Proposed rule change - Semi scheduled generators and dispatch instructions

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AUSTRALIAN ENERGY REGULATOR

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1. Summary

In response to a request from the Council of Australian Governments (COAG) Energy Council the Australian Energy Regulator (AER) is proposing an amendment to the National Electricity Rules (NER) relating to dispatch instructions to, and the operation of, semi scheduled generators. The AER requests this rule change proposal be "fast tracked" under Division 3 of the National Electricity Law (NEL) following the extensive consultation it undertook with stakeholders on the nature and content of the proposal forming the basis of this rule change request.

The proposed amendment aims to ensure semi scheduled generators are restricted from moving from their anticipated level of output without informing the Australian Energy Market Operator (AEMO) of that intention through a rebid and waiting to receive a revised dispatch target. The proposal also seeks to ensure semi scheduled generators operate to the full extent of their resource when system conditions permit.

The NER requires that registered participants must comply with dispatch instructions unless to do so would, in their reasonable opinion, be a hazard to public safety or materially risk damaging equipment or they are providing other system services. Notwithstanding the general requirement to comply with dispatch instructions, other provisions of the NER allow semi scheduled generators to operate at any level except when AEMO declares the relevant interval to be a semi dispatch interval (when they are required to remain below a cap specified by AEMO). This contrasts with the rules for scheduled generators, where the requirement to follow dispatch instructions is a strict obligation and failure to follow the instruction can trigger compliance action.

Recently some semi scheduled generators have been departing significantly from their dispatch instructions, to an extent far in excess of plausible variations in their resource, and unrelated to existing exceptions provided for in the rules. These generators have rapidly reduced their output to zero during negative price dispatch intervals without an instruction from AEMO or valid rebid. While this behaviour may not contravene current provisions of the NER, a rule change is necessary given the behaviour undermines price / dispatch forecast accuracy. Further, with substantial wind and solar development forecast, the problem may occur more frequently in the future, compromising AEMO's ability to manage power system security. A rule change to prevent this behaviour will improve AEMO's ability to manage the power system and strengthen confidence in forecast price and market dispatch.

AER issues and update papers

On 24 June 2020, the AER published an Issues Paper[1] canvassing options aimed at requiring semi scheduled generator operation to align more closely with that of scheduled generation and, in particular, to limit the potential for a rapid reduction in output below the level of a dispatch instruction. The Issues Paper (and subsequent consultation with stakeholders) discussed the development of a rule change proposal to achieve that aim and satisfy the requirements for a fast-track rule under the NEL. The options included abolition of the semi scheduled category altogether, alternative amendments to the definition of dispatch instructions to semi scheduled generators, changes to the design of the causer pays cost allocation for frequency control ancillary services (FCAS) and changes to prohibit market participants from the behaviour that triggered consideration of this rule change.

[1] AER, 2020, 'Issues paper - semi scheduled generator rule change(s)', www.aer.gov.au/publications/reviews/semi-scheduled-generators-proposed-rule-changes

The Issues Paper found that two options warranted further consideration:

- Option 1: Amend the definition of a dispatch instruction for semi scheduled generation to be a ramp rate and a target in the form of a megawatt for the end of the dispatch interval with flexibility to move down if the resource decreased, but not higher.
- Option 2: Remove the semi scheduled generation classification and, subject to legacy or transitional arrangements, require all current semi scheduled generation to be classified as scheduled.

The AER consulted openly and broadly on the Issues Paper to seek input on the nature and extent of the issue as well as on the options for changing the rules. The AER then held a public online workshop to explain the paper and listen to feedback. The AER received 30 written submissions in response to the Issues Paper (listed in appendix A).

A majority of submissions agreed semi scheduled generators turning off during a dispatch interval, without a dispatch instruction, (and apparently in response to negative prices) should be addressed.

Other feedback on the preferred options ranged as follows:

- none supported the removal of the semi scheduled category, at least in the short term
- seven agreed with the approach to modify the requirements for semi scheduled generators to follow a megawatt target and not exceed that target at any stage
- 15 submissions agreed a rule change was required – but considered the AER's preferred option to follow a megawatt target and not exceed that target at any stage would adversely impact on their revenue. Some suggested approaches from other markets such as a New Zealand style exception reporting obligation
- two did not clearly specify a position
- six were not supportive of any rule change, stating a persuasive case had not been made. Of those:
    - at least two argued the problem of generators shutting down in negative price periods was not sufficient to warrant a change at a time when so many other rule changes and a new market design are being considered
    - two strongly opposed any change arguing it would be contrary to the original intention of the rules.

On 24 August 2020, based on this feedback and consultation, the AER published an Update Paper[2] which set out a revised rule change proposal and invited further comment from stakeholders. The revised proposal would clarify that a dispatch instruction to a semi scheduled generator is to be a megawatt target at the end of the dispatch interval, but that the generator would have flexibility to generate either above or below this target subject to the availability of its resource during non semi dispatch intervals. The change addressed a key concern expressed by stakeholders with Option 1 in the Issues Paper, by removing the restriction on semi scheduled generators following their resource availability and operating above their dispatch targets within a non semi dispatch interval. The amendment allows semi scheduled generators to operate to the full extent of their resource other than during a semi dispatch interval.

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2 AER, 2020, 'Semi scheduled rule change proposal update', www.aer.gov.au/publications/reviews/semi-scheduled-generators-proposed-rule-changes

Stakeholders were asked to respond within seven days. Eight responses were received, including five written submissions, listed in appendix A.

Before submissions to the Update Paper closed, AER staff consulted with around 25 members of the Australian Energy Council on 27 August 2020, and around 88 Clean Energy Council members on the following day. The consultation discussed the content of the submissions received, the AER's understanding of the issues, and the revised proposed rule change.

1.1. The Rule Change Proposal

After listening to the many stakeholders who participated in the workshop and meetings and reviewing all submissions, the AER has concluded that it is appropriate to:

- retain the semi scheduled category within the NER and
- amend the NER to clarify the output of semi scheduled generating units must follow their available resource except during a semi dispatch interval when output should be limited to the cap specified by AEMO[3].

Specifically, the AER considers that the NER should be amended to clarify that:

- a dispatch instruction to a semi scheduled generator will be in the form of a megawatt target for the end of the dispatch interval
- during a non semi dispatch interval the target will be based on the forecast resource availability for the end of the interval
- semi scheduled generators will be expected to meet this target subject to variations in resource availability
- during a semi dispatch interval, the generator's output should be the lower of
    - the generator's output cap specified by AEMO and
    - the generator's output as determined by its resource availability in that dispatch interval[4].

The effect of these arrangements is, as far as possible, to retain existing arrangements and flexibility to reflect the variable resource, clarify the intention for semi scheduled generators to fully utilise their available resource unless limited by network conditions or, their offered availability, and restrict the rapid controlled deviations from the resource capability.

[3] As defined in the existing rules, a network constraint or a dispatch offer which results in a semi scheduled generator receiving a dispatch target less than the forecast based on the available resource will still trigger a semi dispatch cap and a semi dispatch interval.

[4] In a semi dispatch interval output is constrained by network conditions or the generator's bids, and economic dispatch by NEMDE results in a target less than the resource capability. This is no change from current arrangements.

2. The Issue

Currently the NER impose different obligations on semi scheduled generators compared to scheduled generators. Semi scheduled generators are typically intermittent renewable energy generators such as grid scale wind and solar farms.

In 2008, when the relevant rules were introduced, this category of generation (then only comprising wind) was subject to less stringent obligations than those imposed on scheduled generators. The rules for semi scheduled generation have not been reviewed or changed since the classification was introduced. When the semi scheduled classification was introduced there was limited experience of the impact of resource variations and wind generation forecasting was immature. Semi scheduled generators were expected to be minor passive participants, not a dominant source in the future energy mix. The focus of the rules for semi scheduled generators in 2008 was to allow them to generate to the full extent of available wind resources. Consequently, for dispatch purposes, their targets could be determined by wind forecasts. There was little or no consideration of changes in market conditions that could lead semi-scheduled generators to rapidly reduce output in response to price.

The rules for following dispatch instructions require registered participants to comply with dispatch instructions unless to do so would, in their reasonable opinion, be a hazard to public safety or materially risk damaging equipment. Also, a scheduled or semi scheduled generator may deviate from their dispatch instruction when providing other system services[5].

Aside from these limited exceptions, compliance with dispatch instructions is a strict obligation for scheduled generators. However, the rules impose more limited obligations for semi scheduled generators and only impose a cap on their output if AEMO determines that a dispatch interval is a 'semi-dispatch' interval. While semi scheduled generators are not required to reach a particular level of output, resource forecasts for semi scheduled generators are used by AEMO's market dispatch engine which resolves the dispatch of all generators to securely meet demand.

The amount of semi scheduled generation has grown significantly and now comprises around 11,000 megawatts of installed and commissioning capacity, around 20% of the 56,000 megawatts of generating capacity in the NEM. This form of generation is forecast to grow to around 56% of the installed capacity in the NEM by 2035.[6] Due to this rapid increase in the amount of semi scheduled generation, the limited obligations required of them no longer allow AEMO to adequately manage the power system.

- Intermittent renewable generating technologies are significantly cheaper and continue to evolve, supported by precise control system software facilitating very fast ramping and close control of output
- Overall grid demand is static or falling and conventional generation is retiring and not being replaced by generators of equivalent capability. AEMO analysis shows that there is now enough intermittent renewable generation to meet demand in some regions in some periods[7]

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5 See NER cl 4.9.8

6 AEMO, 2020, Central scenario, 2020 Integrated System Plan, www.aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2020-integrated-system-plan-isp

7 AEMO 2020, Renewable Integration Study, www.aemo.com.au/-/media/files/major-publications/ris/2020/renewable-integration-study-stage-1.pdf?la=en, page 6

