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5-minute Settlement Rule Change

Assessing the Impacts

Supplementary Report

Report Prepared for

Australian Energy Council

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Introduction

This report has been prepared to supplement our previous report for the Australian Energy Council on 5-minute settlement. It seeks to provide a response to the Directions Paper regarding Five Minute Settlement issued by the AEMC on 11 April 2017 and also to issues raised at the Forum conducted by the AEMC on 4 May 2017.

Economic benefits of introducing 5-minute settlement

As pointed out in our previous report on 5-minute settlement and as acknowledged by one of the AEMC Commissioners at the Forum, before introducing a rule change the AEMC is obliged to undertake analysis to demonstrate that the benefits of making the rule are greater than the costs associated with its introduction.

The AEMC has not undertaken the necessary analytical work to compare the costs and benefits of making this rule. In fact the only analysis supporting the conclusions reached in the Directions Paper was the work undertaken for the AEMC by Energy Edge.

The work by Energy Edge concluded that *"Our modelling suggests that across the market approximately 625MW of flat cap equivalent is likely to be withdrawn from the market, impacting retailers' ability to manage their financial market price and risk."* [1]. This is clearly identifying a cost created by the rule change and not a benefit.

It Is acknowledged that undertaking the necessary market modelling to quantify the potential benefits of the introduction of 5-minute settlement would be very difficult. Given this difficulty the AEMC as a minimum should describe how the benefits of 5-minute settlement would arise.

The AEMC has argued that the change to 5-minute settlement would improve market efficiency because the proposed change would result in the market being more "ideal". In particular the AEMC considers that aligning dispatch and pricing intervals combined with shortening the settlement cycle will create better incentives for market participants. These improved incentives will result in more efficient behaviour and as a result, long term benefits to customers and satisfy the National Electricity Objective.

However the AEMC has failed to provide even simplified examples of what shifts in market behaviour they expect to see as a result of the changed incentives. Without any predicition of shifts in market behaviour it is very difficult to understand how the AEMC can assert that making the market more "ideal" will result in improved efficiency.

Given the significant costs identified in our previous report[2], the expected price increases for customers and the implementation risks it is very disapointing that the AEMC is proposing to proceed with the 5-minute settlement rule change on the basis of the simplistic view that making the market more "ideal" will improve outcomes.

It is imperative that before proceeding the AEMC seek to undertake some analysis or simulation to understand and demonstrate how the rule change is likely to shift incentives and behaviour. Some suggestions on how this could be done are made later in this report.

[1] ENERGY EDGE – EFFECT OF 5-MINUTE SETTLEMENT ON THE FINANCIAL MARKET – MARCH 2017

[2] RUSS SKELTON & ASSOCIATES – 5-MINUTE SETTLEMENT – ASSESSING THE IMPACTS – MARCH 2017

Risks of introducing 5-minute settlement

Given the intention of the AEMC, as stated in the Directions Paper, to make the rule to introduce 5-minute settlement a discussion of the risks associated with this is appropriate.

There are a wide range of risks associated with transitioning to 5-minute settlement, particularly if the transition does not account for the numerous and complex technical and financial implications. These risks are outlined below:

System security

In recent years, there has been an increase in the level of demand side response as the result of a range of factors such as:

- Overall increases in prices creating the incentive for customers to use demand response to manage the cost of electricity purchases,
- Retailers facilitating these demand side responses as a service to their customers,
- Large customers such as Sun Metals choosing to participate in the wholesale spot market at least to some degree and using demand response to manage the risk of high prices,
- The entry of batteries combined with systems such as those supplied by Reposit Power which produce energy at times of high spot prices. As most of this generation is "behind the meter" it is seen by the market as a demand response.

The expected continued increase in prices will reinforce this trend. In addition, based on comments made at the recent Forum, it is expected that making the 5-minute settlement rule – even with a significant delay in implementation - would accelerate this increase. This would be as a result of increasing the returns on investments in batteries combined with systems such as those supplied by Reposit Power.

Almost none of this demand response is visible to AEMO further complicating their already difficult power system operation and forecasting tasks.

Combined with this increase in demand response has been a significant increase in non-scheduled generation. As indicated in ENGIE's rule change request AEMO expects this trend to continue. [3]

Again the making of the 5-minute settlement rule would be expected to accelerate this trend – particularly as it is expected to improve the economics of batteries that could operate as non-scheduled generation. This generation, like demand side response, is not visible to AEMO and not subject to dispatch instructions by AEMO.

A further issue that is emerging is whether AEMO will need to impose limits on the rate of change of active power within each dispatch interval, in part created by the emergence of batteries as a source of both generation and demand that can vary output much more rapidly than existing technologies. At a recent workshop conducted by ESCOSA it is undertood AEMO indicated its view that 5-minute ramp limits may be necessary.

