

Wholesale Electricity Market Rule Change Proposal Submission

RC_2017_02

Implementation of 30-Minute Balancing Gate Closure

Submitted by

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Submissions on Rule Change Proposals can be sent by:

Email to: rcp.secretariat@rcpwa.com.au

Post to: Rule Change Panel
Attn: Executive Officer
C/o Economic Regulation Authority
PO Box 8469
PERTH BC WA 6849

1. Please provide your views on the proposal, including any objections or suggested revisions.

AEMO welcomes the opportunity to provide this submission in respect of Perth Energy's proposal to amend the Wholesale Electricity Market (WEM) Rules to shift the Balancing Gate Closure to 30 minutes before the start of the relevant Trading Interval.

AEMO agrees with Perth Energy that a later Balancing Gate Closure would reflect the increasing dynamism of the WEM, improve the ability of Market Participants to respond to forecast changes, promote competition and facilitate improved decision making by Market Participants. Such a move would be consistent with technological developments taking place in the electricity sector and would be likely to improve the economic efficiency of the Balancing Market.

AEMO notes that later gate closure, or the removal of gate closure altogether, is a core component of the WEM reforms proposed by the Public Utilities Office (PUO) in the *Final Report: Design Recommendations for Wholesale Energy and Ancillary Service Market*

*Reforms.*¹ AEMO remains supportive of this package of WEM reforms and awaits confirmation from the new WA Government as to whether and when it intends to advance this reform package.

Perth Energy's proposal seeks to shift the gate closure time later without the additional elements of the PUO reform package. In preparing this submission, AEMO has considered the practicalities of implementing such a change in isolation, and in advance of further WEM reforms.

AEMO advises that the current hybrid design of the Balancing Market, with AEMO (in its capacity as System Management) retaining responsibility for scheduling and dispatching generation facilities within the Synergy Balancing Portfolio, constrains the extent to which the Balancing Gate Closure can be shifted later. This constraint was acknowledged (albeit superficially) in Market Advisory Committee (MAC) discussions in 2010 that preceded the design and development of the Balancing Market. The chosen market design pathway was to "push the [then] current hybrid model as far as it can go".² Compared to more advanced market designs, the hybrid model was acknowledged as providing reduced opportunity to shorten gate closure.³

The WEM differs from other (non-hybrid) electricity markets as it provides AEMO's generation controllers with an incomplete generation dispatch schedule at the point of Balancing Gate Closure. The Balancing Market only provides information about the dispatch of energy and Load Following Ancillary Services (LFAS) from Independent Power Producer (IPP) facilities, which frequently provide less than half of the energy and LFAS requirements of the WEM in aggregate. After Balancing Gate Closure, AEMO's generation controllers must 'fill in the gaps', analysing the Forecast Balancing Merit Order (BMO) and scheduling the various Balancing Portfolio facilities to achieve energy dispatch consistent with the BMO and ensure adequate Ancillary Service availability to manage system frequency and maintain Power System Security (noting that the Balancing Portfolio provides the majority of the LFAS, Spinning Reserve Service and Load Rejection Reserve Service requirements). In some circumstances, the scheduling of the Balancing Portfolio requires movement of Synergy facilities in advance of the Trading Interval to ensure sufficient capability for the Balancing Portfolio as required to achieve BMO requirements.

As described in this submission, AEMO considers that a reduction of the gate closure to 90 minutes is likely to be achievable without any additional changes to the design of the Balancing Market, though may result in some increases to Constrained On/Off Compensation. However, AEMO advises that a reduction to a 60-minute Balancing Gate Closure would require some complementary changes to dispatch and settlement arrangements, while a further reduction to 30 minutes is infeasible in the absence of more fundamental reform of the WEM.

¹ Report available at

http://www.finance.wa.gov.au/cms/uploadedFiles/Public_Utility_Office/Electricity_Market_Review/Final-Report-Design-Recommendations-for-Wholesale-Energy-and-Ancillary-Market-Reforms.pdf.

² This phrase is used on multiple occasions in MAC meeting papers and minutes, particularly in respect of the special meetings held on 14 April 2010 and 19 July 2010. Quoted text available at <https://www.erawa.com.au/cproot/17155/2/01.%20Minutes%20MAC%20SPECIAL%20MEETING%20NO2.pdf>. All meeting papers and minutes from the MAC are available at <https://www.erawa.com.au/rule-change-panel/market-advisory-committee/market-advisory-committee-meetings>.

³ Noted at various points in MAC papers for the 19 July 2010 meeting, available at <https://www.erawa.com.au/cproot/15209/2/MAC%20Special%20Meeting%20Papers.pdf>.