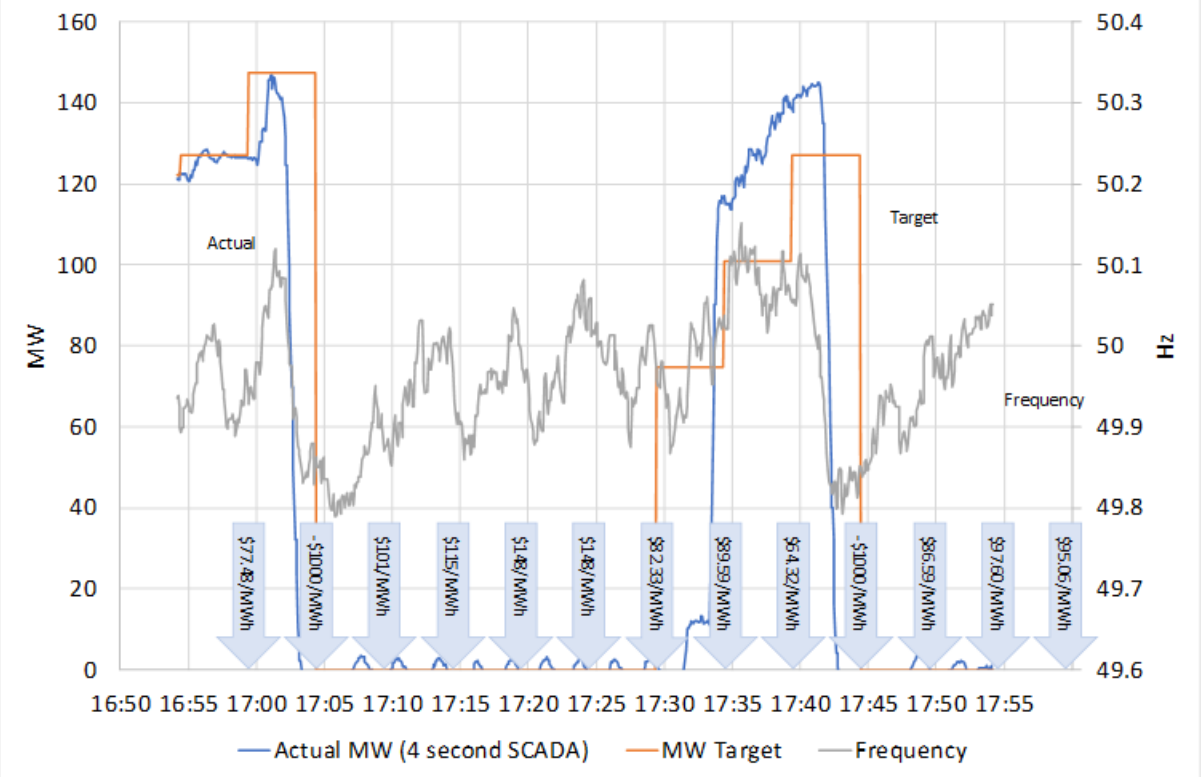
- Negative prices are occurring more frequently and recent power purchase agreements tend to exposure the generators to the spot prices in those periods
- Automated software which optimises dispatch in response to price is available and being used by some generators – in some cases without integrating it with dispatch offers and/or without allowing for appropriate ramping across a dispatch interval.

All scheduled and semi scheduled market participants have the ability to amend their bids and offers, but once a 5 minute dispatch target and associated price has been calculated, the market design assumes all generators will follow their targets. AEMO manages system security on the basis that instructions are followed, including, for example, dispatch of ancillary services and management of operating constraints.

Recently some semi scheduled generators have departed significantly from their instructions, far in excess of plausible variation in their resource. The generators rapidly reduced output during a negative priced dispatch interval, even though their instructed level of output was formed on the basis of their offers and the available resource.

Figure 1 shows a recent example of a wind farm ceasing production during a dispatch interval in which a negative dispatch price occurred. In the figure, light blue arrows show the regional dispatch price and when it was published for the subsequent dispatch interval. The orange line shows the Australian Wind Energy Forecasting System (AWEFS)[8] target for the unit or the offer from the participant. The blue line shows unit output. The grey line shows the power system frequency during that time (referenced against the right hand axis).

Figure 1 – Negative price response



[8] AEMO has two renewable energy forecasting systems one for wind – AWEFS and the Australian Solar Energy Forecasting System (ASEFS).

Source: AEMO, AER analysis

From 17.00hrs the output from the unit initially climbs towards the higher dispatch target based on wind forecasts and the generator's offer. From 17.02 the output starts to sharply reduce, reaching zero well before the end of the dispatch interval at 17.05. The reduction appears to have been prompted by the -$1,000/MWh price for the dispatch interval. The participant also submitted a rebid at 17.02, moving all its capacity from -$1,000/MWh to more than $12 500/MWh, however it only became effective for the 17.10 dispatch interval.

In this example, the early rapid reduction to 0 MW, before a corresponding dispatch instruction was issued with a 0 MW target, appears unrelated to resource availability or technical limitations. SCADA data indicates the number of turbines available remained relatively constant and the wind speed fell only slightly.

As a result of the negative priced dispatch interval, the spot price for the trading interval ending 17.30 hrs was -$67.61/MWh.

The participant's rebid made at 17.02 was only for the 17.30 trading interval, so all of its available capacity reverted back to its original offer of -$1000/MWh for the 18.00 trading interval.

During the 17.45 dispatch interval, for which the dispatch target was in excess of 120 MW, at 17.42 the participant again started to rapidly reduce output. Again, at the same time, the participant also submitted a rebid for the remainder of the trading interval, moving all their capacity from -$1000/MWh to more than $12 500/MWh. However, this rebid did not become effective until the 17.50 dispatch interval. The spot price for the 18.00 trading interval was -$94.47/MWh.

Figure 2Figure 1 also shows the power system frequency in grey. Power system frequency can be seen as a barometer of the supply demand balance. As the generator reduced its capacity and deviated from AEMO's forecast target, power system frequency fell outside the normal operating frequency band. The impact would have been more substantial if multiple generators concurrently operated in this way.

On a large scale, this behaviour has the potential to erode reserves held for frequency management and contingency disturbances, which can only be countered by AEMO deploying more contingency FCAS. Increasingly, the management of the power system depends on AEMO being able to rely on participants providing energy as forecast and on which the total market dispatch solution and price has been predicated.

AEMO's Renewable Integration Study (RIS) published in April 2020 included analysis of system curtailment issues related to system security and shows that managing power system frequency will become increasingly difficult as existing high inertia thermal generators retire.[9]

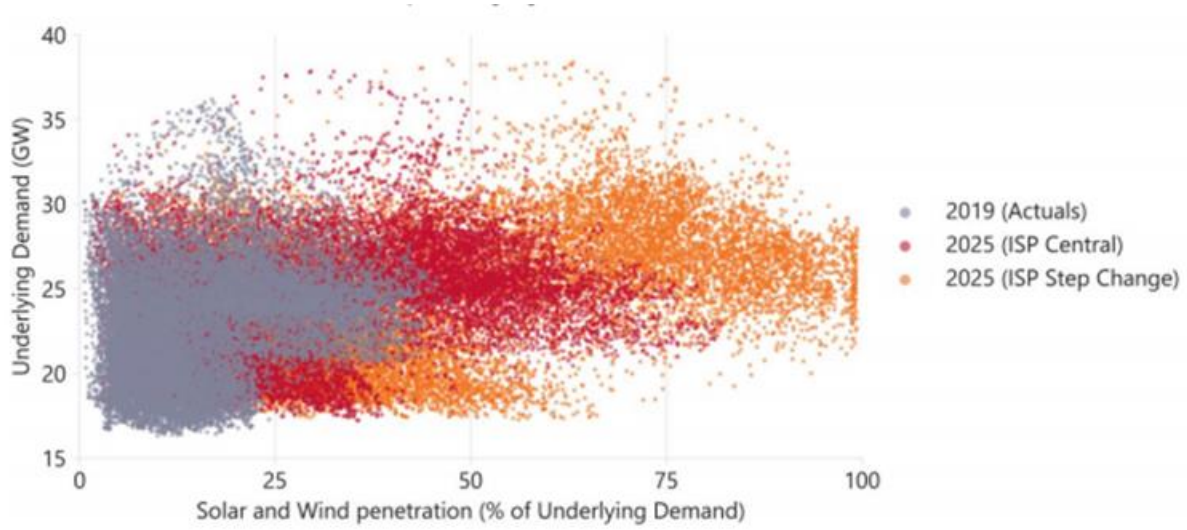
Figure 2 taken from the RIS, shows that, in 2019, renewable generation was, at times, able to meet almost 50% of electricity demand in the NEM (grey scatter dots) and by 2025 this is forecast to increase to 75–100% under different ISP scenarios (red scatter dots shows the central scenario, and yellow scatter dots show the higher step change scenario). Instantaneous penetration levels in this figure represent aggregated contributions from all

9 AEMO 2020, Renewable Integration Study, www.aemo.com.au/-/media/files/major-publications/ris/2020/renewable-integration-study-stage-1.pdf?la=en, page 6

wind and solar generation in the NEM in the half hour divided by the total underlying NEM demand.

A primary conclusion of the RIS report is that, by 2025, instantaneous intermittent renewable penetration levels in the NEM will be constrained to between 50%-60% of the time unless a range of initiatives are implemented.[10]

Figure 2 - Instantaneous penetration of wind and solar generation, actual in 2019 and forecast for 2025 under ISP Central and Step Change generation builds



Source: AEMO Renewable Integration Study – page 25.

The report also highlights the challenges with managing increasing uncertainty and interventions with respect to system operability, frequency management and resource adequacy to ensure that a sufficient overall portfolio of energy resources is available to achieve real time balancing of supply and demand.

> *"...increasingly variable and uncertain supply and demand, and declines in system strength and inertia, have moved the system to its limits, reducing its resiliency and increasing the risk to the system for complex events. The knowledge and tools operators have used in the past to operate the system securely are now less effective and need to be adapted. For example, intervention by AEMO has always been a part of operating a secure NEM, but where it was used rarely in the past as a last resort to manage specific issues on the grid, it has now become commonplace, especially in regions with higher shares of renewable generation (South Australia, Tasmania, and Victoria). This RIS analysis projects that under the current market design the need for interventions to address system security requirements will grow across all NEM regions. Successfully managing the system's increased uncertainty and operational complexity will require different approaches and better co-ordination of all resources. The existing dispatch process for the NEM was not designed for these new conditions, and the current reliance on operators to balance factors and intervene is sub-optimal and unsustainable."* [11]

[10] The ISP assumes that market dispatch has perfect foresight, wind and solar generators are not price responsive and follow their simulated output unless constrained by the network.

[11] AEMO 2020, Renewable Integration study, www.aemo.com.au/-/media/files/major-publications/ris/2020/renewable-integration-study-stage-1.pdf?la=en, Page 25

As highlighted, the existing arrangements that effectively only constrain a semi scheduled generator to remain below a cap during a semi scheduled dispatch interval are part of operating the power system down to its minimum physical limits.

As the rules are currently drafted, a semi scheduled generator deviating from its target (even turning off), other than observing a cap if appropriate, does not contravene the rules, but the impact and incidence of deviations is growing as negative price events become more common and is likely to grow as renewable penetration increases further. This, combined with the analysis presented in AEMO's ISP and RIS on the increase in semi scheduled generation and the issues this creates around uncertainty and achieving real time balancing of supply and demand, has led to the rule change request.

3. Application for fast track approval

3.1. Fast tracking applications

The AER requests that this application be progressed as a 'fast track' rule change. The requirements for fast track consideration are:

(a) An electricity market regulatory body has made a rule change request and has consulted with the public on the nature and content of the request; and

(b) The AEMC is of the opinion that the consultation was adequate, having regard to the nature and content of that request and the kind of consultation conducted by the electricity market regulatory body.

3.2. AER consultation overview and process

The AER conducted extensive consultation on the nature and scope of the issue this rule change request seeks to address, as well as on a range of possible solutions to this issue. On that basis, the AER considers that this rule change request satisfies the requirements under the NEL for this rule change to be fast tracked by the AEMC.

The AER's consultation process commenced with the publication of an Issues Paper on 24 June 2020. The Issues Paper included analysis of:

- examples of instances where some semi scheduled generators have begun to deviate from their instructed output and how this behaviour has been increasing over time
- the impact this behaviour is having on the NEM now, and potentially into the future
- the benefits of having greater certainty of the output of semi scheduled generation.

