

17 June 2016

Mr John Pierce  
Chairman  
Australian Energy Market Commission

10 Eagle Street  
Brisbane QLD 4122  
T 07 3347 3100

By email

Dear Mr Pierce

**Submission to consultation paper – National Electricity Amendment (Five Minute Settlement) Rule 2016**

AEMO welcomes the opportunity to provide a submission on the AEMC's consultation paper on the above rule. AEMO acknowledges the issues raised by the proponent. We consider the proposed solution would be practical and effective in addressing the issues raised.

We would be pleased to provide further assistance to the AEMC regarding the matters highlighted. If you would like to discuss or have any questions regarding this submission, please do not hesitate to contact myself or Violette Mouchaileh, Group Manager Market Enhancement on (03) 9609 8551.

Yours sincerely



Peter Geers  
**Executive General Manager, Markets**

Attachments: National Electricity (Five Minute Settlement) Rule 2016 Consultation: AEMO Submission



# NATIONAL ELECTRICITY AMENDMENT (FIVE MINUTE SETTLEMENT) RULE 2016

SUBMISSION

Published: **June 2016**



## 1. INTRODUCTION

The anomaly between 5 minute dispatch and 30 minute settlement was first considered by NEMMCO within months of the National Electricity Market (NEM) commencing. A range of regulatory arrangements, referred to in this submission, have been put in place in recent years to address strategies that are arguably a response to those anomalous price signals. This is the first time that the price signals themselves have been subjected to the rule change process, and AEMO welcomes consideration of this rule change.

AEMO understands the proposal would require AEMO to develop a process for using SCADA data to profile thirty minute energy data, and settle a subset of participants with five minute prices. The proposal is to make five minute settlement compulsory for all scheduled and semi-scheduled generation, and optional for loads.

In assessing the merits of the proposed rule change, AEMO suggests careful consideration of potential interactions between this rule and other rules current being considered by the AEMC.

Broadly, our submission acknowledges the issues identified by the proponent, confirms AEMO would be in a position to implement the proposed rule and notes that alternatives based around five minute metering would be costly to implement.

## 2. IS THERE A PROBLEM?

The proponent and AEMC have both identified previous work to identify the problem and risks faced by participants from the pricing mismatch between dispatch and settlement (trading) intervals. The issue was also observed as part of the AEMC's optional firm access (OFA) work, which was a determining factor in recommending against a staged approach to OFA.<sup>1</sup>

To demonstrate the potential problem, examples in Appendix A show:

- Perfectly responsive plant is disadvantaged by thirty minute settlement.
- Fast start plant experiences inconsistent outcomes depending on whether it receives start signals at the start or end of a trading interval, and whether the price that triggers a start signal is maintained.
- Plant that operates "base load" is generally indifferent to five or thirty minute settlement.
- Settlement residue auction (SRA) distributions are lower under thirty minute settlement.
- Long term trends in generation by flexible plant suggest the issue is likely to continue into the future and drivers for change are likely to strengthen.

These examples demonstrate the nature of the risks faced by flexible plant and traders in the SRA. Existing technologies such as hydro and some industrial loads, and new technologies such as energy storage devices are examples of plant that would be particularly at risk from the dispatch and settlement mismatch.

The AEMC asks whether five minute settlement would be more conducive to demand side participation. AEMO considers this is likely for industrial processes that can tolerate short term interruptions to production, such as the plant operated by the proponent. Note that this may need to be considered in light of other rule changes in train (non-scheduled generation and load in central dispatch, for example).

## 3. SCADA

AEMO's energy management systems use SCADA extensively to maintain power system security. Typically the data is collected at intervals as short as four seconds from generators, loads and

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<sup>1</sup> AEMO concluded that price signals from the 5 minute dispatch and 30 minute settlement mismatch could not be distinguished from those due to network congestion. AEMO's report on the OFA reform can be found here: <http://www.aemo.com.au/Electricity/Market-Operations/Optional-Firm-Access>. Section 6 of the final report has relevant discussion.

networks. The data collected includes power generation and consumption, power and reactive power flows on networks, voltages and frequency. This data is then used by AEMO to assess whether the power system is within the technical envelope.