Context: relevant aspects of WEM design

The following aspects of the current WEM design are relevant to the discussion within this submission and to the Rule Change Panel's (RCP's) consideration of this Rule Change Proposal.

- As noted above, AEMO (in its capacity as System Management) is responsible for scheduling and dispatching the Facilities within the Balancing Portfolio (under clause 7.6A), providing Synergy with a Dispatch Plan for each Trading Day by 4pm on the Scheduling Day and updating the Dispatch Plan where a significant change is required. However, AEMO plays no part in the construction of Portfolio Balancing Submissions.
- The Balancing Market design seeks to deliver the least-cost provision of energy at the end of each 30-minute Trading Interval, allowing for the provision of Ancillary Services. While this objective is not explicitly stated in the WEM Rules, it is implicit in various provisions, including the Glossary (Chapter 11) definitions of Balancing Price-Quantity Pair and Relevant Dispatch Quantity.
- A Dispatch Instruction issued to a Balancing Facility typically has a start time corresponding to the start of the relevant Trading Interval and a ramp rate equal to the Ramp Rate Limit specified in the Balancing Submission for that Balancing Facility. This is not an explicit requirement of the WEM Rules, but is assumed in the calculations of the Maximum/Minimum Theoretical Energy Schedule, Upwards/Downwards Out of Merit Generation and the Constrained On/Off Quantity in Chapter 6 of the WEM Rules.⁴ Where multiple facilities are ramping in the same direction from the start of a Trading Interval, this has the implication of creating an aggregate ramp movement that may exceed the underlying movement in demand in the early minutes of the Trading Interval.
- The Balancing Market design accounts for total upward and downward ramping movements in solving the end-of-interval energy balance, but does not consider ramping misalignment that can affect the energy balance within the Trading Interval.
 - By default, the implication of this (and the preceding dot points) is that any ramping mismatch within the Trading Interval is assumed to be absorbed by LFAS.
 - In addition, where the total movement of a Balancing Facility within a Trading Interval (in MW) is limited by the Ramp Rate Limit(s) of the Facility or Facilities moving in the opposite direction, it may be eligible for Constrained On/Off Compensation (subject to the Settlement Tolerance determined under clause 6.17.9 or 6.17.10).
- The standard for Spinning Reserve Service in clause 3.10.2 is set at a level to cover only 70 per cent of the output of the generating unit with the highest output at that time, and must include LFAS capacity. Consequently, where LFAS upward-moving capability is absorbing ramping mismatches within a Trading Interval, this can lead to reduction in the available Spinning Reserve Service capability for short periods, leaving the SWIS vulnerable to a contingency event that occurs during the ramping mismatch.

⁴ The marginal Balancing Facility may be re-dispatched within the Trading Interval if required to assist in maintaining the supply-demand balance. In these cases, the output of the relevant units would be expected to fall between the Maximum and Minimum Theoretical Energy Schedule, such that no Constrained On/Off Compensation is payable.

Benefits: Evolution of demand and price forecasts

AEMO publishes an updated Balancing Forecast every 30 minutes, for each Trading Interval in the Balancing Horizon, containing forecasts of the Relevant Dispatch Quantity, the aggregate output of all Non-Scheduled Generators that are Balancing Facilities and the Balancing Price.

AEMO agrees with Perth Energy's observation that forecasts of demand and Balancing Prices can move significantly within the current two-hour period between Balancing Gate Closure and the start of the Trading Interval. AEMO has observed that demand forecast volatility has increased in recent years with the growth in behind-the-meter solar PV generation, while Balancing Price forecasts will also vary as a result of fluctuating forecasts of large-scale intermittent generation or due to contingency events that can occur within the two-hour period, such as a trip of a generating unit that removes it from the Balancing Merit Order.

AEMO observes that Perth Energy's analysis included some basic statistics of forecast variation (maxima, minima and averages) based on the current gate closure time, but did not provide a counter-factual scenario that assessed the accuracy of forecasts that would be used with 30-minute Balancing Gate Closure.

With the current two-hour gate closure period, the last Balancing Forecast available to Market Participants prior to Balancing Gate Closure is published 2.5 hours before the start of the relevant Trading Interval (denoted below as the 'N-5' forecast). With a 30-minute gate closure period, the last Balancing Forecast available prior to Balancing Gate Closure would be that which is published one hour before the start of the relevant Trading Interval ('N-2' forecast).

AEMO presented analysis of forecast accuracy at the Market Advisory Committee (MAC) meeting on 1 May 2017, which is replicated below. This analysis covers the 2016 calendar year in order to allow for seasonal variations. AEMO has separately provided the underlying data (including earlier forecasts up to 10 hours before the start of the Trading Interval) to the RCP Secretariat.