[3] FIGURE 1 RULE CHANGE REQUEST - HTTP://WWW.AEMC.GOV.AU/GETATTACHMENT/4219FFD9-F0F1-4690-84A8-555282D44374/RULE-CHANGE-REQUEST.ASPX

The risks outlined above, created by increasing levels of demand response, increasing levels of non-scheduled load and the entry of very fast ramping generation and demand are making managing system security an increasingly difficult challenge for AEMO. Ideally, to the extent possible, these risks should be addressed prior to the implementation of 5-minute settlement.

Market participants responding to market variations

AEMC has argued that a benefit of 5-minute settlement is a "more efficient price signal". By this it is presumed that the AEMC mean a signal that more accurately reflects the value to the market of the electricity being traded.

This implies that there would be benefits in the short term price forecasts issued by AEMO being as accurate as possible. Without accurate price forecasts market participants are unable to confidently assess how they ought to respond variations in market demand and prices.

Currently AEMO publishes a rolling 1 hour 5-minute pre-dispatch forecast. However this forecast is not very accurate and therefore is not as helpful as it could be. In their recent report "Effect of 5-minute Settlement on the Financial Market" Energy Edge provided results of their analysis of the accuracy of the AEMO 5-minute pre-dispatch forecast. They state *"The results show that even 5-minutes prior to the relevant 5-minute period, pre-dispatch pricing is highly inaccurate and therefore a large proportion of high price events are unanticipated."* They reported that 27.8% of forecast price spikes greater than $2,000 did not eventuate and that only 37.8% of spikes greater than $2,000 were forecast. [4]

The lack of accuracy would appear to be a result of:

- The lack of visibility to AEMO of the intentions of demand response and non-scheduled generation.
- AEMO not taking into account all the variables that will affect the forecast price and demand.

Without any changes, as a result of increased levels of both demand response and unscheduled generation, in part resulting from the 5-minute settlement rule change, the accuracy of the pre-dispatch forecast will further deteriorate and make it increasingly difficult for market participants to effectively respond to variations in market price and demand. This will certainly reduce the efficiency of the market and may also result in higher prices and reduced supply reliability.

Reliability

The analysis undertaken by Energy Edge for the AEMC predicted "financial stress" for peaking generators as a result of the introduction of 5-minute settlement.

It is likely that as a result of this "financial stress" that owners of these assets may withdraw them from the market before alternative providers of peaking capacity install replacement capacity. This is particularly the case for gas turbines that are easily relocated.

As a result there is a real risk that the already high reliability risk in the NEM will be increased.

[4] ENERGY EDGE – EFFECT OF 5-MINUTE SETTLEMENT – PAGE 54 - HTTP://WWW.AEMC.GOV.AU/GETATTACHMENT/9E286789-9686-4E49-8627-612FA9E3DFB0/CONSULTANT'S-REPORT-—-ENERGY-EDGE-EFFECT-OF-5-MINU.ASPX

Failure of IT systems and processes during implementation

As noted in the AEMC directions paper the introduction of 5-minute settlement "will require information system and process changes for most market participants"[5] The complexity of these interactions is illustrated in Figure 7.1 of the paper. In our view the complexity is understated by Figure 7.1 as it excludes some key information flows such as real time market data.

Given the complexity of the system changes and the need for new systems implemented by a wide range of different organizations to work together effectively immediately following the introduction of 5-minute settlement it is clear that there is a very high risk of failure during implementation.

The consequences of such a failure could be significant and affect the secure and reliable operation of the power system.

Unintended consequences

The introduction of 5-minute settlement is a major change to the design of the NEM. To date the AEMC has not been able to model or simulate the changes in market behaviour due to the changed incentives could cause. As a result there is a high level of uncertainity about what patterns of behaviour could emerge from this change.

One example is whether increasing the responsiveness of the system may increase the risk of unstable power system outcomes as highly responsive technologies will be attracted to the market and these will be interacting with a power system that may not be able to respond rapidly enough to adjust. For example, a large and rapid increase in generation from batteries in response to a price spike may result in an oversupply of generation and a rapid increase in system frequency. In the presence of reduced levels of inertia in some regions this may create unstable outcomes.

The AEMC acknowledge this risk but to date does not see it as a reason to not proceed with 5-minute settlement.

Possible risk mitigation options for consideration

Simulation of possible market behaviors and outcomes

It is acknowledged that it would be very difficult at this point to undertake meaningful economic modelling of expected market outcomes from 5-minute settlement in order to quantify the magnitude of the benefits of this change.

However it is recommended that the AEMC engage consultants who can undertake some form of simulation of what market outcomes could emerge.