SCADA is an industry term that is not explicitly referred to in the Rules. AEMO generally considers this to mean remote control and monitoring devices, as described in clause 4.11.1 and in schedules 5.2, 5.3 and 5.3a of the Rules. In the context of this rule change, we understand this to refer to remote monitoring devices. These are widely used in the central dispatch process to determine, for example:

- Current levels of dispatched generation, load and market network services.
- Current levels of network load used in network constraints.
- The technical envelope and whether the power system is being operated within it.
- Dispatch and settlement of the market ancillary services.<sup>2</sup>
- Calculating participation factors used in the 'causer pays' recovery of small deviation market ancillary services costs.<sup>3</sup>

Remote monitoring is generally for operational requirements, is not subject to the requirements in chapter 7 of the rules and is not generally suitable to be the primary measure for energy settlement purposes. However, the proposal to use SCADA in conjunction with existing thirty minute revenue metering would overcome most of the concerns with the use of SCADA.<sup>4</sup>

The existing regulation FCAS causer pays methodology is an example of how SCADA data is applied, and this could be adapted for use with five minute settlement. Because FCAS causer pays methodology applies the previous quarter's data to the next quarter and AEMO considers the processing and analysis for this is more complex than would be required to implement the five minute energy settlement.

The proposal makes five minute settlement compulsory for generators may need some changes to technical requirements in chapter 5 of the rules, but the benefit of doing this would need to consider any changes arising from other overlapping rules such as non-scheduled generation and load in central dispatch. This is particularly the case if the proposal to lower the 30 MW threshold for scheduled generators is adopted.

The proposal does not consider explicitly how large Retailers would participate in five minute settlement. AEMO understands individual market loads would be able to participate provided they have SCADA and revenue metering at the same location. Many Local Retailers would be eligible where the transmission connection point has both revenue and SCADA metering, but this may have implications for settlement-by-difference in the retail market. AEMO recommends consideration on how the proposed change might apply to different types of market load.

Where SCADA data is available, few changes would be needed to make it suitable for profiling energy in the settlement process. However, only very large loads are directly monitored with SCADA and the bulk of customer load is monitored at the substation level. Such load would need to either install SCADA or five minute metering to be able to participate in this change.

## 4. FIVE MINUTE METERING

AEMO understands most metering installations over the last 8 to 10 years should be capable of being reprogrammed remotely to deliver five minute data, with relatively small additional communication and data storage costs. The stock of older meters is still large, suggesting a long lead time would be needed for transition to manage costs. While the cost of the individual meters is relatively small (say in the hundreds of dollars), the cost of labour to physically replace the meters is much larger.

Five minute metering will not be able to be adopted for direct energy settlement without reviewing and changing the metering procedures and formats to move from the current 30 minute formats. This would

<sup>2</sup> Also known as frequency control ancillary services, or FCAS. Note FCAS is dispatched and settlement every 5 minutes.

<sup>3</sup> That is, regulation FCAS.

<sup>4</sup> Some inconsistencies, particularly the use of sent-out or as-generator measures, will need to be addressed during implementation.

be a large project requiring changes to AEMO's MSATS<sup>5</sup> and metering data providers' systems. These costs are also unlikely to be contained to those participants who opt in to five minute settlement. The proposed approach defers, and possibly avoids, these changes by requiring AEMO to develop a parallel five minute settlement adjustment process.

Recognising the potential emergence of new metering technologies, there may be other mechanisms for delivering five minute settlement outcomes without a requirement to impose SCADA data on loads. The rule should provide sufficient flexibility to allow for this.

AEMO considers optional data sources, such as dispatch instructions are unsuitable. These would have many of the same issues as SCADA and would only be applicable to scheduled facilities.

## 5. SETTLEMENTS RESIDUE

The example used in consultation paper may have overstated the extent of the residue by assuming plant that starts in response to a price spike continues to generate. Participants who are issued with a start instruction from their dispatch inflexibility profile are able to submit a (late) rebid to prevent the unit being required to actually start. The incentive to bidding not to be dispatched would be expected to increase under this proposal.

