AEMC

DETERMINATION

Australian Energy Market Commission

RULE DETERMINATION

NATIONAL ELECTRICITY AMENDMENT (SEMI-SCHEDULED GENERATOR DISPATCH OBLIGATIONS) RULE 2021

AER

11 MARCH 2021

INQUIRIES

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ABOUT THE AEMC

The AEMC reports to the Council of Australian Governments (COAG) through the COAG Energy Council. We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the COAG Energy Council.

SUMMARY

1 On 11 March 2021, the Australian Energy Market Commission (AEMC or Commission) made a final determination to amend the national electricity rules (NER or Rules) regarding semi-scheduled generator dispatch obligations. The final rule addresses the issue of semi-scheduled generators curtailing generation in response to market prices without rebidding or waiting for an updated dispatch instruction from the Australian Energy Market Operator (AEMO), thus promoting system security outcomes in the NEM.

2 This rule change actions one of the Energy Security Board's (ESB) recommendations for interim security measures. These are designed to improve market outcomes while more fundamental reforms are designed and implemented through the ESB's 2025 market design process (of which the AEMC is a part).

The rule change request

3 On 24 September 2020, the Australian Energy Regulator (AER) made a request to the AEMC to make a rule regarding semi-scheduled generator dispatch obligations. This rule change request proposed to amend and clarify obligations applying to semi-scheduled generators in the NEM. In particular, it sought to clarify that the output of a semi-scheduled generating system must follow the MW dispatch level specified by AEMO during all dispatch intervals and observe a cap in generation during semi-dispatch intervals. Requirements for both dispatch and semi-dispatch intervals were subject to resource availability.[1]

4 The AER's rule change request followed an observation by the ESB that 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.

5 The AER identified significant emerging system security implications from this behaviour and submitted the rule change on the basis that it is in the long-term interest of consumers. The AER considered the proposal "enhances security of the supply of electricity and reduces the cost for services dispatched by AEMO to manage power system security, particularly as penetrations on intermittent generation in the NEM increase."

The final rule

6 The Commission has determined to make a more preferable final rule that addresses the AER's rule change request. The Commission has made some changes to the draft rule to accommodate suggestions by stakeholders, including in response to the draft determination. However, the policy intent and approach is the same as that proposed by the AER.

7 The key features of the Commission's final determination are:

1 During a semi-dispatch interval AEMO constrains a semi-scheduled generator's output to be below its resource availability. A semi-dispatch interval occurs due to a binding constraint or where the offers made by a semi-scheduled generator make its dispatch uneconomic.

- The final rule requires a semi-scheduled generator to comply with a MW dispatch level, contained in a dispatch instruction issued by AEMO, for all dispatch intervals
- A semi-scheduled generator is considered to have complied with the dispatch level in its dispatch instruction, if:
  - it only varies from the dispatch level as a result of energy source availability, and
  - in the case of a 'semi-dispatch interval' does not exceed the dispatch level regardless of energy source availability.

8 The effect of the final rule is to require semi-scheduled generating units to follow their available resource except during a semi-dispatch interval, when output is also limited to the cap specified by AEMO.

9 The final rule also includes supporting changes, including a housekeeping amendment to the definition of 'inflexible, inflexibility' to capture semi-scheduled generators and a transitional requirement for AEMO to update any relevant power system operating procedure to take into account the rule change.

Differences between the draft and final rules

10 The Commission's final determination and draft determination are the same with some changes to the drafting to better implement the policy intent of the rule change.

11 The final determination includes a transitional provision that was not included in the draft determination and rule, which requires AEMO to amend any relevant power system operating procedure to take into account the rule change.

12 The substantive changes in the Commission's final rule commence on Monday 12 April 2021 (32 days after publication of this final determination and rule), to allow for affected parties to make relevant changes to systems and processes.

Background and rule change process

13 The rule change request utilised the fast-track rule change process as the AER consulted extensively with the public on the nature and content of the rule change request before submitting it to the Commission. Under the fast track process, the Commission proceeded directly to the publication of a draft determination without publication of a consultation paper.

14 The AER's consultation included two rounds of formal consultation prior to submitting the rule change request. This included the publication of an issues paper and an update paper, as well as a public stakeholder workshop and bilateral meetings with stakeholders.