Figure 1 shows the mean absolute deviation of demand, wind farm and Balancing Price forecasts produced at different times prior to the start of the relevant Trading Interval. Two wind farm forecasts are shown, with the blue bars corresponding to forecasts provided by the respective Market Participants in their Balancing Submissions (which do not change after Balancing Gate Closure) and the grey bars corresponding to the 'persistence forecast' developed by AEMO (being the contemporaneous output of the wind farms).

As expected, Figure 1 demonstrates that the accuracy of demand and price forecasts in 2016 improved as the Trading Interval approached. Specifically, the figure shows that the mean absolute deviations reduced from the N-5 forecast to the N-2 forecast by 23 per cent for the load forecast, 44 per cent for the persistence wind farm forecast and 20 per cent for the Balancing Price forecast. The improvement from the N-5 to the N-4 forecast was 7 per cent for the load forecast, 13 per cent for the persistence wind farm forecast and 8 per cent for the Balancing Price forecast.

Figure 1 also shows that the mean absolute deviation of N-5 Market Participant-provided forecasts of wind farm output is 11 per cent lower than the corresponding persistence forecasts. Market Participants do not provide updated forecasts of wind farm output after Balancing Gate Closure.

Figure 1: Mean Absolute Deviation of Demand, Wind Farm and Balancing Price Forecasts, 2016

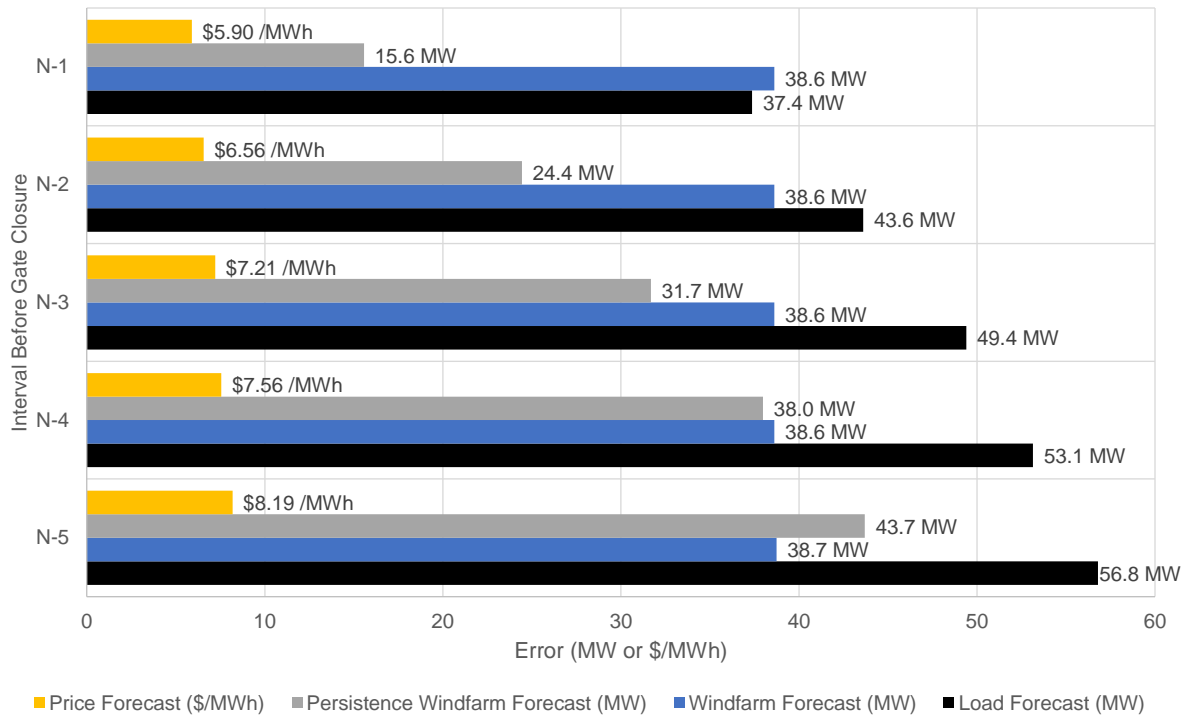


Figure 2 and Figure 3 show the demand and Balancing Price forecast error duration curves respectively, displaying the errors corresponding to forecasts from N-5 to N-1. Table 1 provides a focused comparison of the N-5, N-4 and N-2 forecasts, showing the progressive reduction of forecast errors.