This simulation should focus on what changes to market behaviour could emerge in response to the changed incentives resulting from 5-minute settlement. This could be done by taking a range of historical price spike events with a range of different behaviours demonstrated and then simulating the effect of a range of different responses to the introduction of 5-minute settlement. The price

[5] AEMC DIRECTIONS PAPER – PAGE 109

spike events identified in our previous report on 5-minute settlement would be a good starting point.[6]

This simulation would have to be very detailed and take into account the fact that choices made by participants in one period will constrain or influence their choices in subsequent periods.

Two benefits of this simulation would be:

1. The identification of patterns of behaviour that are likely to emerge from the introduction of 5-minute settlement. This would provide an indication as to whether market outcomes are likely to be improved and whether some unintended consequences may result.
2. It may provide some insight on how to assess the overall economic impact of introducing 5-minute settlement.

Rule changes

In order to minimize the system security risks that already exist and which will be exacerbated by the introduction of 5-minute settlement the AEMC should rapidly progress the combined non-scheduled generation and load in central dispatch rule changes.

Given the system security risks it would be prudent to require both loads, including aggregated loads, and generation that is currently non-scheduled to make binding offers to vary load or generation and be subject to dispatch instructions with similar obligations to comply as currently apply to scheduled generation. Further it would be prudent to apply this requirement to loads or generators with capacities of down to 1 to 2 MW.

In our view the implementation of these rule changes should be a pre-condition for proceeding with the implementation of 5-minute settlement.

Improving the quality of the 5-minute pre-dispatch forecast

To improve the accuracy of the 5-minute pre-dispatch forecast provided by AEMO it is proposed:

1. That the Rules require AEMO to publish a rolling 1 hour, 5-minute pre-dispatch forecast that takes into account all the same input variables that the dispatch engine considers when it calculates dispatch targets and the price for each dispatch interval. This will require AEMO to make short term projections for a range of these variables.
2. That AEMO measure the accuracy of the pre-dispatch forecast by comparing prices forecast with actual prices realised and that they provide routine reports for sample dispatch intervals. For example AEMO could be required to report routinely on the comparison of actual prices realised in each dispatch interval (or dispatch intervals above some price threshold such as $300/MWh) with forecast prices from 3 of the rolling pre-dispatch forecasts that covered that dispatch interval (ie. the price realised at 1000 might be compared to the pre-dispatch forecast made at 0955, 0930 and 0905). In addition AEMO should be required to store the data for all of the pre-dispatch forecasts that were made for each realised price. This data should be made available to market participants to undertake their own analysis.

It is anticipated that a rule change request will be made for this proposal.

[6] RUSS SKELTON & ASSOCIATES – 5-MINUTE SETTLEMENT – ASSESSING THE IMPACTS – MARCH 2017

IT and process change implementation plan

The key to reducing the risk of IT and process change failure is an effective and co-ordinated implemenation plan that incorporates all the necessary IT and process changes required.

To ensure this implemenation plan is developed we propose that the AEMC ensure that an appropriate body works closely with all market participants, AEMO and other affected parties such as metering providers to develop this plan. This body should then have a role in monitoring progress on the implementation of this plan. This body should also be required to sign of on the readiness of IT systems and processes prior to proceeding with the switch over to 5-minute settlement.

IT and process fall back option

There is a very real risk of a failure of an IT system or process during the switch over from 30 minute to 5-minute settlement. In this event it not good enough for the AEMC to suggest "send us another rule change" as was suggested at the recent Forum.

It is important that the AEMC work with all affected parties to set in place a fall back option that will allow the market to revert to previous systems and processes for as long as necessary to ensure that any failure can be resolved.

Monitoring regime

To ensure that the transition to 5-minute settlement is effectively managed and that the possible impact of the risks outlined in this report are minimized.We propose that the AEMC put in place a monitoring regime that both monitors and reports on indicators of these risks. Indicators that could be included in this regime are:

- Peaking capacity available to the market and in particular exit of existing peaking capacity compared to investment in new peaking capacity.
- Trends in the liquidity of both the cap and swap market.
- Trends in both cap and swap prices.
- Progress on development of IT and process change implementation plans and when plans are finalised reporting of progress against plans.
- Trends in indicators of system security.
- Trends in indicators of system reliability.
- Progress on changes to the operation of the market proposed above – such as related Rule changes and improvements in AEMO's pre-dispatch forecasts.

Conclusion

The AEMC has failed to make the case that the benefits of introducing 5-minute settlement will exceed the costs of making this change – both transitional and ongoing. Until the AEMC can do this it should not proceed with making this rule change.

There are several risks currently evident in the market that the rule change will exacerbate. These risks have potentially significant consequences and it is imperative that before proceeding with the implementation of 5-minute settlement, the AEMC should do everything in its power to ensure that appropriate steps have been taken to mitigate these risks.

In addition the AEMC should implement a monitoring and reporting regime that informs all interested parties on the level of risk of implementing 5-minute settlement and progress on risk mitigation options proposed.