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1 THE RULE CHANGE REQUEST

This chapter provides a summary of the AER's rule change request and the issues it addressed. An introduction to rules arrangements applying to semi-scheduled generators is provided in Appendix B as background to the frameworks the AER is seeking to amend through its rule change request.

This chapter presents the:

- AER's rule change request
- rule making process
- publication and consultation undertaken.

1.1 The AER's rule change request

On 24 September 2020, The AER made a request to the AEMC to make a rule regarding semi-scheduled generator dispatch obligations. This rule change request proposed to amend and clarify obligations applying to semi-scheduled generators in the NEM. In particular, it sought to clarify that the output of a semi-scheduled generating system must follow its available resource; except during a semi-dispatch interval when a unit's output should be limited to the cap specified by AEMO.[2]

The AER submitted this rule change request following a request by the former COAG Energy Council to consider, and if required, develop two rule changes as part the Energy Security Board's (ESB) interim security measures. These measures were identified by the ESB as a range of potential interim steps to improve visibility of and confidence in resources leading to more accurate information that AEMO can rely upon to operate the power system. The interim measures were designed to be modest measures, consistent with the current market design, to improve outcomes while more fundamental reforms are designed and implemented.[3] This rule change relates to the fifth measure i.e. that semi-scheduled generators are to be obligated to follow their dispatch targets, in a similar manner to scheduled generator.[4]

1.1.1 The AER's proposed change to the rules

The AER's rule change request followed an observation by the ESB that 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

2 AER, rule change request, p. 3.

3 For more information on the ESB's interim security measures see: http://www.coagenergycouncil.gov.au/interim-security-measures

4 The second measure i.e. that semi-scheduled plant be required to continually inform AEMO of any restrictions on their available capacity due to physical factors, ambient weather conditions, and their market intentions will be progressed by the AER following this rule change. The AER consider the outcome of this rule change is required to inform any decision on the second potential rule change. AER, issues paper, p. 9.

provided for in the rules.[5] These generators have rapidly reduced their output to zero during negative price dispatch intervals without an instruction from AEMO or valid rebid.[6]

The AER considered that the National Electricity Rules (NER or Rules) should be amended to prevent semi-scheduled generators deviating from the MW dispatch levels that AEMO issues for each dispatch interval for reasons other than natural resource availability.

The AER proposed the following changes to the Rules:[7]

- a dispatch instruction to a semi-scheduled generator to be in the form of a MW target for the end of the dispatch interval
- semi scheduled generators to be expected to meet this target subject to variations in resource availability
- during a non semi-dispatch interval the target to be based on the forecast resource availability for the end of the interval
- during a semi-dispatch interval,[8] 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.

The AER considered the effect of these arrangements would be, 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
- and restrict the rapid controlled deviations from the resource capability.[9]

1.1.2 Rationale for the rule change request

The AER considered that, if made, the rule change proposal would improve AEMO's ability to manage the power system and build confidence in forecast price and market dispatch, now and into the future.[10]

The AER considered its proposed rule change would prevent semi-scheduled generators from rapidly reducing their output to zero during negative price dispatch intervals without rebidding and waiting for an updated dispatch target from AEMO. The AER considered this behaviour undermines AEMO's price / dispatch forecast accuracy by operating at levels not reflected in the pre-dispatch or dispatch solution. Further, the AER considered, with substantial wind and solar development forecast, the identified behaviour may occur more

5 An existing exception is provided in the clause 4.9.8(a1) of the NER for generators to deviate from their dispatch targets when operating in frequency response mode to adjust power system frequency in response to power system conditions.

6 AER, rule change request, p. 1.

7 AER, rule change request, p. 3.

8 A semi-dispatch interval is triggered when a network constraint or a dispatch offer results in a semi scheduled generator receiving a dispatch target less than the forecast based on the available resource.

9 Ibid.

10 Ibid, p. 1 and p. 7.

frequently in the future, further compromising AEMO's ability to manage power system security.[11]

The AER considered it timely to amend these provisions.[12] The AER noted in its rule change that there was limited experience of the impact of resource variations on wind output and wind generation forecasting was immature when the semi scheduled classification was introduced in 2008. Also, 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 without rebidding and waiting for an updated dispatch instruction from AEMO. The AER's rule change request noted that the rules for semi-scheduled generation have not been reviewed or materially changed since the classification was introduced.[13] The AER considered its rule change request would update the Rules to reflect enhanced semi-scheduled generator control capabilities and changed commercial incentives.