On 2 July 2020 AER staff held a two hour online workshop, with around 110 participants. Staff presented on the background of the semi scheduled category, the rule change request, analysis from the Issues Paper and a range of potential rule change proposals. Much of the workshop involved discussing with participants their thoughts on the issue paper and presentation including potential costs and benefits of each of the rule change proposals.

On 24 August 2020 the AER published an update on minor amendments to the proposed rule change. This paper acknowledged feedback received on the issues paper in regards to the effect of a cap on output and presented the AER's revised rule change proposal (which matches that in the change now requested). Stakeholders were provided with a further week to provide any feedback on the amended proposed rule change.

AEMO has been working with the AER to define and analyse the problem since late 2019. AEMO analysis assisted our assessment of the validity of stakeholder feedback on frequency impacts on the market and the correlation of variability across the NEM. The AER understands AEMO is supportive of the proposed rule change.

The Issues and Update papers are attached to this proposal. A list of stakeholders who provided submissions is documented in appendix A.

3.3. Submissions in response to AER papers and additional meetings

As described above, the AER received 30 submissions in response to the Issues Paper and were published on the AER website in early August 2020.[12]

Eight responses including five written submissions were received in response to the Update Paper and were also published on the AER website.

Across June–August 2020 AER staff met individually with a number of interested stakeholders. The meetings generally focussed on participants seeking a deeper understanding of the AER's proposal, or the AER seeking further information based on a stakeholder's submission. Individual meetings occurred with:

- The Clean Energy Council (CEC)
    - A closed discussion was held the executive group of the CEC prior to the release of the Issues Paper.
    - A separate overview of the Issues Paper was provided to CEC members on 29 June 2020, before the public workshop, because this group consists of the majority of stakeholders who were most likely to be impacted by the proposed rule changes.
    - An overview on the Update Paper was provided to CEC members on 28 August 2020.
- CEC/Windlab (6 August 2020) - to discuss analysis of potential revenue impacts to wind farms presented in the CEC submission
- CEC/RES (6 August 2020) - to discuss analysis of potential revenue impacts to solar farms presented in the CEC and RES submissions
- Tilt Renewables (21 July 2020 and 18 August 2020) - to discuss the Issues Paper and submission provided to the AER.
- Infigen (21 and 31 July 2020) - to discuss analysis provided in submission on revenue impacts and impacts on system frequency.
- University of New South Wales Collaboration on Energy and Environmental Markets (CEEM) (11 August 2020) - to discuss analysis provided in submission, the possible application of some of their more theoretical analysis to the rule change and obtain an independent academic perspective.
- ACCIONA (19 and 26 August 2020) to explore their perspectives on the investment impact of these developments and understand the operational challenges that the proposed rule might have with respect to ramping.
- Clean Energy Investor Group (25 August 2020) - to discuss AER Update Paper.
- Shell Energy Australia (26 August 2020) - to discuss AER Update Paper.
- Australian Energy Council (AEC) (29 July and 27 August 2020) - An overview of the Issues Paper and then the Update Paper was provided to AEC members.

The AER notes that four submissions—from Shell Energy Australia, Ratch, Hard Software and Tilt Renewables—opposed fast tracking on the grounds the proposed amendments

[12] AER, 2020, www.aer.gov.au/publications/reviews/semi-scheduled-generators-proposed-rule-changes/initiation

were material. Shell Energy Australia subsequently supported the revised proposal without further comment on fast tracking.

The AER considers that by undertaking detailed consultation and clarifying and revising its final proposal (as set out in the Update Paper), it has addressed stakeholder concerns about the materiality of the change to the rules and the associated implications for fast tracking of the rule change. In particular, the final proposal substantially reduces the materiality of the proposed changes while still achieving their intention. This was acknowledged by stakeholders in submissions to the Update Paper and in stakeholder meetings to discuss the AER's revised proposal.

4. Stakeholder responses and AER assessments

A listing of the 30 submissions received to the Issues Paper and five submissions to the Update Paper are presented in appendix A.

Submissions to the issues paper generally argued that semi scheduled generators should not be prevented from fully utilising their resource. Two submissions strongly argued that rapid reduction in output described in the AER Issues Paper as leading to adverse outcomes for system security should be allowed to continue. However, there were a range of views about how best to address the adverse impacts.

- none supported the removal of the semi scheduled category, at least in the short term
- seven agreed with the approach to modify the requirements for semi scheduled generators to follow a megawatt target and not exceed that target at any stage
- 15 submissions agreed a rule change was required – but considered the AER's preferred option to follow a megawatt target and not exceed that target at any stage would adversely impact on their revenue. Some suggested approaches from other markets such as a New Zealand style exception reporting obligation
- two did not clearly specify a position
- six were not supportive of any rule change, stating a persuasive case had not been made. Of those:
    - at least two argued the problem of generators shutting down in negative price periods was not sufficient to warrant a change at a time when so many other rule changes and a new market design are being considered
    - two strongly opposed any change arguing it would be contrary to the original intention of the rules.

Submissions also noted a range of matters highlighting the interactions between technical, commercial, economic and regulatory incentives at play.

The following sections discuss:

- the key points raised by stakeholders in submissions to the Issues and Update papers
- the AER's responses to stakeholder feedback on these issues
- how the AER has provided an opportunity for stakeholders to comment on both its initial proposal set out in the Issues Paper and its revised proposal set out in the Update Paper, and how this feedback has informed the final proposal that forms the basis of this rule change request submitted to the AEMC.

4.1. Materiality

Submissions

A number of submissions challenged the materiality of the issue. Submissions, including those from Powershop/Meridian Energy and Global Roam, presented analysis and argued that many occasions where semi scheduled generators deviated from dispatch instructions by more than the 20 MW tolerance used by the AER to illustrate the problem in the issues paper, are likely to have been due to reasons other than deliberate controlled actions.

Conversely other submissions considered rapid ramping down after receipt of dispatch instruction is a problem that requires a regulatory solution. Infigen noted:

'We agree with the AER that this could ultimately lead to system security issues. At the extreme, the rapid curtailment of a significant portion of the generation fleet within a dispatch interval could lead to a shortfall of generation. We consider that this is a material issue that should not be left to market signals, and a regulatory solution is required.'

AER response

The AER has not undertaken a case by case review but accepts a range of reasons other than deliberate controlled action may lead semi scheduled generators to deviate from the targets in dispatch instructions. The AER remains concerned about occasions where very rapid and significant reductions in output were initiated early in negative price dispatch intervals, but where generators had not submitted bids that would result in lower targets. The AER considers that some instances of deviation from dispatch target by semi scheduled generators were not due to deliberate controlled action. Some instances are however indicative of deliberate control action (either manual or automated), and therefore it is appropriate for the NER to restrict situations where this may occur (providing the available intermittent resources are fully utilised whenever possible).

4.2. Removal of semi scheduled classification

No submissions supported the option to abolish the semi scheduled category.

The Australian Sugar Milling Council in particular was strongly opposed to removal of the semi scheduled classification as it saw removal as a risk to continuance of the non scheduled classification. The AER is not aware of any consideration to amend the non scheduled classification.

The AEC submitted that it saw no reason for a distinction to be made between the obligations for compliance with dispatch obligations of scheduled compared to semi scheduled generators and therefore supported efforts to align the obligations, but did not call for the abolition of the semi scheduled classification.

AER response

The AER agrees and the revised proposal does not consider the removal of the semi scheduled registration category as proposed rule change adequately deals with the issues highlighted.

4.3. Holistic reform

Submissions

A number of submissions emphasised the importance of holistic reform of the NEM particularly in light of potential changes being developed by the Energy Security Board's (ESB) NEM 20205 work, as well as recent amendments to require Mandatory Primary Frequency Response (MPFR) and the introduction of five minute settlement in October 2021.

Several responses to the Issues Paper said that the MPFR rule will have an impact on semi scheduled generators' decisions to change their output.

The final MPFR rule places an obligation on all scheduled and semi-scheduled generators, who have received a dispatch instruction, to generate to a volume greater than 0 MW, to operate their plant in accordance with the performance parameters set out in AEMO's Primary Frequency Response Requirements (PFRR) as applicable to that generator. The

PFRR says affected generating systems (including semi scheduled generators) must respond to frequency deviations from 50Hz by ±0.015Hz at the connection point. Submissions to the AER suggest that the MPFR rule could change semi scheduled generator behaviour and reduce incentives to rapidly reduce output but this is not a strong, known outcome and the general feeling was to observe the impacts of MPFR before making big changes to rules for semi scheduled generators.

Edify Energy said that MPFR requirements will mean that semi scheduled generators operating in frequency responsive mode will respond to frequency deviations and will be unable to manually change their energy output in these situations. NEOEN also said that MPFR could reduce incentives for non-linear ramping. AEMO also thought that over time MPFR will create incentives to reduce the behaviour. ACCIONA said that the AER should consider the impact of MPFR when considering a rule change.

In its response to the Issues Paper Infigen said that the AER's preferred rule would increase the need for primary frequency response but that MPFR (along with FCAS) also means that AEMO has the ability to procure sufficient resources to manage variability within dispatch intervals. The AEC, AMS, Impact Investment Group and Pacific Hydro were all more circumspect and wanted to see how the MPFR changed behaviour or market outcomes before the AER proposed significant changes to the rules.

From 1 October 2021 the NEM will be settled on a five minute basis: operational dispatch and financial settlement will be aligned to 5 minutes, rather than the current arrangement where settlement occurs on a 30 minute basis with the final price being the average of the preceding six five minute periods. Currently, with 30 minute settlement, some generators manage their output for each dispatch interval against their expectation of the average price outcome at the end of the 30 minutes, and semi scheduled generators may have an economic incentive to turn off during negative prices to avoid negative prices which would result for the 30 minute settlement period.

Edify Energy, Infigen and CEC said that moving to five minute settlement will make the price risk much sharper and could provide a stronger incentive to deviate from dispatch target. The Clean Energy Investor group also said that with five minute pricing, semi scheduled generators may wish to deviate from negative prices they have been dispatched at, and Infigen also said that incentives to turn off may become even sharper under five minute settlement. The Australian Energy Council only goes so far as to say that five minute settlement changes may affect or mitigate the issues observed. AMS said that the move to five minute settlement will not eliminate opportunities or incentives for engaging in "early economic curtailment" and therefore the rules should be changed. Impact Investment Group said that while other market reform changes are under way, such as the move to five minute settlement, we should only make light touch minor changes to the semi scheduled category. ACCIONA said that the move to five minute settlement should be carefully considered.

AER response

The rule change request from COAG Energy Council to the AER was part of its Interim Security Measures which they considered needed to occur within the next 12 to 18 months, prior to the large market reforms underway in the post market 2025 market design.[13] The AER is cognisant of the changes to the design of the NEM and considers this amendment to the current design relatively minor and does not detract from the range of options in the

[13] COAG Energy Council, 2020, Post 2025 Market Design Consultation Paper, www.coagenergycouncil.gov.au/energy-security-board/reliability-and-security-measures

ESB's report published on 7 September 2020 entitled 'Post 2025 Market Design Consultation Paper'.