The examples in Appendix A.3 show that the settlement outcome is dependent on a number of factors including:

- Where in the trading interval the higher prices occur.
- The relative size of the high and low prices.
- How the energy within the trading interval is distributed.

The consultation paper notes that it is expected that money paid by electricity consumers will usually be less than money earned by generators in the spot market. This will tend to occur where energy consumption or generation aligns with the five-minute dispatch prices. Where spot prices are relatively constant, there will be little difference between the two approaches. Where responses are not aligned, the reverse is likely to be the case. Nonetheless, AEMO agrees that on balance five minute settlement is more likely to collect marginally less money from customers and pay marginally more to generators.

Under current rules, settlements residue is defined as being either inter-regional settlements residue (IRSR - calculated from interconnector flow) or intra-regional settlements residue (representing residue from the application of marginal loss factors, but calculated by subtracting IRSR from the overall settlements residue).

The proposal effectively creates a third type of settlements residue that would need to be determined by calculating thirty minute settlement as well as five minute settlement, and would require a new recovery mechanism. This would involve additional complexity and risk on participants who are subject to this recovery, and it is unclear whether a new settlement residue is warranted. AEMO considers it more appropriate to allow existing processes for calculating and recovering residues remain in place, and that any residue that results from five minute settlement be considered as intra-regional settlements residue. This would have the following benefits:

- Consistency with the existing policy framework for treatment of settlement residue, avoiding the need for more complex treatment of 5 minute settlement adjustments that separately arise from interconnectors and connection points.
- Reduces the implementation effort for AEMO and participants by avoiding a new recovery mechanism.
- Allows small 5 minute settlement deficits to be absorbed within the (generally) positive intra-regional settlement residue.

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<sup>5</sup> Market Settlements and Transfer Solution

# APPENDIX A. ANALYSIS

## A.1 Perfectly Responsive Plant

Consider a hypothetical 1 MW peaking plant that offers at its fuel cost, has unlimited ramp rate capability and is instantly able to respond to dispatch instructions. Using the South Australian five and thirty minute prices in the 2012/13 financial year, settlement and profit outcomes (ignoring fixed costs) are shown in Table 1.

In this example:

- The plant will generate 1 MW whenever the 5 minute price exceeds the plant’s fuel cost.
- Profit is equal the difference between revenue earned in either a 30 minute or 5 minute interval, less fuel costs incurred.
- Revenue and profit increase is the 5 minute revenue and profit minus the 30 minute revenue and profit as a percentage of the 30 minute revenue and profit.

**Table 1 Settlement Outcomes for hypothetical peaking plant**

Bidding at fuel cost at	\$50	\$100	\$300
Energy (MWh)	5532	459	18
30 min Revenue	\$ 460,286.50	\$ 96,218.84	\$ 17,651.48
30 min Profit	\$ 183,644.83	\$ 50,318.84	\$ 12,276.48
5 minute revenue	\$ 470,713.70	\$ 147,563.00	\$ 77,621.41
5 minute profit	\$ 194,072.03	\$ 101,663.00	\$ 72,246.41
Revenue increase	2.27%	53.36%	339.74%
Profit increase	<b>5.68%</b>	<b>102.04%</b>	<b>488.49%</b>

This example shows that highly flexible plant would be more profitable under five minute settlement. The higher the plant’s fuel costs, the larger the relative profit.

Such a plant would be better off to engage in strategies such as bidding below cost, lowering ramp rates, late rebidding, non-conformance and other approaches that have been identified in work by AEMO and its predecessor on this issue. It is also worth noting these strategies have been the target of a number of recent rule changes.

## A.2 SCADA Profiling for Different Plant

Figure 1 shows an example of an actual response to price changes that is similar to the example provided in the consultation paper. In this case, the unit was dispatched according to its dispatch inflexibility profile in response to relatively high prices in the first two dispatch intervals in the trading interval. By the time the unit started generating, the prices had reverted to lower levels.