Further explanation of issue being addressed and rationale for the rule change is provided in Appendix C.

1.1.3 How the AER considered the rule change will address the identified issue

The AER identified that the rules, as drafted prior to publication of this final determination, did not prevent a semi-scheduled generator from rapidly reducing their output to zero during negative price dispatch intervals without an instruction from AEMO or valid rebid.[14] These rule arrangements only required semi-scheduled generators to observe a cap in their generation during semi-dispatch intervals. Rules arrangements prior to publication of this final determination therefore did not prevent semi-scheduled generators from curtailing generation for any reason without informing AEMO and waiting for an updated dispatch instruction.

The AER's rule change would amend current arrangements to require semi-scheduled generators to achieve a dispatch level, based on forecast resource availability, at the end of each dispatch interval subject to variations in resource availability.[15] The AER considered this change would restrict the potential for large and rapid deviations from dispatch instructions due to negative price curtailment, and make semi-scheduled generators behave more like scheduled generators. The AER considered its proposal retains the current flexibility of intermittent semi-scheduled generators to fully utilise their available resource where system conditions permit.[16]

11 Ibid, pp. 6-7.

12 When the semi scheduled classification was introduced in 2008, the AER notes that 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 at that time was to allow them to generate to the full extent of available wind resources.

13 Ibid, p. 4.

14 AER, rule change request, p. 8.

15 Ibid, p. 4.

16 Ibid, p. 1.

1.1.4 The AER's claim against the NEO

The AER considered the proposed rule change is in the long-term interest of consumers since it "enhances security of the supply of electricity and reduces the cost for services dispatched by AEMO to manage power system security."[17] The AER also noted that the proposed change is an incremental response to an emerging but (not yet major) problem.

The AER considered its rule change request does not foreclose options for more extensive changes as the amount of intermittent generation increases and holistic reform of the design of the NEM progresses under the post-2025 market design work of the ESB. The AER therefore considered the proposed changes to be proportionate to the problem at hand in terms of being minimally disruptive and low cost, further enhancing the long-term interests of consumers.[18]

1.2 The rule making process

1.2.1 AER Consultation process

On 24 June 2020, the AER published an issues paper that canvassed options to amend dispatch obligations for semi-scheduled generators to align more closely with those of scheduled generation. In particular, the paper examined ways to limit the potential for negative price curtailment by semi-scheduled generators (without re-bidding or waiting for an updated dispatch instruction).[19] The paper (and subsequent consultation with stakeholders) also discussed the development of a rule change proposal with a view to satisfying the requirements to progress the rule change as a fast-track rule under the national electricity law (NEL).

The AER consulted on a range of options presented including: 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 motivated development of the rule change request. The AER received 30 written submissions in response to its issues paper containing feedback on the options presented. The set of options consulted on by the AER is further summarised in Appendix D.

On 24 August 2020, based on this feedback and consultation, the AER published an update paper which set out a rule change proposal and invited further comment from stakeholders.[20] The AER then conducted a second round of consultation, and received five written submissions. The AER's proposal put forward in its update paper reflects the solution proposed in its rule change request.

17 AER, rule change request, p. 28.

18 Ibid.

19 AER, Issues paper - semi scheduled generator rule changes, June 2020. For further information see: https://www.aer.gov.au/publications/reviews/semi-scheduled-generators-proposed-rule-changes.

20 Ibid.

1.2.2 AEMC assessment of AER consultation for the purpose of rule fast tracking

The requirements for fast track consideration of a rule change request are set out in part 96A of the NEL as:

1. 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
2. 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.

The Commission determined to progress the AER's rule change as a fast track rule change because:

- The AER conducted two rounds of formal consultation on the nature and content of the rule change proposal, including the publication of an issues paper and an update paper, as well as a public stakeholder workshop and bilateral meetings with stakeholders.[21]
- The AER's proposal has been informed and refined by feedback provided by participants throughout their consultation process, with stakeholders given an additional opportunity to provide feedback on the latest version of the proposal through the publication of an update paper in August 2020.[22]

Therefore, on 15 October 2020, the Commission published a notice advising of its intention to commence the rule making process in respect of the rule change request.[23] The Commission commenced the rule change request as a 'fast track' rule change.

Accordingly, the AEMC did not publish a consultation paper upon initiation of the rule change process and instead proceeded straight to a draft determination.

