Period	30 minutes	Simulated Five Minutes for selected participants
Five Minute Settlement	Not Applicable	Compulsory for all market generators, scheduled loads and MNSPs. Optional for other market loads based on simulated volume.
Five Minute Dispatch	Compulsory for all scheduled generators and market network services.	No change
Five Minute Volume	Equal to one sixth of 30 minute metered volume for all participants in the NEM.	*Measured or* Estimated as a proportion of 30 minute metered volume using SCADA data for calculating a Settlement Adjustment Factor for generators and MNSPs. Five minute interval metering would be an option to SCADA data.

[2] The 2002 NEMMCO draft final report uses the term "recovered". However the 30 minute settlement might deliver a positive imbalance or a negative imbalance, and therefore recovered could be positive or negative.

[3] Words in italics are additional to Table 2.1 from MMA "NEMMCO Issues Paper. Modelling of Efficiency Gains from Resolution of 5/30 Issue", 28 January 2002

Dispatch Price	Ex ante based on bid stack and SCADA indications of regional load	No change
Generator Payment Received	Simple average of regional dispatch prices based on generator MLF.	Payment equivalent to full 5-minute dispatch and settlements. Payment calculated using existing settlement payment (30 minute energy multiplied by the time weighted average RRP) multiplied by a settlement adjustment factor to achieve simulated 5-minute settlements.
Market Network Service Provider (MNSP) Payments	Simple Average of regional dispatch prices based on MNSP MLF and net energy flows in a trading interval.	Bi-directional settlement required. Total payments equivalent to full 5 minute dispatch and settlements.
Market Customer Payments	Simple average of regional dispatch prices adjusted by the Market Customer's marginal loss factor (MLF).	Customer payments are comprised of an energy payment and a levy or ancillary service to restore a settlements balance attributable to the simulated 5-minute settlement regime used by other market participants. The energy payment is the customer's 30-minute energy multiplied by the regional reference price (a total system demand volume weighted average price) *adjusted by the Market Customer's marginal loss factor (MLF)* The levy calculated for a market customer is simply the customer's share on a pro-rated by energy basis of the regional settlement imbalance created by the simulated 5 minute settlement regime. Some market customers may opt into the simulated 5- minute settlement

		regime by installing the required SCADA or 5 minute interval metering. These customers would then be settled in a similar manner to others using this settlement arrangement and would not be exposed to the levy or ancillary service mechanism applicable to market customers under this option. *Under this proposal Retailers are not obligated to offer optional 5 minute settlement to their customers.*
Settlement Residuals	Settlement Residuals only arise due to the difference between marginal loss factors and actual losses and due to metering errors. Intra-regional surpluses paid to TNSPs, interregional surpluses available for interregional hedging through the SRA process, with auction proceeds passed back to TNSPs.	Additional settlement residues will arise due to the partial participation in the volume-weighted settlement. This creates the need to define an additional ancillary service, which may be difficult to forecast and hedge.

Affected Rules

The key Rules that would be impacted by this Rule change proposal are:

- 3.9.1 Principles applicable to spot price determination, particularly 3.9.1(a)(2)
- 3.9.2 Determination of spot prices, particularly 3.9.2 (h)
- 3.15, especially
    - 3.15.5 Adjusted energy – transmission network connection points
    - 3.15.5A Adjusted energy – virtual transmission nodes; and
    - 3.15.6 Spot market transactions

Additional Rules will be needed to cover the use of SCADA for profiling the 30 minute generation and (optionally) loads, and to make adjustments for the settlements imbalance arising because the 5 minute settlements process is not applied to all loads. An additional Rule may also be required to clarify that Retailers are not obligated to offer the five minute service to loads.

The matter is one on which the AEMC may make a rule

Schedule 1 s34 of the National Electricity Law allows the AEMC to make rules related to the following:

"Subject to this Division, the AEMC, in accordance with this Law and the Regulations, may make Rules, to be known, collectively, as the "National Electricity Rules", for or with respect to—

(a) regulating—

(i) the operation of the national electricity market;

(ii) the operation of the national electricity system for the purposes of the safety, security and reliability of that system;

(iii) the activities of persons (including Registered participants) participating in the national electricity market or involved in the operation of the national electricity system;

(iv) the provision of connection services to retail customers; and

(aa) facilitating and supporting the provision of services to retail customers; and

(b) any matter or thing contemplated by this Law, or is necessary or expedient for the purposes of this Law."

This proposed Rule change relates to operation of the national electricity market, and is therefore a matter on which the AEMC may make a rule.

The proposed Rule contributes to the National Electricity Objective

The National Electricity Objective (NEO) is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to—

a) price, quality, safety, reliability and security of supply of electricity; and
b) the reliability, safety and security of the national electricity system.

The proposed Rule contributes to the NEO by increasing:

- allocative efficiency and
- dynamic efficiency.

It does not affect the reliability, safety and security of the national electricity system.