Figure 2: Demand Forecast Error Duration Curve, 2016

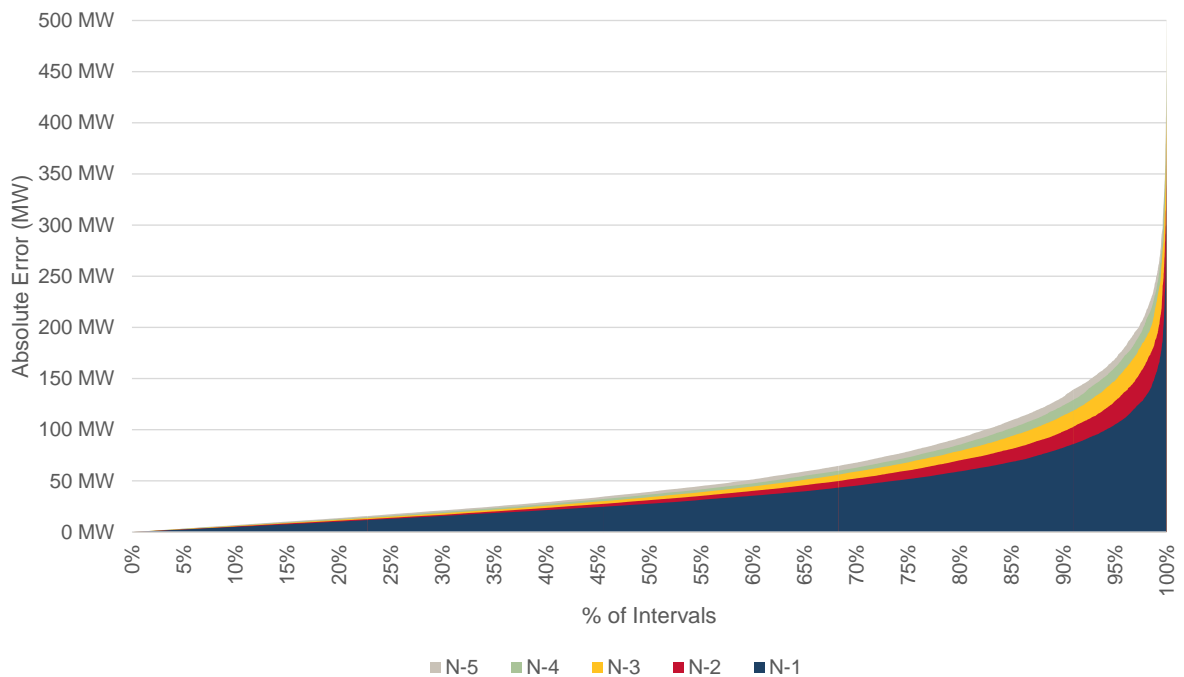


Figure 3: Balancing Price Forecast Error Duration Curve, 2016

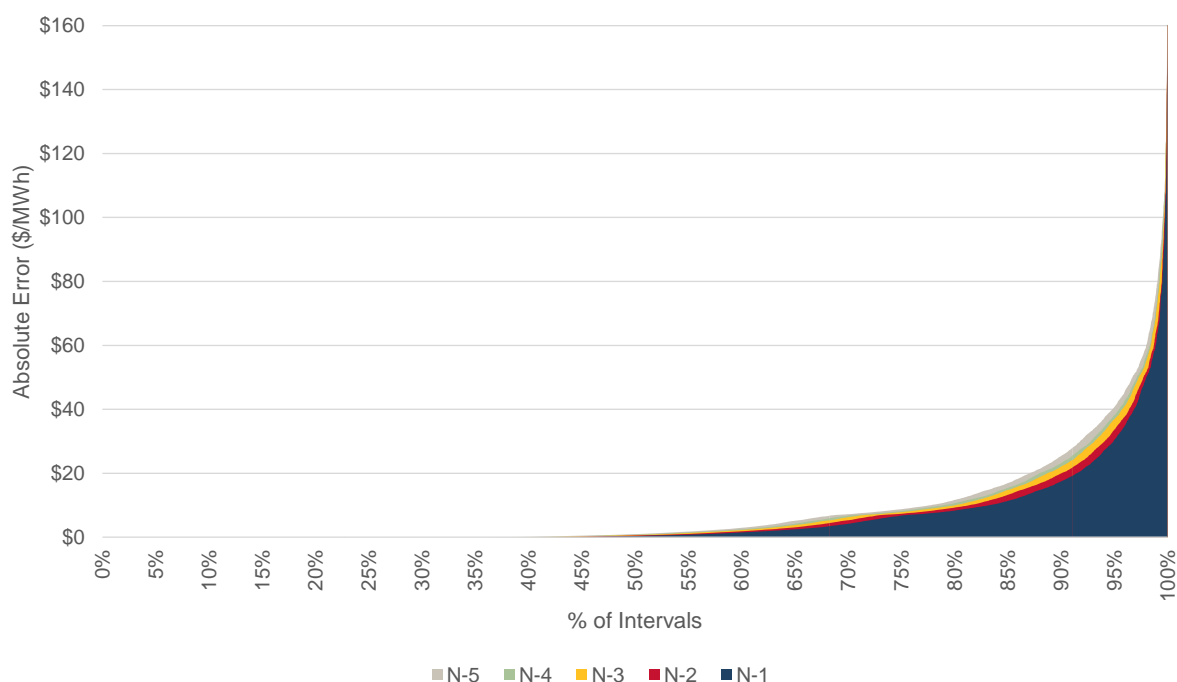


Table 1: Comparisons of N-5, N-4 and N-2 forecast errors, 2016

Percentage of Trading Intervals with ...	Forecast		
	N-5	N-4	N-2
Demand forecast error of 20 MW or less	28%	31%	35%
Demand forecast error of 50 MW or less	59%	62%	68%
Zero Balancing Price error	36%	38%	41%
Balancing Price error of \$1 or less	50%	52%	55%
Balancing Price error of \$10 or less	78%	79%	81%

In summary, the analysis presented above shows that improvements in forecast accuracy are likely to be achievable by shifting Balancing Gate Closure later, though the improvements may not be as large as suggested by Perth Energy in its proposal. However, AEMO is not aware of a reliable method of translating these reductions in forecast error into estimates of market-wide cost savings.

AEMO considers that improved forecast accuracy would be expected to result in cost savings for consumers as a result of improved decision-making by, and reduced risk for, Market Participants. However, AEMO advises that attempts to quantify these cost savings would require speculative assumptions of behaviour changes and reductions in any risk premium incorporated in Balancing Submissions.

Benefits: Return from outage

While not considered in Perth Energy’s proposal, a later Balancing Gate Closure would reduce the current delay when a generating unit returns to service following maintenance. When low-cost generation returns from maintenance, it can displace higher-cost generation and reduce the Balancing Price. This advantage of later Balancing Gate Closure was highlighted in the *Final Report: Design Recommendations for Wholesale Energy and Ancillary Service*

Market Reforms, which estimated a recurring benefit of \$300,000 per annum if the Balancing Gate Closure was moved to 30 minutes before the start of the interval. AEMO suggests that approximately one-third of this benefit could be realised by a shift to a 90-minute Balancing Gate Closure.

Challenges: Scheduling and dispatch of the Balancing Portfolio

As noted above, the current Balancing Market design provides AEMO's generation controllers with an incomplete dispatch schedule at the point of Balancing Gate Closure, with the controllers required to plan and execute the dispatch of the facilities within the Balancing Portfolio during the two hours before the start of the Trading Interval. During this time, the generation controller is seeking to satisfy multiple objectives:

- dispatch of energy according to the BMO (including accommodation of the aggregate ramping requirements of IPP generating units), the Synergy dispatch guidelines (provided under clause 7.6A.2(a)), and the obligation to employ reasonable endeavours to minimise changes to the Synergy Dispatch Plan (under clause 7.6.2A), noting that the Balancing Portfolio provides roughly half of the annual energy requirements of the WEM;
- dispatch of LFAS according to the LFAS Merit Order and the Synergy dispatch guidelines (provided under clause 7.6A.2(a)), noting that the Balancing Portfolio provides more than half (and sometimes all) of the WEM's LFAS requirement;
- availability of adequate Spinning Reserve Service and Load Rejection Reserve Service to satisfy the requirements for these services in clause 3.10 of the WEM Rules; and
- maintenance of Power System Security.

At a high level, the steps taken by the generation controller during the period between receipt of the final BMO (a few minutes after Balancing Gate Closure) and the start of the Trading Interval are as follows:

- Where the change in the required generation of the Balancing Portfolio is forecast to be at least 50 MW in a Trading Interval, the controller will perform an initial assessment of the current operating levels and ramping capability of the facilities within the Balancing Portfolio, comparing these with the BMO and system security assessments. The initial assessment determines whether a detailed assessment will be required to plan material changes to the Balancing Portfolio dispatch before the start of the Trading Interval, such as starting/stopping a generating unit or a coal mill, in order to achieve the required energy movement, aggregate ramp rate and/or preserve/restore system security. This initial assessment is performed for approximately 40 per cent of Trading Intervals and takes a few minutes.
- The more detailed assessment is situation-dependent based on the point on the load profile, time of the day/night, the level of intermittent generation, pre-existing network and generation outages, previous interval movements by the Balancing Portfolio, the expected changes in the power system and the level of ancillary services available, though is frequently required when larger movements of the Balancing Portfolio are expected.⁵ This assessment involves the controller developing a dispatch schedule for