1.3 Publication and consultation on draft rule determination

On 19 November 2020, the Commission published a draft determination and rule. The Commission's draft determination was to make a more preferable rule largely as proposed by the AER. The draft determination's policy is aligned with the AER's rule change request. Differences between the draft rule and AER's rule change request are limited to minor differences in the legal drafting that implements the policy.

The Commission invited submissions from stakeholders on the draft determination and rule by 14 January 2021. Ten submissions were received from stakeholders in response to the draft determination and rule. The Commission has made its final determination and rule following consideration of the issues raised in stakeholder submissions. The Commission's consideration on these issues is set out in detail in Chapters 3 to 5.

21 AER, rule change request, p. 9.
22 Ibid.
23 This notice was published under s 95 of the National Electricity Law (NEL).

2 FINAL RULE DETERMINATION

This chapter presents the Commission's final determination on the semi-scheduled generator dispatch obligations rule change. Specifically, this chapter sets out the:

- final rule determination and differences between the draft and final rule
- rule making test and assessment framework
- summary of reasons
- transitional arrangements

Chapters 3 to 5 detail the Commission's considerations in making the final determination.

2.1 The Commission's final rule determination

This section sets out the Commission's final rule determination and differences between the Commission's draft and final rules.

2.1.1 Description of the final rule

The Commission has determined to make a more preferable final rule that addresses the AER's rule change request. The Commission has made changes to the draft rule to accommodate suggestions by stakeholders, including in response to the draft determination, but the policy substance is the same as that proposed by the AER.

The key features of the Commission's final determination are set out below. A summary of reasons is provided in section 2.4.

- The final rule requires a semi-scheduled generator to comply with a MW dispatch level, defined at the end of the dispatch interval, and contained in a dispatch instruction issued by AEMO, for all dispatch intervals.
- A semi-scheduled generator is considered to have complied with its dispatch level, if:
  - it only varies from the dispatch level as a result of energy source availability, and
  - in the case of a 'semi-dispatch interval' does not exceed the dispatch level regardless of its energy source availability.

The effect of the final rule is to require semi-scheduled generators to follow their available resource except during a semi dispatch interval, when output should be limited to the cap specified by AEMO. During non-semi dispatch intervals semi-scheduled generators would be able to generate above and below the dispatch level where the deviation is due to energy source variability. 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 energy source availability in that dispatch interval.

The final rule includes supporting elements including a:

- 'housekeeping' amendment to the Chapter 10 NER definition of 'inflexible, inflexibility' to capture semi-scheduled generators, and
- transitional requirement for AEMO to update any relevant power system operating procedure to take into account the rule change.

Table 2.1 sets out the specific elements of the Commission's final rule. Interactions between the final rule and rules made but not yet commenced have been identified in respect of the five-minute settlement and wholesale demand response mechanism rules. These interactions are addressed in section 2.6.

Table 2.1: **Elements of the final rule**

RULE CLAUSE	DESCRIPTION OF FINAL RULE PROVISION
Dispatch instructions for semi-scheduled generators (**Clause 4.9.2(a) of the NER)**	To implement central dispatch AEMO may give dispatch instructions nominating: • in the case of a *semi-scheduled generating unit*, the *dispatch level*, to be supplied by the *generating unit* over the specified period.
General responsibilities of registered participants **(Clause 4.9.8(a2) of the NER)**	A *Semi-Scheduled Generator* is taken to have complied with a *dispatch level* in a *dispatch instruction* if the *active power* of the relevant *semi-scheduled generating unit* at the end of the relevant *dispatch interval*: 1. only varies from the *dispatch level* as a result of energy source availability; and 2. in the case of a *semi-dispatch interval*, does not exceed the *dispatch level*, regardless of energy source availability.
Definition of dispatch level **(Chapter 10 of the NER - Glossary)**	The amount of electricity to be *supplied* by a *semi-scheduled generating unit* for a *dispatch interval*, specified in a *dispatch instruction* as the target *active power* at the end of the *dispatch interval*.
Definition of inflexible, inflexibility **(Chapter 10 of the NER)**	Add semi-scheduled generator to the list of registration categories for which the definition of inflexible, inflexibility applies.
Transitional requirement **(Clause 11.136.1 of the NER)**	By 12 April 2021, *AEMO* must amend and publish any relevant *power system operating procedure* as is required to take into account the Commission's final rule.