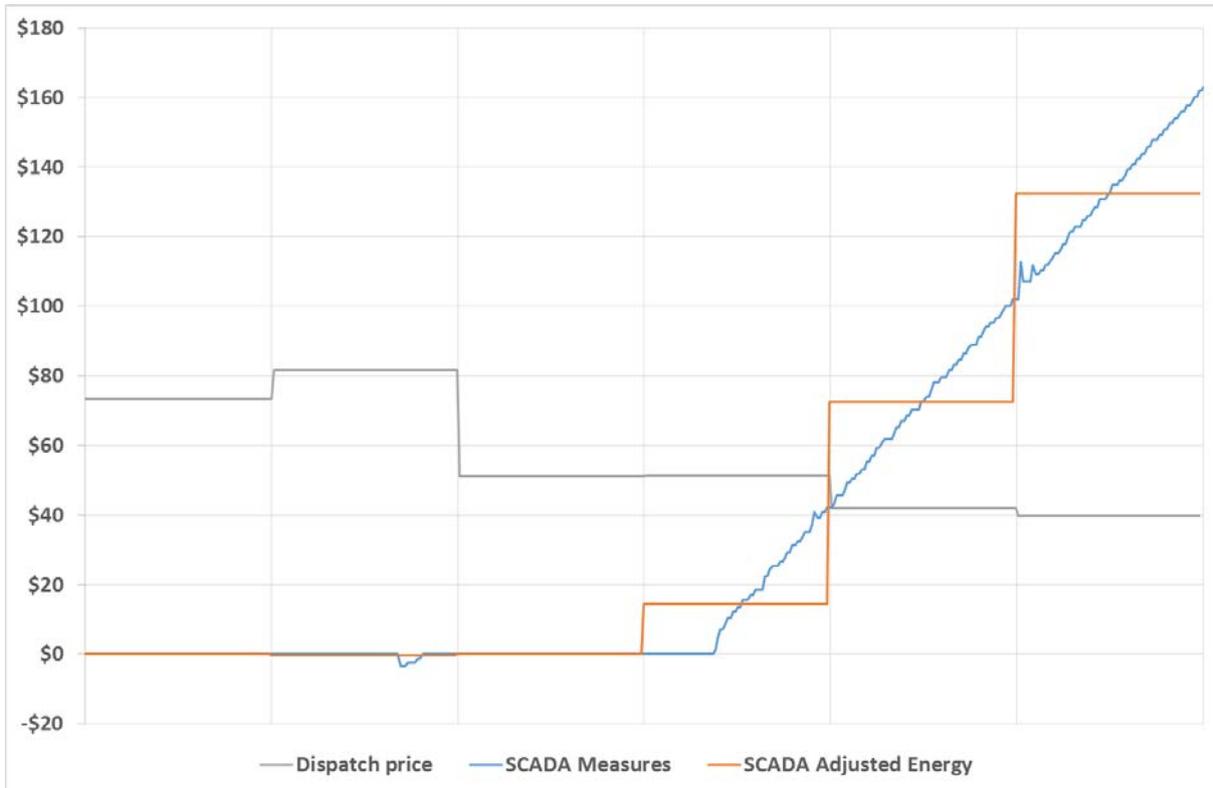
Figure 2 shows an example of SCADA profiling for a base load plant.

The time-weighted average price (the spot price) for these examples was \$56.50 per MWh, compared to a volume weighted price of \$41.13 per MWh for the plant in figure 1 and \$56.50 per MWh for the plant in figure 2.