The AER agrees that five minute settlement may sharpen the incentives to deviate from dispatch instructions, increasing the need for regulatory change.

With respect to MPFR, the AER agrees that extreme variations in frequency due to semi scheduled generators unilaterally deviating from a dispatch target may be mitigated by MPFR obligations. However while the MPFR is designed to require all generators to respond to correct a frequency deviation, this rule change proposal is designed to reduce the incidence of one possible source of deviation by prohibiting semi scheduled generators from responding to price without a dispatch instruction. The AER considers obliging semi scheduled generators to follow their targets should reduce the overall requirement allowing existing FCAS and MPFR to operate more efficiently.

The AER therefore considers that neither of these factors addresses or mitigates the underlying rationale for an amendment to the NER to restrict the opportunity for semi scheduled generators to deviate from dispatch targets (while retaining the opportunity for semi scheduled generators to fully utilise their available resource when possible).

4.4. Options for stronger compliance and education

A number of submissions referred to alternative approaches focusing on compliance action and/or education.

Submissions

A number of submissions expressed a preference for enhanced compliance including Pacific Hydro, Hard Software, ACCIONA and Australian Sugar Milling Council.

Pacific Hydro considered that increased compliance would be sufficient to address the problems identified without amendment to the NER.

Australian Sugar Milling Council also preferred changes to enforcement arrangements as it was strongly opposed to abolition of the semi scheduled category.

AER response

The Issues Paper noted that under the current provisions of the NER semi scheduled generators may operate at any level of output except during a semi dispatch interval (in which case their output must not exceed a cap). Accordingly, the AER is of the view that stronger enforcement action cannot address the underlying issue without accompanying changes to the NER to clarify the dispatch obligations of semi scheduled generators.

In the Issues Paper the AER also considered the option of limiting the use of facilities or procedures that lead to rapid reduction in output in response to price as part of registration. The AER's assessment in the Issues Paper, which was supported by AEMO, AGL and ACCIONA, was that changes of this nature to registration were problematic. The approach proposed in the revised option will have the same effect but is more general in that it restricts deviation from the target determined by AEMO, based on resource forecasts and offers for all generators, in the energy and ancillary services dispatch process for the NEM.

Some submissions proposed an approach that the AER had not considered where semi scheduled generators self-report deviations greater than some prescribed amount. This approach is used in the New Zealand market, and calls for generators to provide a report to

the Electricity Authority if their output deviates from that target by more than a specific megawatt amount.

In practice the AER considers the difference between the approaches is whether the AER requests an explanation, or the semi scheduled generator is required to self-report. Self-report approaches present a range of unique monitoring and compliance issues.

For consistency with the application to scheduled generators, a discretionary AER-initiated 'please explain' method is preferred. This approach allows, when questioned, semi scheduled generators to link sudden changes in their output to any relevant feature not apparent from data, for example unexpected high speed cut out or run back, temperature effects or other technical protection systems not related to the energy price. More information on how AER will monitor for compliance is set out in 5.3.

4.5. Ramping and the requirement for a linear trajectory

The rate of change in output and requirement for a linear rate of change discussed in the Issues Paper are closely linked. The most significant concern is a situation where semi scheduled generators rapidly and materially reduce their output below their dispatch instruction, for example within the first few seconds of the start of a dispatch interval, or very rapidly change their output to meet an instruction. This concern applies in both non semi dispatch intervals and semi dispatch intervals.

The rate of change of output of generation, or the ramp rate, is a key factor that leads to perturbations in power system frequency that may reduce power system security and is a significant driver for the need for ancillary services. Dispatch targets are set for the end of each 5-minute period and are constrained to be within the rate of change advised by generators.

The rate of change of scheduled generators is determined by AEMO's Automatic Generation Control (AGC) system implementing a linear ramp. Semi scheduled generators commissioned after 2018 have an obligation specified within an AEMO procedure to follow a linear trajectory when ramping from their initial active power to the subsequent target, but only during a semi dispatch interval. This requirement is further limited to those generators that have an active power control system capable of achieving the requirement specified in their performance standard.

While we recognise that generators commissioned prior to when these requirements were imposed may not be able to ramp smoothly we would expect that, within the technical capabilities of these generators, they will ramp in such a way as to approximate a linear ramp.

In the Issues Paper the AER proposed that a ramp rate be published as part of the dispatch instruction. AEMO has since advised the AER that they intend to be more prescriptive in their dispatch procedure (PS_OP_3705) and will require generators to ramp linearly by default.

Submissions

A number of submissions including from Pacific Hydro, Infigen and Global Roam criticised this requirement noting that on a minute to minute basis a linear ramp is impractical or would be ineffective at addressing the underlying problem identified by the AER. They submitted that this is because of the typical operation of control systems provided by manufacturers and minimum loading levels before shutdown is required (applicable in the event of winding back to very low output) and in reverse when starting up.

The submission from Diamond Energy was the only submission to argue that rapid changes in output should be allowed to continue. They noted that registration arrangements that restrict ramp rate to no more than 20 per cent of capacity[14] exclude fast acting response from the NEM stating:

> *'Our view is that this constrains the capability of fast activating technologies, and limits their potential useability to AEMO should they require fast activating technologies in the future to manage the Power System. In short, why limit the future by imposing the control systems of the past?'*

The submission then addressed the requirement to ramp linearly to a cap during semi dispatch intervals and stated it:

> *'……impedes these technologies from avoiding negative price exposure and creates a disincentive to submit an Energy Offer that might incur a "cap" and possibly a contributing factor toward some semi scheduled assets offering the "floor" price'*

Diamond Energy further suggested increasing the market floor price to -$100 in order to reduce the incentive to avoid negative prices.

AER response

A key intention of the rule change is to remove the opportunity for semi scheduled generators to make large controllable rapid changes in output that are not the result of a dispatch instruction, the provision of ancillary services or other technical reason, while allowing semi scheduled generators to operate to the full extent of their resource whenever possible. The AER therefore does not accept the view that rapid controlled deviations from dispatch instruction should be permitted due to the issues highlighted in section 2. The proposed rule change reflects this by requiring semi scheduled generators to follow their dispatch instructions, subject to technical and resource availability.

The revised rule change does not specify that semi scheduled generators should linearly ramp to each dispatch target. The issue of linear ramping will be adequately accommodated by AEMO's proposed changes to the dispatch procedure (PS_OP_3705). We expect that the AER will work with AEMO to accommodate the issues raised in submissions around technical limitations with older plant and operation at minimum operating levels and compliance.

4.6. Stakeholder recommendation to increase the market floor price

Diamond Energy, Impact Investor Group and Tilt Renewables all commented on the market floor price and the impact of constrained operation. The issue raised by all three submissions is that currently, in South Australia, when there are system strength constraints in place, semi scheduled generators included in those constraints, have their output curtailed. For those that bid at the price floor the level of curtailment is shared between the generators but for those that bid higher than the price floor (but below the dispatch price) their full output could be curtailed.

Diamond Energy and Impact Investor Group proposed increasing the floor price to -$100/MWh to reduce the impact and thereby reduce the incentive to reduce output. Tilt Renewables suggested instead that all generators that bid below the clearing price be

[14] This would appear to ensure that a generator cannot move more quickly than that which would be required to its full range of output in 5 minutes.

constrained equally and this would eliminate the incentive semi scheduled generators have to bid at the current floor price.

AER response

Changing the market floor price would have wider implications on the market design and is part of the reliability settings administered by the Reliability Panel and the AEMC. Fundamental to the market dispatch design is that all generators indicate their willingness to generate at a price, through their offers. This is achieved by the participant distributing their desired output across 10 price bands that can be positioned anywhere between the market price floor and the market price cap. The distribution of their output can be changed at any time. The dispatch engine (NEMDE) then resolves the offers from all generators, network constraints and security requirements to determine the least cost solution to supply customer demand. Bidding to the price floor by generators affected by a constraint is a long-standing and well-recognised challenge in the NEM and allows affected generators to seek pro-rata reductions in their dispatch targets with respect to other participants affected by the same constraint.

The magnitude of the market price floor will not materially affect the opportunity for semi scheduled generators rapidly deviating from dispatch instructions (although the incentive to deviate from instruction may). The result is therefore that even if the price floor could be adjusted without adversely affecting other reliability settings, it would not provide an effective deterrent in the long term and would not clarify the market operator's expectations of semi scheduled generators.

The AER considers that, changing the market floor price as proposed by Diamond Energy, does not directly address the issue of concern and has wider implications and potential unforeseen consequences. The AER has not therefore pursued this approach.

4.7. Output capped to the target and FCAS costs

Submission

The most common point of disagreement with the AER proposal in the Issues Paper related to the requirement that semi scheduled generators (linearly) progress to a megawatt target for the end of a dispatch interval, and increasing their output above target in the presence of an increased resource was not allowed.

A number of submissions presented detailed explanations of the potential economic and commercial losses to which they considered this provision would lead to if the full availability of the resource was forfeit as a consequence of the cap on output in all intervals. This was raised by Edify Energy, Global Roam, RES, Infigen, CEC and the University of New South Wales CEEM.

A number of submissions also asserted that this capping would increase the need for and the cost of FCAS raise services. Clean Energy Investor Group, Edify Energy, Pacific Hydro, Tilt Renewables and RES considered risks of higher FCAS requirements and costs as being a reason to remove the linear ramp requirement and the cap on output in non semi dispatch intervals.

In response to these submissions, the Update Paper amended the AER position to propose that semi scheduled generators would be able to fully utilise their resource where system conditions permitted (subject to a semi dispatch cap during a semi dispatch interval). This amended position was supported in email responses from CEC, University of New South Wales CEEM and Energy Queensland. Formal submissions supporting the revised position

were also provided by PowerShop/Meridian, Shell Energy Australia, Clean Energy Investor Group, and Infigen. Tilt Renewables also provided a submission which supported the removal of the cap as proposed in the Update Paper but emphasised that variations from dispatch instructions can also be due to technical characteristics of equipment as well as variations in resource.