⁵ To provide a measure of the frequency of such events, AEMO analysis of IPP Dispatch Instructions and demand data for the 2016 calendar year has identified that the required movement of the Balancing Portfolio exceeded 100 MW in 9.6 per cent of Trading Intervals, 150 MW in 2.3 per cent of Trading Intervals and 200 MW in 0.5 per cent of Trading Intervals. Two Trading Intervals had a required movement of more than 300 MW. This analysis excluded

the Balancing Portfolio using the Generation Output Schedule (GOS) module within the System Operations Control Centre User Interface (SOCC_UI). This module allows the controller to develop alternative Balancing Portfolio dispatch schedules and assess their impact on the maintenance of Ancillary Service requirements within the Trading Interval⁶, as well as utilising the Synergy Dispatch Guidelines to consider the impact on the Balancing Portfolio for the remainder of the Balancing Horizon, before deciding on the most appropriate Dispatch Plan (and providing formal notification to Synergy if this represents a significant change from the previously notified Dispatch Plan for the Trading Day). This detailed assessment takes approximately 15 to 20 minutes for an experienced controller although this assumes the controller will be able to largely focus attention to this task.⁷

- The controller will then issue the relevant instructions to Synergy power station operators to give effect to the chosen Balancing Portfolio Dispatch Plan. Longer lead time actions that may be needed to position the Balancing Portfolio for the start of the Trading Interval include starting/stopping coal mills and slow ramping of coal units into the desired starting position (which collectively may take 45 to 60 minutes) and starting gas turbines (which may take up to 15 minutes for open cycle gas turbines). Some of these actions may require Balancing Portfolio plant to be turned around (i.e. dispatched in the opposite direction to the previous interval) and/or moved to ensure the required suite of Ancillary Services is provided.

In total, the time requirement for these steps can exceed 80 minutes in circumstances where larger movements of the Balancing Portfolio facilities are required in advance of the Trading Interval, and can exceed 90 minutes in extreme cases. Consequently, AEMO advises that a shortening of the gate closure to any less than 90 minutes would be extremely challenging under the current Balancing Market design. In the extreme cases, it is possible that the movements of the Balancing Portfolio may not be completed prior to the start of the Trading Interval, leading to the potential for increased Constrained On/Off Compensation. This is of course based on present bidding behavior of IPPs which would be expected to become more dynamic with a shorter gate closure.

In parallel to the steps described above, the generation controller routinely undertakes system security assessments, in collaboration with Western Power's transmission system controllers, when significant changes in system dynamics occur such as changes in the generation profile. These assessments are performed to identify any potential contingency violations (where the system is in a non-secure state) that may arise. The current real-time contingency analysis tool runs automatically every three minutes, but this real-time analysis uses only the current generation levels. With the contingency analysis tools available to AEMO's generation controllers in the WEM, the assessment of alternative generation scenarios requires manual configuration and takes approximately 25 minutes to construct and run. Once this study is run, contingencies identified may require a detailed assessment of the ability of the system to accommodate any change in dispatch.

AEMO notes that it is establishing a security controller role to work in parallel with the generation controller, currently scheduled to be operational during the fourth quarter of 2017, and that it is planning the implementation of the e-terra Energy Management System (EMS) to replace the use of the XA/21 EMS provided via Western Power in mid-2018. The security

movement of Intermittent Generators as AEMO uses persistence forecasts for these facilities for the dispatch process.

⁶ Includes consideration of impacts if plant does not move or start as planned.

⁷ There are numerous issues which may require the generation controller's attention. For example, planned network switching or large movements in the Balancing Portfolio that occur in quick succession may require the generation controller to simultaneously implement an earlier dispatch schedule and undertake the detailed assessment and plan a future dispatch schedule due to the rolling gate closure.

controller will be able to take on the parallel security assessments from the generation controller and share the operational burden. However, neither of these changes will affect the critical path steps described above to plan and schedule the dispatch of the Balancing Portfolio.

As indicated above, AEMO is supportive of shortened gate closure (or the removal of gate closure) and considers that this can best be achieved as part of the full set of WEM reforms proposed by the PUO. However, AEMO is concerned that shortening of the gate closure beyond 90 minutes in the absence of other changes to the market design may lead to unintended consequences, such as increased instances of Constrained On/Off Compensation or declarations of High Risk Operating States.