Source: AEMC

2.1.2 Differences between the final and draft rules

The Commission's final determination and draft determination are the same with some changes to the drafting to better implement the policy intent of the rule change. Changes to drafting have occurred for:

- the definition of dispatch level in Chapter 10,
- general responsibilities of registered participants in clause 4.8.9 of the NER, and
- definition of 'resource' in Chapter 10.

Reasons and details of these changes are presented in Chapters 3 to 5.

The final determination includes a transitional provision that was not included in the draft determination and rule, which requires AEMO to amend, by 12 April 2021, any relevant power system operating procedure to take into account the rule change.

2.2 Rule making test

2.2.1 Achieving the NEO

Under the NEL the Commission may only make a rule if it is satisfied that the rule will, or is likely to, contribute to the achievement of the national electricity objective(NEO).[24] This is the decision making framework that the Commission must apply.

The NEO is:[25]

> to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:
>
> (a) price, quality, safety, reliability and security of supply of electricity; and
>
> (b) the reliability, safety and security of the national electricity system.

The Commission has identified that the relevant aspects of the NEO are the efficient operation and use of, electricity services with respect to price, reliability and security of the national electricity system. This is because negative price curtailment behaviour by semi-scheduled generation without rebidding and waiting for an updated dispatch instruction reduces:

- AEMO's ability to maintain power system security, increasing the risk of supply interruptions
- the efficiency of AEMO's market dispatch solution leading to higher prices than would otherwise be the case
- the accuracy of AEMO's price and operational forecasts thereby reducing the ability of participants to formulate efficient operational and investment strategies, and
- reliability of supply by reducing the level of intermittent generation capacity that can be securely integrated in the NEM.

24 Section 88 of the NEL.
25 Section 7 of thence.

2.2.2 Making a more preferable rule

Under s. 91A of the NEL, the Commission may make a rule that is different (including materially different) to a proposed rule (a more preferable rule) if it is satisfied that, having regard to the issue or issues raised in the rule change request, the more preferable rule will or is likely to better contribute to the achievement of the NEO. In this instance, the Commission has made a more preferable rule.

2.2.3 Making a differential rule

Under the Northern Territory legislation adopting the NEL, the Commission may make a differential rule if, having regard to any relevant MCE statement of policy principles, a different rule will, or is likely to, better contribute to the achievement of the NEO than a uniform rule. A differential rule is a rule that:

- varies in its term as between:
  - the national electricity system, and
  - one or more, or all, of the local electricity systems, or
- does not have effect with respect to one or more of those systems

but is not a jurisdictional derogation, participant derogation or rule that has effect with respect to an adoptive jurisdiction for the purpose of s. 91(8) of the NEL. As the rule relates to parts of the NER that currently do not apply in the Northern Territory, (Chapter 4) or will have no practical effect in the Northern Territory (Chapter 10), the Commission has not assessed the rule against the additional elements required by the Northern Territory legislation.

2.3 Assessment framework

The Commission has considered the following five principles in assessing the rule change request against the NEO:

- **Promoting a secure power system at lowest cost** – the extent to which the rule change is the lowest cost option to enhance AEMO's ability to maintain the system in a secure state.
- **Market efficiency** – the extent to which the rule change enhances market efficiency and improves the accuracy of information available to stakeholders to optimise their participation in the market.
- **Technology neutrality** – whether the rule change promotes a level playing field between scheduled and semi-scheduled generators to the extent possible given technology characteristics.
- **Regulatory certainty/clarity** – regulatory intent should be clearly articulated in the rules, and provide a clear basis for the assessment of compliance.
- **Proportionality** – the rule change, and costs imposed on participants, should be proportionate to the issue being addressed.

2.4 Summary of reasons

The Commission has made a final determination to make a more preferable final rule that implements the policy intent of the AER's proposed rule change. The Commission has made drafting changes to the final rule relative to the draft rule, but the policy intent remains unchanged. The more preferable final rule made by the Commission is attached to, and published with, this final determination.

The Commission's reasons for the approach adopted in the final rule are summarised below and discussed in more detail in Chapters 3 to 5 in the sections on 'Commission considerations'.