AER response

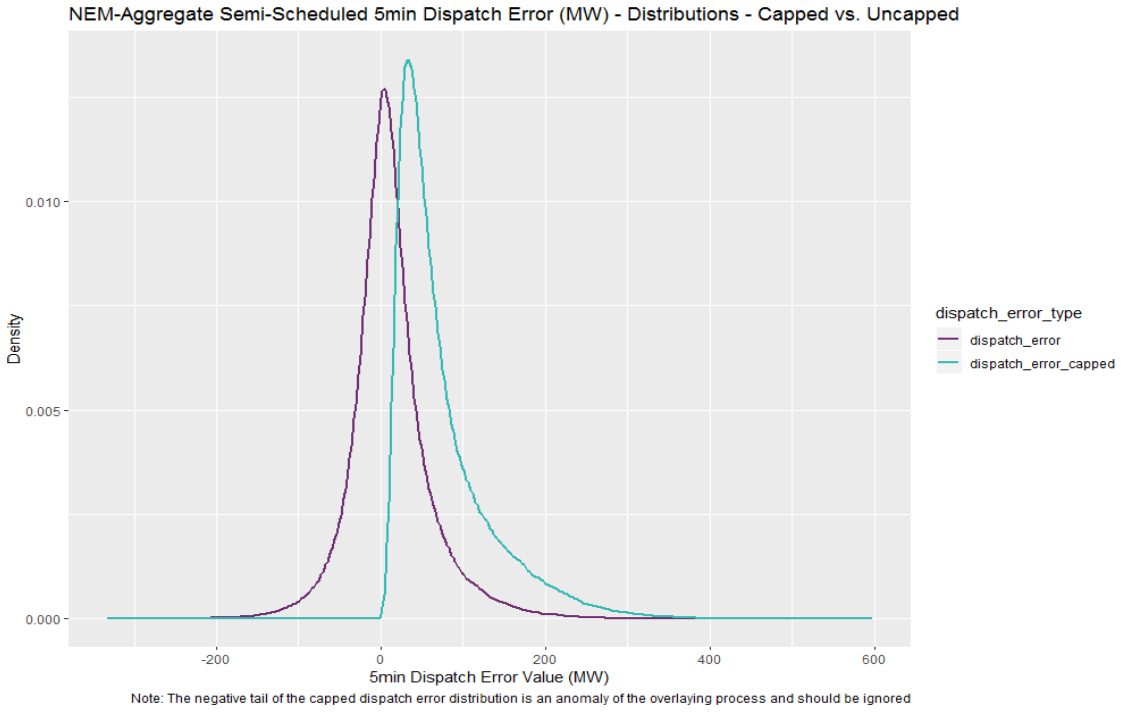
Evidence provided by participants, and the results of AER internal analysis, supports the assertion of economic and commercial losses as a consequence of the imposition of a cap during non semi dispatch intervals.

The AER also acknowledges that allowing deviations from target due to the resource in non semi dispatch intervals improves market efficiency.

Furthermore, in subsequent discussion with AEMO, they agreed that capping the output from semi scheduled generators in non semi dispatch intervals could have an adverse effect on the requirements for raise regulation and may increase overall FCAS costs.

AEMO provided analysis regarding the difference in the cumulated dispatch error with and without capping the output of semi scheduled generators in non semi dispatch intervals.

Figure 3 – NEM aggregate semi scheduled dispatch error (MW) – Capped and uncapped



Source: AEMO internal analysis

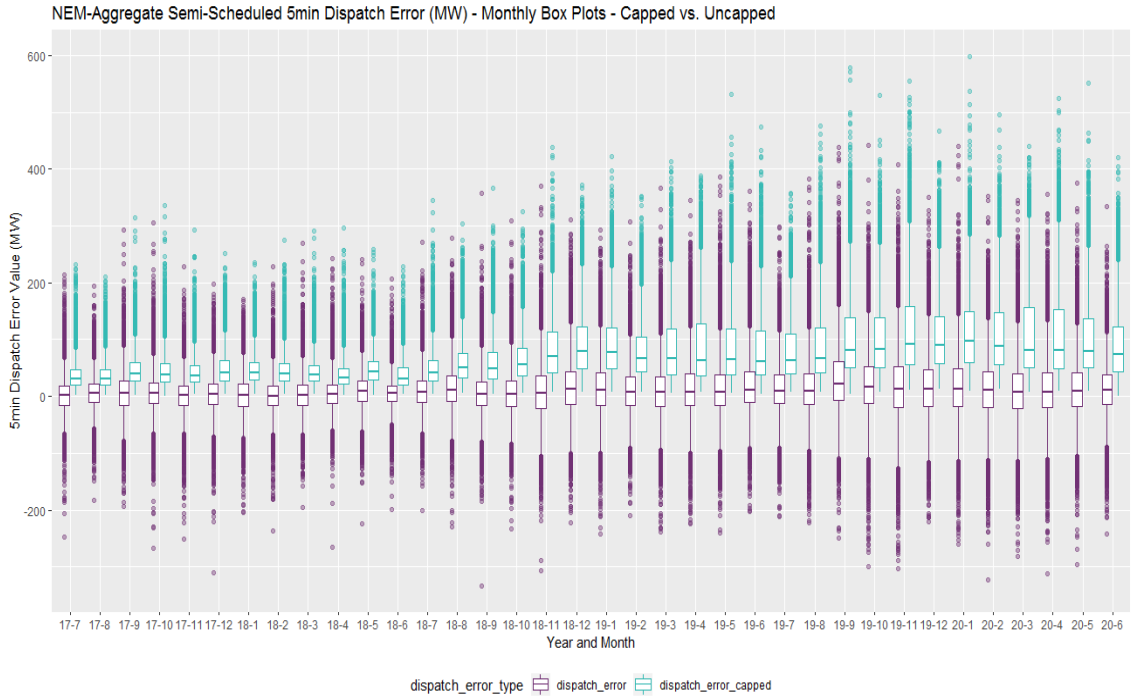
Figure 3 and Figure 4 show the statistical histograms or density charts of the difference between the forecast and the actual generation from all semi scheduled generators in the NEM in all dispatch intervals over the last three years. The purple line shows that the distribution is approximately symmetrical (with a slight bias towards an over forecast shown by the peak of the chart being slightly above zero). Of note the largest difference was in the order of 350 MW. The blue line is effectively the same calculation but caps the output of all

semi scheduled generators individually at the target. As the graph shows, the blue curve has shifted to the right, the highest point now occurring at around 40 MW, and the largest deviation increase to around 600 MW. Overall AEMO concluded that more FCAS raise would be needed to manage the power system if the output of each semi scheduled generator was capped at the forecast target.[15]

AEMO also provided analysis of the same data on a, more granular, monthly resolution. This analysis shows the inter-quartile ranges (the middle 50% of the events in the distribution) more clearly and highlights the outliers that occur outside that range. The large number of outliers exposes the long tails of the curves shows in Figure 3.

Figure 4 shows that at an aggregated NEM level the inter quartile ranges for the capped dispatch error are significantly more positive. This means the total capped actual generation for all semi scheduled generators was less than that for the total uncapped actual generation. The capped data also show larger positive outliers.

Figure 4 – NEM aggregate semi scheduled dispatch error (MW) by month – Capped and uncapped



Source: AEMO internal analysis

Overall AEMO's analysis supports the proposed rule change presented in the update paper.

As noted the AER's revised option described in the Update Paper no longer prohibits increase in output above a dispatch target if it is linked to increased resource and is not in a semi dispatch interval.

The AER considers the final proposal has clarified and confirmed that variation from dispatch instruction due to resource availability is now adequately included.

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15 The analysis does not take in to account that semi scheduled generators would be allowed to exceed targets if providing frequency support.

4.8. FCAS causer pays factors

Submissions

Submissions about whether FCAS causer pays arrangements could (or do) influence decisions to rapidly reduce output were varied.

Powershop/Meridian were opposed to any changes to FCAS causer pays arrangements due to the risk of inadvertent outcomes.

Hydro Tasmania and AGL each considered that changes to FCAS causer pays would have a material impact on deliberate and rapid changes in output.

Diamond Energy stated that the FCAS Causer Pays Factor currently creates a disincentive for semi scheduled generators to deviate from dispatch instructions.

AEMO agreed with the AER that causer pays arrangements are not an effective deterrent and changes to these systems may have unforeseen outcomes.

AER Response

In the Issues Paper the AER considered the extent to which the formulation of the current FCAS causer pays factor is likely to discourage the negative price shut down behaviour. We remain of that opinion, unless a major overhaul of the factors is undertaken. This conclusion was informed by analysis by AEMO presented in the Issues Paper.

The AER notes, that the FCAS causer pays arrangement may be more effective under the revised rule change proposal particularly if the revised proposal encourages improved forecasting. Improved forecast targets should reduce the average causer pays factor for each facility which may then accentuate the relative contribution to the total causer pays cost incurred by shutting down during a negative price period.

4.9. Forecasting

Submissions

Seven submissions made suggestions that AEMO's forecasting systems for semi scheduled generators, AWEFS and ASEFS, could or should be improved. Submissions suggested the inclusion of parameters such as improved site layout information including actual turbine outage information, wind direction, more wind and solar reference points on each site and wind speed and panel dusting measurements for solar. Clean Energy Investor Group said that AEMO needed better technology and live generator data to improve the forecasts. Meridian Energy said AEMO should accept all self-forecast information which would improve the information available to AEMO, and Pacific Hydro said that an increase in self-forecasting would be a positive outcome but more work is needed to include the design constraints for generator control systems. ACCIONA said that AEMO's forecasting systems would need to be enhanced to more accurately include site conditions (wind speed, direction and topography), across the site, wind turbine technology performance and site layout. ACCIONA considered that AWEFS and ASEFS are not currently fit for purpose especially if they are used to produce firm dispatch targets. AEC made a general suggestion for forecasting improvements without listing specific details.

Global Roam, Fulcrum 3D and the University of New South Wales CEEM discussed the limitations of AWEFS and ASEFS and opined that without improvements to forecasting methodologies it would be difficult to accurately dispatch semi scheduled generators under the options proposed by the AER.

AER response

The AER agrees that an improvement in the forecasts used in the determination of the overall dispatch solution by NEMDE and where it meets the NEO would be advantageous. However, the requirement to improve forecasting is not a specific recommendation or requirement of this rule change package nor is it part of the existing rules.

In summary the submissions highlighted that forecasting improvements would be obtained if the representation of each facility was more detailed and provided with more continuous situational updates. Enhancing AEMO's existing AWEFS and ASEFS tools could be costly and require considerable customisation, testing and verification. Given that the participants have full knowledge of the performance characteristics of their facilities and live detail in their systems a more economically efficient outcome may be achieved by AEMO facilitating self-forecasting to capitalise on that intimate local live data. We note that the Australian Renewable Energy Agency have successfully supported a number of self-forecasting trials.

AEMO advised that all semi scheduled generators may replace AEMOs ASEFS or AWEFS forecast with self-forecasts when the forecasts provided by the participant show improvement on those prepared by AEMO. AEMO further advised that of the 96 semi scheduled units in the NEM, 33 are accredited for self-forecasting, five are under assessment for self-forecasting and a further 19 have applied and are waiting AEMO assessment.

Regardless of forecasting improvements, the AER is of the view that the principles underpinning the revised proposal are valid. Actual performance against forecast will inform the compliance arrangements and clearly more accurate forecasts will improve the efficacy of the wider integration of intermittent renewable generation into the NEM now and into the future.

4.10. Prohibition on curtailment for the sole purpose of reacting to price

Submission

Pacific Hydro submitted they were unable to assess the situation in the time available and therefore argued for no rule change. Instead, Pacific Hydro as well as Tilt Renewables proposed a prohibition of curtailment for the sole purpose of reacting to price.

AER Response

The AER has considered this option carefully, as it is intended to target problematic conduct. However, the AER believes it would be difficult to frame a prohibition that makes compliance straightforward, and captures the behaviour of concern in all cases. The AER is also concerned that the evidentiary challenges in enforcing a provision based on purpose may allow unlawful behaviour to go undetected. The AER considers that its proposed approach is clearer, more effective, and consistent with the rules governing the operation of generators more generally.