Options: Complementary rule/process amendments that could be made to support later gate closure

To alleviate some of the operational challenges and potentially allow some shortening of the gate closure period beyond 90 minutes, AEMO has considered the following complementary changes that may be worthy of consideration.

Staggering of IPP ramping

As noted above, the need to accommodate the aggregate ramping of IPP generators at the start of a Trading Interval can create challenges for AEMO's generation controllers and require preparatory scheduling of the Balancing Portfolio to balance the ramping without materially eroding Ancillary Service quantities within a Trading Interval.

Analysis of Dispatch Instruction data for the 2016 calendar year indicates that the aggregate start of interval ramping of IPP generators exceeded 10 MW per minute in 670 Trading Intervals (nearly four per cent of Trading Intervals, or two per day) and exceeded 15 MW/minute in 193 Trading Intervals (one per cent of the year, or once every second day).

However, further analysis of these intervals shows that the IPP generators frequently finish their ramping in the early minutes of the interval. Of the 670 Trading Intervals where the aggregate ramping exceeded 10 MW per minute, the maximum ramp duration⁸ was:

- less than 5 minutes in 180 of these Trading Intervals (27 per cent);
- less than 10 minutes in 492 of these Trading Intervals (73 per cent); and
- less than 15 minutes in 585 of these Trading Intervals (87 per cent).

Similar proportions are evident for the Trading Intervals where the aggregate ramping exceeded 15 MW per minute.

AEMO considers there may be merit in staggering the start times of IPP Dispatch Instructions within a Trading Interval to reduce the aggregate IPP ramp rate that may be experienced at the start of the Trading Interval, without altering the end of interval MW targets. This would reduce the need for positioning of the Balancing Portfolio to counter fast IPP ramping and alleviate the need for the ramping to be absorbed by LFAS (reducing the erosion of available Spinning Reserve that can occur within the Trading Interval). AEMO anticipates that such a change may enable the gate closure period to be shortened to 60 minutes, though further analysis is required to confirm this.

⁸ For each facility, this is calculated by dividing the movement in MW by the facility's Ramp Rate Limit.

Such a change in operational practice (noting that AEMO is currently able to stagger the start times of Dispatch Instructions) may result in increased Constrained On/Off Compensation payments as it deviates from the assumption in the Maximum/Minimum Theoretical Energy Schedule calculations that ramping commences at the start of the relevant Trading Interval. AEMO suggests that changes to these calculations are worthy of consideration as part of any exploration of this option.

AEMO also advises that any analysis of this option should consider the impact of such a change on the revenues earned by generators.

Linear ramping across the Trading Interval

A further change that AEMO has considered is for AEMO to dispatch generators at the ramp rate required to meet the MW target by the end of the Trading Interval, as a means to alleviate the need to balance the aggregate ramping of IPP generators.

While this may reduce the pre-interval requirements to position the Balancing Portfolio and reduce the pressure on LFAS, AEMO anticipates that such a change is less favourable as it would likely require additional implementation costs for AEMO and for Market Participants, in addition to the changes to calculations for Constrained On/Off Compensation, and may not be consistent with the broader WEM reforms proposed by the PUO.

Other considerations

AEMO notes that Perth Energy has only proposed a change to Balancing Gate Closure, but does not appear to have considered the merit of changes to related market timeframes, particularly the LFAS Gate Closure and the deadlines for Synergy in submitting updated Balancing Portfolio Supply Curves. AEMO considers that market efficiency will be improved when all Market Participants are able to make operational decisions with the most accurate available information. Consequently, AEMO suggests that the Rule Change Panel consider the potential for amendments to these timeframes. AEMO does not foresee any additional operational challenges to those mentioned above if these timeframes were shortened proportionally.

Conclusion

In summary, AEMO considers that shortening the gate closure period to 90 minutes is likely to be achievable without any additional changes to the design of the Balancing Market, though this may result in some increases to Constrained On/Off Compensation in situations where required movements of the Balancing Portfolio are large and preparatory steps must be taken in advance of the Trading Interval. A shift to 60 minutes is likely to require complementary changes to reduce the scope of those preparatory steps (and hence the time required to execute them). However, AEMO advises that a shift to 30-minute Balancing Gate Closure is infeasible with the current hybrid design of the Balancing Market. AEMO reconfirms its support for the more extensive reforms of the WEM proposed by the PUO, which will provide for consistent treatment of Synergy and IPP generation and allow gate closure to be either very late or removed altogether.