Having regard to the issues raised in the rule change request, the Commission is satisfied that the final rule will, or is likely to, contribute to the achievement of the NEO for the following reasons:

- **Promoting a secure power system at lowest cost** – The Commission considers the more preferable final rule will contribute to the achievement of the NEO by enhancing power system security through:
  - Increasing AEMO's visibility of changes in semi-scheduled generation levels thereby improving AEMO's ability to maintain the power system in a secure state for the set of all credible contingency events.
  - Retaining contingency FCAS as available to manage contingency events rather than using it to respond to deviations in frequency due to negative price curtailment behaviour by semi-scheduled generation.
- **Market efficiency** – The Commission considers the final rule will contribute to the achievement of the NEO by enhancing market efficiency through:
  - Allowing less constrained market operation. The final rule will allow AEMO to set operating margins and interconnector limits less conservatively. This will allow the dispatch of lower cost generation leading to lower market prices relative to what would have otherwise been the case.
  - Improving the accuracy of AEMO's price and operational forecasts. More accurate information will enhance market participant confidence and their ability to formulate efficient operating and investment strategies.
  - Reducing the cost of FCAS that need to be procured by AEMO. Lower FCAS requirements will reduce costs borne by consumers relative to what would have otherwise been the case.
- **Technology neutrality** – The Commission considers the final rule will contribute to the achievement of the NEO by improving consistency in the obligations faced by different types of generators, to the extent possible given technology characteristics. Existing arrangements, which do not prohibit negative price curtailment without rebidding and waiting for an updated dispatch instruction, confer a commercial advantage on semi-scheduled generators relative to scheduled generators that is not justified by fundamental technology characteristics.

- **Regulatory certainty/clarity** – The Commission considers the final rule will contribute to the achievement of the NEO by clearly articulating to the market the performance expected from semi-scheduled generators. This will increase certainty for market participants when developing operating and investment strategies. The clear articulation of expectations in the rules will also enhance the AER's ability to effectively assess compliance, strengthening the effectiveness of the regulatory framework.
- **Proportionality –** The Commission considers the final rule will contribute to the NEO as the rule change, and costs imposed on participants, are proportionate to the issue being addressed. The final rule amends existing arrangements with minimal process, system, and regulatory change. The rule change effectively specifies the intent of the Commission's 2008 semi-scheduled rule.

2.5 Implementation

Schedule 1 of the more preferable final rule will commence on 12 April 2021. Schedule 2 will commence on 1 October 2021, immediately after the commencement of Schedule 1 to 6 of the *National Electricity Amendment (Five Minute Settlement) Rule 2017 No. 15*. Schedule 3 will commence on 24 October 2021, immediately after the commencement of Schedule 5 of the *National Electricity Amendment (Wholesale demand response mechanism) Rule 2020 No. 9*. The transitional rule in Schedule 4 commences on 11 March 2021, upon publication of the Commission's final determination, with AEMO required to amend and publish any relevant power system operating procedures is required to take into account the final rule by 12 April 2021.

The final rule does not require AEMO or affected semi-scheduled generators to implement new systems. The most significant change will be for those semi-scheduled generators that utilise systems and procedures enabling negative price curtailment without rebidding or waiting for an updated dispatch instruction, to disable those systems.

The substantive changes in the Commission's final rule therefore commence 32 days after publication of the rule (i.e. Monday, 12 April 2021), to allow for affected semi-scheduled generators to make relevant changes. The Commission considers this sufficient time for affected semi-scheduled generators to rewrite generator operating procedures, brief operating staff, and disable any automated systems that enable negative price curtailment behaviour.

The Commission's considerations in its approach to implementation are set out in Chapter 5.

3 MATERIALITY AND SCOPE

This chapter sets out the Commission's considerations on the materiality of the issue, and the scope of its final determination and rule. The Commission's final determination on materiality and scope is summarised in Box 1 below.

BOX 1: FINAL DETERMINATION ON MATERIALITY AND SCOPE

The Commission's final determination is that:

- The issue of semi-scheduled generator curtailment without rebidding and waiting for an updated dispatch instruction is material to the achievement of the NEO given the system security and market efficiency implications of this behaviour. The Commission therefore considers a rule change is required to address this issue.
- the final rule should be narrowly scoped to address the specific behaviour motivating the rule change. The Commission considers structural changes to rule arrangements, such as arrangements relating to the future of semi-scheduled generator registration category, to be appropriately addressed in alternate ESB work programs.