5. AER proposal

5.1. Description of the proposed rule

After listening to the many stakeholders who participated in the workshop and meetings and reviewing the submissions to the two papers, the AER has concluded that it is appropriate to:

- retain the semi scheduled category within the NER;
- amend the NER to clarify the output of semi scheduled generating units must follow their available resource except during a semi dispatch interval when output should be limited to the cap specified by AEMO.[16]

Specifically, the AER considers that the NER should be amended to clarify that:

- a dispatch instruction to a semi scheduled generator will be in the form of a megawatt target for the end of the dispatch interval
- during a non semi dispatch interval the target will be based on the expected resource availability for the end of the interval
- semi scheduled generators will be expected to meet this target subject to variations in resource availability
- during a semi dispatch interval, the generator's output should be the lower of
    - the generator's output cap specified by AEMO; and,
    - the generator's output as determined by its resource availability in that dispatch interval[17].

The effect of these arrangements is, as far as possible, to retain existing arrangements and flexibility to reflect the variable resource, clarify the intention for semi scheduled generators to fully utilise their available resource unless limited by network conditions or, their offered availability, and restrict the rapid controlled deviations from the resource capability.

The amendments to the rules should be implemented within the current structure of the NER. In order to minimise regulatory disruption the AER proposes making only minor changes to:

- clause 4.9.2 to remove the reference to maximum dispatch for semi scheduled generators
- the inclusion of a new sub clause, 4.9.8 (a2), to provide for circumstances when a semi scheduled generator's failure to comply with dispatch instructions due to resource availability is permitted
- amendments to the glossary term for a dispatch level to clarify obligations during semi dispatch and non semi dispatch intervals
- inclusion of a new glossary term to define the term "resource"

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[16] As defined in the existing rules, a network constraint or a dispatch offer which results in a semi scheduled generator receiving a dispatch target less than the forecast based on the available resource will still trigger a semi dispatch cap and a semi dispatch interval

[17] In a semi dispatch interval output is constrained by network conditions or the generator's bids, and economic dispatch by NEMDE results in a target less than the resource capability. This is no change from current arrangements.

Clause 4.9.8(a) would remain the operative provision for compliance purposes and therefore no change to the civil penalties provisions would be needed. The AER's proposed rule changes are in appendix B.

5.2. How will the proposal address the issue?

The AER considers that these amendments will restrict the potential for large and rapid deviations from dispatch instructions and, in line with the request from COAG Energy Council, make semi scheduled generators behave more like scheduled generators.

The revised proposal retains the current flexibility of intermittent semi scheduled generators to fully utilise their available resource where system conditions permit and imposes limitations on rapid controlled deviations from the resource capability that are the basis for this rule change.

This change should ensure ancillary services are deployed to address variations in generator capability, resource related reasons and variations in demand, rather than being required for controllable commercial reasons that can lead to adverse impact on system security and the cost of ancillary services.

If the rule change is made as proposed in the revised option, the AER expects that semi scheduled generators wishing to avoid dispatch at low prices will utilise the rebidding arrangements in the NEM.

5.3. How will the AER monitor compliance?

The proposed rule change will improve the AER's ability to monitor and enforce compliance with dispatch instructions as well as provide greater clarity of what is expected from semi scheduled generators at all times.

The AER will consider all relevant factors when monitoring semi scheduled generators' compliance with dispatch instructions. The AER already monitors dispatch instruction compliance by scheduled generators and, during semi dispatch intervals, semi scheduled generators' compliance with the imposed cap. As such monitoring the compliance by semi scheduled generators with respect to their performance against a target in non semi dispatch intervals is only an incremental increase in our current work program. While the AER will need to consider addition variables such as the variation in performance against the resource forecast, it anticipates working with AEMO to develop appropriate metrics to inform that monitoring function. Other relevant technical factors will also be considered as discussed in 4.4.

As with broader enforcement of the NER the AER will follow the approach as set out in the Compliance and Enforcement Policy.[18]

5.4. Transition to the new rules

The rule change as described should only affect the negative price shut down behaviours that occur without warning but require intervention, either manual or through software.

Rewriting procedures and re-educating operating staff for those sites where the intervention is manually initiated should not be unduly burdensome.

[18] AER, 2019, Compliance and enforcement policy, www.aer.gov.au/publications/corporate-documents/aer-compliance-enforcement-policy

The AER understands that where the intervention is controlled by software, these automated systems are not an intrinsic part of the control systems supplied by the original wind or solar original equipment manufacturers and should be relatively easily disabled.

As a consequence of this, the AER considers that a relatively short transitional period, before these rules commence, would be appropriate. A rapid transition would also immediately clarify the operational expectations for semi scheduled generators in the dispatch process and should improve market efficiency and outcomes.

6. Potential impacts of the proposed rule change

The AER's assessment of the potential impacts has been informed by further discussion and analysis with AEMO, oral consultation with the industry and written feedback from stakeholders in their submissions.

6.1. Impact on energy

Compared to the status quo by improving forecasting and proscribing the negative price response the proposed change should reduce the volume of energy required for FCAS. Optimisation of dispatch through AEMO's dispatch software, NEMDE, presumes all generators comply with dispatch instructions and the proposed rule will increase the probability that energy will be produced at least cost, contributing to the National Electricity Objective (NEO). The materiality of this outcome will grow as more intermittent generation connects.

Where participants are sensitive to negative prices their increased vigilance may reduce the number of negatively priced intervals.

6.2. Impact on frequency and FCAS

The proposed rule will reduce the call on FCAS. If instances of controllable rapid reductions in output that prompted this proposal were to grow, in the absence of the amendment it is likely there would be an increase in occasions where the frequency exceeds the normal operating frequency band. This situation would prompt AEMO to increase the amount of FCAS and increase cost of supply. The proposed rule change will assist in controlling the cost of FCAS and assist in ensuring frequency stays within the normal operating band without avoidable increase in cost. These outcomes result in more efficient operation within the market and further contribute to satisfying the NEO.

6.3. Impact on semi scheduled generators

The proposed rule change will constrain semi scheduled generators from unilaterally reducing exposure to negative prices. Semi scheduled generators who wish to reduce their exposure to negative prices will need to actively monitor price forecasts and submit offers and rebids to achieve this.

The risk of exposure to an un-forecast low or negative price during the time it takes to ramp down to meet a dispatch instruction (and similarly, lack of exposure to high price during the time to ramp up rapidly in the event they are operating at below their current capacity for any reason) will remain. The fast ramping ability of semi scheduled generators is not able to be fully utilised which is an unavoidable outcome and a balance between overall system cost and security and the private commercial interest of semi scheduled generators with this capability. However improved forecasting and stricter controls on output away from target should result in improved causer pays factors.

6.4. Impact on other market participants

The proposed rule change will reduce the cost of supplying electricity and benefit customers and therefore satisfies the NEO. In the absence of the rule change, increased volatility in frequency will create a risk to system security, this is managed by AEMO adjusting the FCAS requirement. It will increase the cost to provide that FCAS service and that incremental cost would flow through to customers.

The proposal will remove calls for FCAS to meet the negative price response which should create downward pressure on FCAS costs. Given all semi scheduled generators are already required to have the capability to remain below a cap during semi dispatch intervals and the proposed changes only clarifies the obligations around generating in response to the available resource, no changes or costs should need to be made to generator systems.

6.5. Impact on AEMO

AEMO's core dispatch process will be unaffected. However there will be an increased reliance on forecasting inputs to the dispatch process. As noted in section 4.9 above, participants provided a number of suggestions regarding additional parameters that will improve the AEMO forecasts. Careful consideration of the NEO will be needed to balance the cost of enhancing AWEFS and ASEFS against facilitating self-forecasting by supporting the development of bespoke forecasting systems tailored to each semi scheduled generator.

The AER will work with AEMO to determine methodologies to monitor the performance of the semi scheduled generators against the proposed changes to the NER.

7. How the proposed rule contributes to the National Electricity Objective

The National Electricity Objective as stated in the (NEL) 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:*
>
> - *price, quality, safety and reliability and security of supply of electricity*
> - *the reliability, safety and security of the national electricity system.*

The proposed rule change contributes to the NEO by enhancing security of the supply of electricity and reducing the cost for services dispatched by AEMO to manage power system security and is therefore in the long term interests of consumers cost of supply.

The proposed changes are an incremental response to an emerging but not yet major problem. The changes do not foreclose options for more extensive changes as the amount of intermittent generator increases and holistic reform of the design of the NEM progresses under the work of the ESB, which is also in the long term interests of consumers. The proposed changes are therefore proportionate to the problem at hand in terms of being minimally disruptive and low cost, further enhancing the long term interests of consumer costs.

APPENDIX A: List of submissions to issues and update papers

Table 1 - Stakeholders that made submissions to the issues paper

Stakeholder
Australian Energy Market Operator
AGL
Energy Queensland
ENGIE
Major Energy Users
Shell Energy Australia
Snowy Hydro
AMS
Australian Energy Council
Clean Energy Council
Clean Energy Investor Group
Edify Energy
EnergyAustralia
Fulcrum 3D
Global Roam
Hydro Tasmania
Infigen
Impact Investment Group
Origin Energy
Powershop / Meridian
Tilt Renewables
RES
ACCIONA
Australian Sugar Milling Council

Stakeholder
HARD Software
NEOEN
Pacific Hydro
RATCH Australia
University of New South Wales - Collaboration on Energy and Environmental Markets
Diamond Energy

Table 2 – Stakeholders that emailed or made submissions to the update paper

Stakeholder
Clean Energy Investor Group
Infigen
Meridian
Shell Energy Australia
Tilt Renewables
Clean Energy Council
Energy Queensland
University of New South Wales - Collaboration on Energy and Environmental Markets

APPENDIX B: Proposed rule changes

The AER suggests that the following rules need to be amended to achieve a more secure and reliable power system for the NEM.

Rules Clauses and Glossary Terms that would need to be addressed for the revised rule change option

New Glossary Terms

resource, for a *Semi Scheduled Generator*, means the natural environmental energy from which the generator creates electrical energy, for example, for a solar farm - solar radiation, and for a wind farm the energy captured from the moving air.

Revised Glossary Terms

dispatch level , in relation to a semi-scheduled generator, means:

1) for a *semi-dispatch interval*, an amount of electricity specified in the *dispatch instruction* as ~~the *semi-scheduled generating units* maximum permissible~~ both the target and the maximum permissible *active power* at the end of the *dispatch interval* specified in the *dispatch instruction*; and.

2) for a *non semi-dispatch interval*, an ~~estimate of the~~ amount of electricity specified as the target *active power* at the end of the *dispatch interval* specified in the *dispatch instruction*.

Revised Rules Clauses

Clause 4.9.2 - update sub clause (a)(2) to refer to semi-scheduled generating units and remove sub clause (a)(3)

4.9.2 Instructions to Scheduled Generators and Semi-Scheduled Generators

(a) To implement *central dispatch* or, where *AEMO* has the power to direct or to instruct a *Scheduled Generator* or *Semi-Scheduled Generator* either under Chapter 3 or this Chapter, then for the purpose of giving effect to that direction or instruction, *AEMO* may at any time give an instruction to the *Generator* in relation to any of its *generating units (a dispatch instruction*), in accordance with clause 4.9.5(b), nominating:

1. whether the facilities for *generation* remote control by *AEMO*, if available, must be in service; and

2. in the case of a *scheduled generating unit* or *semi scheduled generating unit*, the level or schedule of power to be supplied by the generating unit over the specified period~~; and~~.