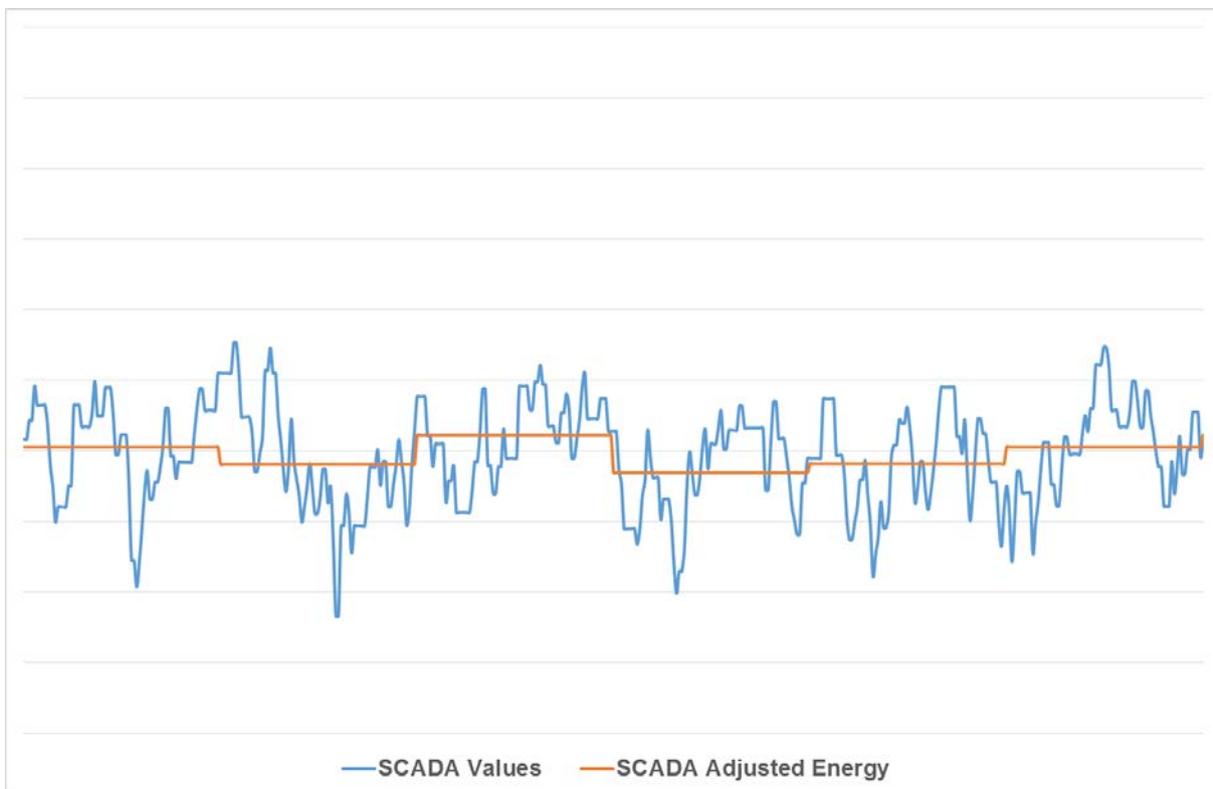
The actual settlement outcome for the plant in figure 1 is highly dependent on where in the trading interval the price trigger occurs. In this case, the trigger occurred in the 2nd dispatch interval of the trading interval. However, if the trigger occurred in the fifth or sixth dispatch interval, the volume weighted price would have been lower (noting the dispatch price remained at around \$40 per MWh in the next trading interval).

The plant in figure 2 would be indifferent to five or thirty minute settlement.

**Figure 1 SCADA Measurements to Determine Settlement Energy, Fast Start Plant**



**Figure 2 SCADA Measurements to Determine Settlement Energy, Base Load Plant**



### A.3 Settlement Residue Auction Payouts

AEMO has analysed the SRA payouts that would have occurred on the Victoria to South Australia directional interconnector in the 2012/13 financial year, using 5 minute settlement.

In 2012/13 the total residue distributed on the VICSA interconnector was \$48.1 million. Under 5 minute settlement, the residue distribution would have been approximately \$53.4 million or 12% higher than under 30 minute settlement.

The overall difference in SRA distributions across different interconnectors in the NEM will vary considerably, although AEMO considers five minute settlement will generally increase the SRA payout.

### A.4 Long Term Trends in Flexible Plant

Figure 3 shows the overall market share of fast-start generation in the NEM since market start. The market share has grown steadily in 16 years (note the increase in 2014 is due to the effect of carbon pricing and ramp gas in advance LNG exports in Queensland).

This indicates the market sector that would benefit from five minute settlement is likely to continue growing. When coupled with flexible unscheduled sources of energy, such as battery storage, AEMO concludes the issue identified by the proponent is growing.

**Figure 3 Fast-start generation in the NEM – a trend of increasing market share**