AEMO is keen to assist the Rule Change Panel where possible as it assesses the merits of Perth Energy's proposal and any alternative options, including through provision of data, analysis and advice.

2. Please provide an assessment whether the change will better facilitate the achievement of the Wholesale Market Objectives.

AEMO considers that later Balancing Gate Closure would be likely to improve the economic efficiency of the Balancing Market, promote competition and remove barriers to dispatch of fast-response technologies. However, subject to the extent to which Balancing Gate Closure is shifted later, AEMO is concerned that impediments in the hybrid design of the Balancing Market may reduce, and potentially negate, these benefits. AEMO considers that a shift to 90-minute Balancing Gate Closure is achievable with low implementation cost and risk, and would better facilitate the achievement of Wholesale Market Objectives (a), (b), (c) and (d). However, AEMO advises that the cost and risk could increase if Balancing Gate Closure is shifted to 60 minutes or 30 minutes in the absence of further change to the design of the Balancing Market. Consequently, the extent to which a gate closure change to 60 minutes or less, in isolation, would improve the achievement of the Wholesale Market Objectives is unclear.

3. Please indicate if the proposed change will have any implications for your organisation (for example changes to your IT or business systems) and any costs involved in implementing these changes.

The initial assessment in this section considers only the potential implications of a change in the Balancing Gate Closure time for AEMO's systems and processes. While AEMO has provided suggestions for complementary changes that may assist the transition to a later gate closure of less than 90 minutes, AEMO has not yet analysed the potential costs of these changes due to the range of available implementation options.

Wholesale Electricity Market System (WEMS)

Market Participants make Balancing Submissions to AEMO through WEMS. Clause 7A.2.10 of the WEM Rules requires or allows (depending on the circumstances) a Market Participant to update its Balancing Submission for a Trading Interval for which Balancing Gate Closure has occurred if there is an Internal Constraint or an External Constraint.

To accommodate this requirement, WEMS allows Market Participants to make Balancing Submissions for a Trading Interval at any time up to the commencement of that Trading Interval. If a Market Participant makes a Balancing Submission covering one or more Trading Intervals for which Balancing Gate Closure has passed, the Market Participant must, as soon as reasonably practicable, provide AEMO with written details of the nature of the Internal Constraint or External Constraint, when it occurred and its duration in accordance with clause 7A.2.11. This is done through an email to AEMO's Market Operations team.

After the end of each Trading Interval, WEMS processes the Balancing Submissions received from Market Participants, generates a Balancing Merit Order (BMO) for each Trading Interval in the Balancing Horizon that has yet to commence, publishes the BMOs and passes the BMOs to System Management systems. Under normal operating conditions, this process takes approximately three minutes.

To accommodate a later Balancing Gate Closure of 30 minutes or more, the following changes to WEMS would be required:

- since the Balancing Gate Closure is a configurable field in the WEMS, configuration changes to the Balancing Gate Closure parameter;

- changes to systems that support monitoring and compliance processes; and
- amendments to the automated test suite.

The process and timing for generating BMOs would remain unchanged.

A Balancing Gate Closure of less than 30 minutes would require more substantial changes to AEMO's systems. For example, AEMO would need to change the timing of the calculations for the BMO processes and may even need to invest in improving the efficiency of the calculation.

Power system operation IT systems

Similarly, AEMO anticipates that only minor changes would be required in the IT systems that support power system operation. The SOCC_UI is currently able to accommodate gate closure periods down to 30 minutes. However, a gate closure period of less than 30 minutes would require changes to processing cycles, leading to more substantial system change requirements.

Documentation

To accommodate changes to Balancing Gate Closure, minor changes to Market Procedures, internal procedures and documentation and information published by AEMO would be required, though the scope of the required changes has not yet been compiled. There are also likely to be minor changes to compliance monitoring processes that relate to monitoring gate closure violations.

4. Please indicate the time required for your organisation to implement the change, should it be accepted as proposed.

AEMO advises that a shift to 90-minute Balancing Gate Closure could commence in advance of IT system changes, which would take approximately three to six months to implement and schedule into AEMO's IT release plan. In the interim, Market Participants could be instructed to ignore warning messages related to submissions in the period between two hours and 90 minutes before the start of the Trading Interval, although this would not be ideal. AEMO also advises that the security controller role is scheduled to be operational in the fourth quarter of 2017, which will share some of the operational burden on the generation controllers and reduce any risk to system security that could otherwise occur by an increase in the generation controller's workload from a move to a shorter gate closure which may occur due to increased market dynamics.

AEMO has not yet analysed the scope or time requirements associated with the complementary changes to dispatch and settlement arrangements.