~~3. in the case of a semi-scheduled generating unit, the maximum level of power to be supplied by the generating unit over the specified period.~~

Clause 4.9.8 – update to specifically ensure that semi-scheduled participants are expected to follow their dispatch instructions subject to the availability of their resource.

4.9.8 General responsibilities of Registered Participants

(a) A *Registered Participant* must comply with a *dispatch instruction* given to it by *AEMO* unless to do so would, in the *Registered Participant's* reasonable opinion, be a hazard to public safety or materially risk damaging equipment.

(a1) A *Scheduled Generator* or *Semi-Scheduled Generator* is not taken to have failed to comply with a *dispatch instruction* as a consequence of its *generating unit* operating in *frequency response mode* to adjust *power system frequency* in response to *power system* conditions.

(a2) A *Semi-Scheduled Generator* is not taken to have failed to comply with *a dispatch instruction* for a *dispatch interval* as a consequence of:

i. the level of power supplied by the *generating unit* being less than the level nominated in a *dispatch instruction*, to the extent that the shortfall is the result of *resource* availability;

ii. in a *non semi-dispatch interval*, the level of power supplied by the *generating unit* exceeding the level nominated in a *dispatch instruction*, to the extent that the excess is the result of *resource* availability.

(a) A *Scheduled Generator* must ensure that each of its *scheduled generating units* is at all times able to comply with the latest *generation dispatch offer* under Chapter 3 in respect of that generating unit.

(b1) A *Scheduled Network Service Provider* must ensure that each of its *scheduled network services* is at all times able to comply with the latest *network dispatch offer* under Chapter 3 in respect of that market network service.

(b) A *Registered Participant* must ensure that each of its facilities is at all times able to comply with any relevant *dispatch bid* under Chapter 3 in respect of the *facility* (as adjusted by any subsequent restatement of that bid under Chapter 3).

(c) A *Market Participant* which has classified a *generating unit* or *load* as an *ancillary service generating unit* or an *ancillary service load*, as the case may be, must ensure that the *ancillary service generating unit* or *ancillary service load* is at all times able to comply with the latest *market ancillary service offer* for the relevant *trading interval*.

(d) A *Semi-Scheduled Generator* must ensure that each of its *semi-scheduled generating units* is at all times able to comply with its latest *generation dispatch offer.*

Rules and Glossary Terms discussed in the Issues paper that are not to be changed

Glossary Terms

dispatch instruction

An instruction given to a *Registered Participant* under clauses 4.9.2, 4.9.2A, 4.9.3, 4.9.3A, or to an *NMAS provider* under clause 4.9.3A.

Intermittent

A description of a *generating unit* whose output is not readily predictable, including, without limitation, solar generators, wave turbine generators, wind turbine generators and hydro-generators without any material storage capability.

semi-dispatch interval

For a semi-scheduled generating unit, a dispatch interval for which either:

(a) a *network constraint* would be violated if the *semi-scheduled generating unit's* generation were to exceed the *dispatch level* specified in the related *dispatch instruction* at the end of the *dispatch interval*; or

(b) the *dispatch level* specified in that *dispatch instruction* is less than the *unconstrained intermittent generation forecast* at the end of the *dispatch interval*, and which is notified by AEMO in that *dispatch instruction* to be a *semi-dispatch interval*.

semi-scheduled generating system

A *generating system* comprising *semi-scheduled generating units*.

semi-scheduled generating unit

(a) A *generating unit* classified in accordance with clause 2.2.7.

(b) For the purposes of Chapter 3 and rule 4.9, two or more *generating units* referred to in paragraph (a) that have been aggregated in accordance with clause 3.8.3

Semi-Scheduled Generator

A *Generator* in respect of which any *generating unit* is classified as a *semi scheduled generating unit* in accordance with Chapter 2

Rules Clauses

3.7B Unconstrained intermittent generation forecast

(a) AEMO must prepare a forecast of the *available capacity* of each *semi scheduled generating unit* (to be known as an *unconstrained intermittent generation forecast*) in accordance with this rule 3.7B for the purposes of:

1. the *projected assessment of system adequacy process*;
2. *dispatch*; and
3. *pre-dispatch*.

(b) A *Semi-Scheduled Generator* must:

1. submit to AEMO, in accordance with the t*imetable*, the *plant availability* for each *semi-scheduled generating unit* for the purpose of paragraph (a) as soon as the *Semi-Scheduled Generator* becomes aware that the *plant availability* of the unit is at least 6MW below or above the *nameplate rating* of the unit; and
2. where the *Semi-Scheduled Generator* has submitted *plant availability* in accordance with subparagraph (1), notify *AEMO* in accordance with the *timetable* as soon as the *Semi-Scheduled Generator* becomes aware of any changes to the *plant availability* of that *semi-scheduled generating unit* until such time as the plant availability of that *semi-scheduled generating*

unit is no longer at least 6MW below or above the *nameplate rating* of the unit.

(c) When preparing an *unconstrained intermittent generation forecast* for the purposes referred to in paragraph (a), *AEMO* must take into account:

1. the maximum *generation* of the *semi-scheduled generating unit* provided by the *Semi-Scheduled Generator* as part of its *bid and offer validation data*;
2. the *plant availability* of the *semi-scheduled generating unit* submitted by the *Semi-Scheduled Generator* under paragraph (b);
3. the information obtained for the *semi-scheduled generating unit* from the *remote monitoring equipment* specified in clause S5.2.6.1;
4. the forecasts of the energy available for input into the electrical power conversion process for each *semi-scheduled generating unit*;
5. the *energy conversion model* for each *semi-scheduled generating unit*;
6. the assumption that there are no *network constraints* otherwise affecting the *generation* from that *semi-scheduled generating unit*; and
7. the timeframes of:
   i. *pre-dispatch*;
   ii. *dispatch*,
   iii. *medium term PASA*; and
   iv. *short term PASA*.

(d) *NEMMCO* must prepare the first *unconstrained intermittent generation forecast* for each *semi-scheduled generating unit* by 31 March 2009 and there must be an *unconstrained intermittent generation forecast* for each *semi-scheduled generating unit* available at all times after that date.

Clause 3.8.4 Notification of scheduled capacity

All *Scheduled Generators* and *Market Participants* with *scheduled generating units, scheduled network services* and/or *scheduled loads* must inform *AEMO* of their *available capacity* as follows in accordance with the *timetable*:

(a) *Scheduled Generators* and *Market Participants* must notify *AEMO* of the *available capacity* of each *scheduled generating unit*, *scheduled network service* and/or *scheduled load* for each *trading interval* of the *trading day*;

(b) subsequent *changes* may only be made to the information provided under clause 3.8.4(c), (d) and (e) in accordance with clause 3.8.22;

(c) for *Scheduled Generators*, two *days* ahead of each *trading day*:

1. a MW capacity profile that specifies the MW available for each of the 48 *trading intervals* in the *trading day*;
2. estimated *commitment* or *decommitment* times;
3. daily *energy* availability for *energy constrained generating units*; and
4. an up *ramp rate* and a down *ramp rate*;

(d) for *scheduled loads*, two *days* ahead of each *trading day*:

1. a MW capacity profile that specifies the MW available for dispatch for each of the 48 *trading intervals* in the *trading day*;
2. daily *energy* availability for *energy constrained scheduled load*; and
3. an up *ramp rate* and a down *ramp rate*;

(e) for *scheduled network services*, two *days* ahead of each *trading day*:

1. a MW capacity profile that specifies the power transfer capability in each direction available for each of the 48 *trading intervals* in the *trading day*; and
2. an up *ramp rate* and a down *ramp rate.*

Clause 3.8.19 Dispatch inflexibilities

(a) Subject to clause 3.8.19(a2), if a *Scheduled Generator* or *Market Participant* reasonably expects one or more of its *scheduled generating units*, *scheduled network services* or *scheduled loads* to be unable to operate in accordance with *dispatch instructions* in any *trading interval*, due to abnormal *plant conditions* or other abnormal operating requirements in respect of that *scheduled generating unit*, *scheduled network service* or *scheduled load*, it must advise *AEMO* through the *PASA* process or in its *dispatch offer* or *dispatch bid* in respect of that *scheduled generating unit*, *scheduled network service* or *scheduled load*, as appropriate under this Chapter, that the *scheduled generating unit*, *scheduled network service* or *scheduled load* is i*nflexible* in that *trading interval* and must specify a fixed *loading level* at which the *scheduled generating unit*, *scheduled network service* or *scheduled load* is to be operated in that *trading interval.*

(a1) Subject to clause 3.8.19(a2), if a *Semi-Scheduled Generator* reasonably expects one or more of its *semi-scheduled generating units* to be unable to operate in accordance with *dispatch instructions* in any *trading interval* due to abnormal *plant* conditions or other abnormal operating requirements in respect of that *semi-scheduled generating unit*, it must advise *AEMO* in its *dispatch offer* in respect of that *semi-scheduled generating unit*, as appropriate under this Chapter, that the *semi-scheduled generating unit* is *inflexible* in that *trading interval* and must specify a maximum *loading level* at or below which the *semi-scheduled generating unit* is to be operated in that *trading interval*. Where the specified maximum loading level in these circumstances exceeds the *unconstrained intermittent generation forecast* for the *semi-scheduled generating unit*, the *dispatch level* for the *semi scheduled generating unit* will nonetheless not exceed the *unconstrained intermittent generation forecast*.

Clause 3.8.20 Pre-dispatch schedule

(a) Each *day*, in accordance with the *timetable*, *AEMO* must prepare and *publish* a *pre-dispatch schedule* covering each *trading interval* of the period commencing from the next *trading interval* after the current *trading interval* up to and including the final *trading interval* of the last *trading day* for which all valid *dispatch bids* and *dispatch offers* have been received in accordance with the *timetable* and applied by the *pre-dispatch* process.

(b) The *pre-dispatch* process is to have a resolution of one *trading interval* and no analysis will be made of operations within the *trading interval*, other than to

ensure that *contingency capacity reserves* are adequate as set out in Chapter 4.

(c) *AEMO* must determine the *pre-dispatch schedule* for each *trading interval* on the basis of:

1. *dispatch bids*, *dispatch offers* and *market ancillary service offers* submitted for that *trading interval*;
2. *AEMO's* forecast *power system load* for each *region* for that *trading interva*l; and
3. the *unconstrained intermittent generation forecasts*,

and by using a process consistent with the principles for *central dispatch* as set out in clause 3.8.1.

(d) In determining the *pre-dispatch schedule AEMO* shall not take account of any *dispatch inflexibility profile submitted* in accordance with clause 3.8.19.

(e) Any inputs made to the *pre-dispatch* process by *AEMO* for the purpose of achieving a physically realisable schedule or to satisfy *power system security* requirements must be made prior to release of the *pre-dispatch schedule* and recorded by *AEMO* in a manner suitable for audit.