Allocative efficiency refers to whether the allocation of resources is the most efficient from society's point of view for a given set of prices, incomes, and resource availability. The proposed alternative

settlement arrangements will improve allocative efficiency by encouraging a more efficient pattern of generator dispatch and electricity consumption, leading to an overall reduction in the cost of supply.

Dynamic efficiency refers to whether arrangements encourage technological developments or institutional changes that improve the efficiency with which resources are used over time.

In the medium term the closer alignment of dispatch and settlement prices may result in a better mix of new plant entering the market. In particular the proposed change may encourage the new entry of fast start generation, because of removal of the distortion under the current market of the five minute dispatch and 30 minute settlement process.

Anticipated Benefits and Costs

Costs of implementation

At the time this market mechanism was investigated by NEMMCO, it was not implemented because the net costs were thought to exceed the benefits.

Since the active participation by retailers in 5 minute settlement is voluntary, we contend that retailers would only participate in 5 minute settlement if the net benefit to them were positive. Voluntary costs that are only incurred when a business will receive a net benefit should not be taken into account in the calculation of net market benefits.

Our discussions with retailers suggest that most retailers are unlikely to opt into the 5 minute settlements process at this stage. Our discussions confirmed that most of the large costs identified by AEMO in the 2002 investigation would only be incurred if the Retailer opted into the 5 minute settlement process.

Some retailers expressed concern about the materiality of settlement residue under the 5 minute dispatch with simulated 5 minute settlement proposal. To test the materiality of the settlement residue we examined market data from Queensland in January 2015. Analysis of this market data indicates that if generator bidding and load usage were unchanged from the current pattern, and all loads were calculated on a 30 minute basis, all generation on a five minute basis, the difference in AEMO money received from market customers and money paid to generators across the whole of Queensland would be less than 0.3% of settlement. Settlement residues from this process could be combined with the existing intra-regional settlements residue, in which case no changes would be required to retailers' systems to manage the residue.

Nevertheless there will be some costs to retailers regardless of whether they actively participate in the scheme or not, to monitor the market when the scheme is implemented, and to manage their risk. These costs are likely to be no more than the costs incurred by generators. Therefore, it is reasonable to assume retailer costs are not more than the costs to generators, who have no choice but to participate under this proposal, amounting to $2 million in aggregate upfront costs and $0.2 million per annum ongoing.

Converting to 2015 dollars this equates to:

	Upfront costs ($M)	ongoing annual costs ($M)	pv ($M)
Generators	2.78	0.278	
Retailers	2.78	0.278	
AEMO	1.39	0	
MNSP	0.139	0	
Total PV	$7.09	$0.56	$10.27

Clearly, there are assumptions in this analysis that need to be more fully investigated. However we anticipate that IT costs, particularly in relation to data storage and hardware have dropped significantly in the intervening period.

(Optional) Metering 5 minute data

Our investigations to date suggest that for those participants who choose 5 minute metering, the upgrade costs for two meters would be around $4000 to $5000 or $30,000 to replace the whole meter. Implementation of 5 minute metering is optional under the proposed simulated 5 minute settlement process, but it is likely that some Participants (Generators or Customers) would prefer the improved reliability of meter data over SCADA. The need to upgrade meters seems to be related mainly to a requirement for 35 days data storage NER Clause 7.3.1 (a)(10). The AEMC could consider whether the current requirement for 35 days of data storage is necessary, or if a shorter storage record would be appropriate. If a shorter storage period is adequate then a change to this clause could be considered as part of this proposal.

There would also likely be some associated cost to Metering Data Agents to upgrade to a new meter data format, as the current NEM12 format does not cater for 5 minute meter data. We assume that upgrade of the aseXML standard would be accounted for in the AEMO costs, and we note that some metering related costs were included under Retailer costs in the 2002 proposal.

Potential impacts of the change

The potential impacts of the change are as follows:

Party	Impact
AEMO	AEMO will need to make changes to its software systems to incorporate the SCADA generation and load profiling, to adjust the pricing algorithm and to create the market balancing mechanism (possibly a new ancillary service).
Financial Markets	Gradually, as market customers opt for a 5 minute settlements, there will be opportunities for hedge instruments to develop with similar pricing terms embedded in it.
Generators	Some generators may change their bidding strategies as a result of this change. In the medium to longer term fast response generators may enter the market in response to new opportunities arising out of this rule change.
Retailers	Retailers will need to amend their IT systems to allow for the additional ancillary service for balancing the market. Retailers who opt in to the 5 minute settlements process will need to update their systems to accommodate this process.
Meter Data Agents	Meter Data agents would need to upgrade to a new meter data format as the NEM12 format does not support 5 minute meter data.
Market Customers	More demand side management could be encouraged with a move to 5 minute settlement processes including potentially some large industrial loads. To participate in 5 minute settlements, loads would need to have 5 minute interval meters or suitable SCADA in place. Customers generally should benefit from greater efficiency of the market.
Market Network Service Providers	The payments for MNSPs will be affected by the 5 minute settlement, and may increase or decrease income depending their response capability and the supply-demand balance.
Retail Customers	Customers generally should benefit from greater efficiency of the market.