(f) The *pre-dispatch schedule* must include the details set out in clause 3.13.4(f).

(g) Each *Scheduled Generator*, *Scheduled Network Service Provider* and *Market Customer* which has classified a *scheduled load* and *Market Participant* (which has classified an *ancillary service generating unit* or *ancillary service load*) must ensure that it is able to *dispatch* the relevant plant as required under the *pre-dispatch schedule* and is responsible for changing inputs to the *central dispatch* process, if necessary to achieve this, via the rebidding provisions under clause 3.8.22.

(h) The *pre-dispatch schedule* must be re-calculated and the results re-*published* by *AEMO* regularly in accordance with the *timetable*, or more often if a change in circumstances is deemed by *AEMO* to be likely to have a significant effect on the operation of the *market*.

(i) *AEMO* must fully document the operation of the *pre-dispatch* process, including the principles adopted in making calculations required to be included and all such documentation must be made available to *Scheduled Generators*, *Semi-Scheduled Generators* and *Market Participants* at a fee to be set by *AEMO* to cover its costs of supplying such documentation.

(j) The following *pre-dispatch* outputs relating specifically to a *generating unit*, *scheduled network service*, *scheduled load* or *ancillary service load* operated by a *Scheduled Generator*, *Semi-Scheduled Generator* or *Market Participant* (as the case may be) must be made available electronically to the relevant *Generator* or *Market Participant* on a confidential basis:

1. the scheduled times of *commitment* and de-commitment of individual *slow start generating units*;
2. scheduled half hourly *loading level* for each scheduled entity;
3. scheduled provision of *ancillary services*;
4. scheduled *constraints* for the provision of *ancillary services*;
5. scheduled *constraints* due to *network* limitations;

6. *unconstrained intermittent generation forecasts* for each *trading interval;* and

7. for each *semi-scheduled generating unit* and *trading interval,* whether or not a condition for setting a *semi-dispatch interval* applies.

(k) Where the *pre-dispatch schedule* may have failed to *dispatch* a *scheduled generating unit* or a *semi-scheduled generating unit* to maximise the joint value of *energy* and *ancillary services pre-dispatch* outputs of a *scheduled generating unit* or *semi-scheduled generating unit*, due to the *generating unit* operating outside its *enablement limit*, *AEMO* must notify the *Scheduled Generator* or *Semi-Scheduled Generator* operating the relevant *generating unit* electronically on a confidential basis.

Clause 3.8.23 Failure to conform to dispatch instructions

(a) If a *scheduled generating unit*, *scheduled network service* or *scheduled load fails* to respond to a *dispatch instruction* within a tolerable time and accuracy (as determined in *AEMO's* reasonable opinion), then the *scheduled generating unit*, *scheduled network service* or *scheduled load* (as the case may be):

1. is to be declared and identified as non-conforming; and

2. cannot be used as the basis for setting *spot prices*.

(b) If a *semi-scheduled generating unit* fails to respond to a *dispatch instruction* within a tolerable time and accuracy (as determined in *AEMO's* reasonable opinion) in a *semi-dispatch interval* where the unit's actual *generation* is more than the *dispatch level*, the unit is to be declared and identified as nonconforming and cannot be used as the basis for setting *spot prices*.

Clause 3.8.21 On-line dispatch process

(a) *Dispatch bids* and *dispatch offers* must be *centrally dispatched* by *AEMO* using the *dispatch algorithm*.

(a1) A *dispatch interval* is to be five minutes in duration.

(b) The *dispatch algorithm* is to be run by *AEMO* for each *dispatch interval*. If the *dispatch algorithm* is not successfully run for any *dispatch interval* then the values of the last successful run of the *dispatch algorithm* must be used for that *dispatch interval*.

(c) *Central dispatch* results in the setting of *dispatch prices* and *ancillary services prices* for each *dispatch interval* and *spot prices* for each *trading interval* in accordance with rule 3.9.

(d) Where possible, *dispatch instructions* will be issued electronically via the *automatic generation control system* or via an electronic display in the *plant* control room (which may be onsite or offsite) of the *Scheduled Generator*, or *Market Participant* (as the case may be).

(e) *AEMO* may issue *dispatch instructions* in some other form if in its reasonable opinion the methods described in paragraph (d) are not possible.

(f) A *Scheduled Generator* or *Market Participant* must ensure it has facilities to receive *dispatch instructions* in the manner described in this clause 3.8.21.

(g) *Dispatch instructions* that are issued via the *automatic generation control system* are to be issued progressively at intervals of no more than 5 minutes

following re-evaluation of *central dispatch* to achieve a prompt and smooth implementation of the outcomes of each *central dispatch* update.

Clause 3.13.4 Spot market

….

(q) Each *day*, in accordance with the *timetable*, *AEMO* must publish details of:

1. *dispatched generation*, *dispatched network service* or *dispatched load* for each *scheduled generating unit*, *semi-scheduled generating unit*, *scheduled network service* and *scheduled load* respectively in each *trading interval* and *dispatch interval*; and
2. for each *semi-scheduled generating unit* in each *trading interval* and *dispatch interval*, whether or not a condition for setting a *semi dispatch interval applied,*

for the previous *trading day*.

Clause 3.15.6A Ancillary service transactions

…..

(k) *AEMO* must prepare a procedure for determining contribution factors for use in paragraph (j) and, where *AEMO* considers it appropriate, for use in paragraph (nb), taking into account the following principles:

1. the contribution factor for a *Market Participant* should reflect the extent to which the *Market Participant* contributed to the need for *regulation services*;
2. the contribution factor for all *Market Customers* that do not have *metering* to allow their individual contribution to the aggregate need for *regulation services* to be assessed must be equal;
3. for the purpose of paragraph (j)(2), the contribution factor determined for a group of r*egions* for all *Market Customers* that do not have *metering* to allow the individual contribution of that *Market Customer* to the aggregate need for *regulation services* to be assessed, must be divided between *regions* in proportion to the total *customer energy* for the *regions*;
4. the individual *Market Participant's* contribution to the aggregate need for *regulation services* will be determined over a period of time to be determined by *AEMO*;
5. a *Registered Participant* which has classified a *scheduled generating unit, semi-scheduled generating system*, *scheduled load*, *ancillary service generating unit* or *ancillary service load* (called a **Scheduled Participant**) will not be assessed as contributing to the deviation in the *frequency* of the *power system* if within a *dispatch interval*:
    i. subject to the provision of *primary frequency response* by that Scheduled Participant in accordance with the *Primary Frequency Response Requirements*, the Scheduled Participant achieves its *dispatch* target at a uniform rate;

ii. the Scheduled Participant is *enabled* to provide a *market ancillary service* and responds to a control signal from *AEMO* to *AEMO's* satisfaction; or

iii. the Scheduled Participant is not *enabled* to provide a *market ancillary service,* but responds to a need for *regulation services* in a way which tends to reduce the aggregate deviation;

6. where contributions are aggregated for *regions* that are operating asynchronously during the calculation period under paragraph (i), the contribution factors should be normalised so that the total contributions from any non-synchronised *region* or *regions* is in the same proportion as the total *customer energy* for that *region* or *regions*; and

7. a *Semi-Scheduled Generator* will not be assessed as contributing to the deviation in the *frequency* of the *power system* if within a *dispatch interval*, the *semi-scheduled generating unit*:

i. subject to the provision of *primary frequency response* by that *semi-scheduled generating unit* in accordance with the *Primary Frequency Response Requirements*, achieves its *dispatch level* at a uniform rate;

ii. is *enabled* to provide a *market ancillary service* and responds to a control signal from *AEMO* to *AEMO's* satisfaction; or

iii. is not *enabled* to provide a *market ancillary service*, but responds to a need for *regulation services*.

Clause 4.9.4 Dispatch related limitations on Scheduled Generators and Semi Scheduled Generators

A *Scheduled Generator* or *Semi-Scheduled Generator* (as the case may be) must not, unless in the *Generator's* reasonable opinion, public safety would otherwise be threatened or there would be a material risk of damaging equipment or the environment:

(a) send out any *energy* from the *generating unit,* except:

1. in accordance with a *dispatch instruction*;

2. in response to remote control signals given by *AEMO* or its agent;

3. in connection with a test conducted in accordance with the requirements of this Chapter or Chapter 5; or

3A. as a consequence of its operation in frequency response mode in order to adjust power system frequency in response to power system conditions; or

4. in the case of a *scheduled generating unit,* in accordance with the *self-commitment* process specified in clause 4.9.6 up to the *self-dispatch level*;

(b) adjust the *transformer tap position* or *excitation control system voltage* setpoint of a *scheduled generating unit* or *semi-scheduled generating unit* except:

1. in accordance with a *dispatch instruction*;

2. in response to remote control signals given by *AEMO* or its agent;

3. if, in the *Generator's* reasonable opinion, the adjustment is urgently required to prevent material damage to the *Generator's plant* or associated equipment, or in the interests of safety; or
4. in connection with a test conducted in accordance with the requirements of rule 5.7;

(c) energise a *connection point* in relation to a *generating unit* without obtaining approval from *AEMO* immediately prior to *energisation*;

(d) *synchronise* or *de-synchronise* a *scheduled generating unit* with a *nameplate rating* of 30MW or more, without prior approval from *AEMO* or other than in response to a *dispatch instruction* except:

1. *de-synchronisation* as a consequence of the operation of automatic protection equipment; or
2. where such action is urgently required to prevent material damage to *plant* or equipment or in the interests of safety;

(e) change the *frequency response mode* of a *scheduled generating unit* without the prior approval of *AEMO*; or

(f) remove from service or interfere with the operation of any *power system* stabilising equipment installed on that *generating unit*.

Clause 4.9.5 Form of dispatch instructions

(a) A *dispatch instruction* for a *scheduled generating unit*, *semi-scheduled generating unit*, *scheduled network service* or *scheduled load* must include the following:

1. specific reference to the *generating unit* (including any aggregated generating unit), *scheduled network service* or *scheduled load* or other facility to which the *dispatch instruction* applies;
2. the desired outcome of the *dispatch instruction* (if applicable) such as *active power*, *reactive power*, *transformer tap* or other outcome;
3. in the case of a *dispatch instruction* under clause 4.9.2, the *ramp rate* (if applicable) which is to be followed by the *generating unit* or a specific target time to reach the outcome specified in the *dispatch instruction*;
4. the time the *dispatch instruction* is issued;
5. if the time at which the *dispatch instruction* is to take effect is different from the time the *dispatch instruction* is issued, the start time; and
6. in the case of a dispatch instruction for a *semi-scheduled generating unit*:
    i. a notification as to whether the *dispatch interval* to which the *dispatch instruction* relates is a *semi-dispatch interval* or a *non semi-dispatch interval*; and
    ii. the *dispatch level*.

(a1) A dispatch instruction for an ancillary service must include:

1. specific reference to the *generating unit* or load to which the *dispatch instruction* applies;

2. the desired outcome of the *dispatch instruction*;
3. the time the *dispatch instruction* is issued; and
4. if the time at which the *dispatch instruction* is to take effect is different from the time the *dispatch instruction* is issued, the start time.

(b) The *dispatch instruction* must be provided as provided in clause 3.8.21.