This chapter presents the following:

- the AER's claims on materiality and scope of the rule change
- the Commission's draft determination on materiality and scope
- stakeholder submissions to the draft determination and rule
- the Commission's final determination on materiality and scope

3.1 The AER's rule change request

The section summarises the AER's views on materiality and scope put forward in its rule change request.

Materiality of the issue

The AER's rule change request identified the practice of some semi-scheduled generators departing significantly from the active power level provided in their dispatch instructions, without rebidding and waiting for an updated dispatch target from AEMO, as a material issue for power system security and market efficiency that warranted a rule change.[26]

The AER noted that a semi-scheduled generator deviating from its target (even turning off), other than observing a cap if appropriate, does not contravene the existing rules (applying prior to this rule being made), 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.[27]

26 AER, rule change request, p. 8.
27 Ibid.

The AER's rule change request identified system security and market efficiency implications from semi-scheduled generator curtailment in response to negative prices. The AER identified the following issues in this regard:

- Optimisation of dispatch through AEMO's dispatch software, NEMDE, presumes all generators comply with dispatch instructions. Negative price curtailment without rebidding and waiting for an updated dispatch instruction would increase the probability that energy will be produced more expensively, given the likelihood of more constraints and limitations on the system. This situation would be expected to only increase as the generation mix changes to include a higher penetration of intermittent generation.
- Existing arrangements (applying prior to publication of this final determination and rule) which did not prevent negative price curtailment without rebidding and waiting for an updated dispatch instruction would increase the call on FCAS. If the instances of controllable rapid reductions in output that prompted the AER's rule change request were to grow, under existing arrangements 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.
- Under arrangements applying prior to publication of this final determination and rule, increased volatility in frequency was likely to create risks to system security, that would be managed by AEMO adjusting the FCAS requirement. This would increase the cost to provide that FCAS service and that incremental cost would flow through to customers.

In its rule change request, the AER also noted that 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.[28] Due to rapid expected increase in the amount of semi-scheduled generation, the AER consider the limited obligations required of semi-scheduled generators under existing arrangements are no longer appropriate.[29]

The AER's full claims of materiality of the issue are presented in Appendix C.

Scope of the rule change request

The AER's rule change request was narrowly focused on amending rule arrangements to prevent rapid curtailment by semi-scheduled generators in response to price, without first re-bidding and waiting for an updated dispatch instruction.

The AER determined the scope of its rule change request following consideration and consultation on a range of rule change options for addressing the material issue of negative price curtailment by semi-scheduled generators. These options included structural amendments to remove the semi-scheduled generator registration category, amending causer pays factors for ancillary services to increase economic incentives for semi-scheduled

28 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

29 AER, rule change request, p. 7.

generation to follow dispatch instructions, as well as several other options for amending existing arrangements applying to semi scheduled generators.[30] Further description of the options considered by the AER are summarised in Appendix D.

In submitting its rule change request, the AER considered it appropriate to:[31]

- retain the semi-scheduled generation registration category within the NER
- amend the NER such that 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.

The AER considered amendments to the rules should be implemented within the current structure of the NER. In order to minimise regulatory disruption the AER proposed making only minor changes to exiting arrangements required to 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.[32]

The AER's proposal does not include a requirement for linear ramping between dispatch targets, or impose a cap on generation during a non semi-dispatch interval. The AER identified advice from AEMO to the AER stating that they intend to be more prescriptive in their dispatch procedure (PS_OP_3705) and will require generators to ramp linearly by default.[33]

3.2 Commission's draft determination on materiality and scope

The Commission's draft determination considered the issue identified by the AER as material for the advancement of the NEO. The Commission identified the system security and market efficiency implications of negative price curtailment without re-bidding and waiting for an updated dispatch instruction to be material, and contrary to the efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity. On that basis, the Commission determined to make a draft rule to address the issue identified by the AER.

The Commission considered the rule change was appropriately limited to arrangements that address the specific behaviour by some semi-scheduled generators that motivated the rule change request. In determining the scope of the rule change, the Commission identified several rule change and market reform programs currently underway that are more appropriate vehicles for implementing longer term structural arrangements for the integration of high levels of intermittent generation than this rule change.

The Commission's considerations in making its draft determination on scope and materiality are set out in the sections below.

30 AER, issues paper, pp. 5 - 6.
31 AER, rule change request, p. 23.
32 AER, rule change request, p. 23
33 AER, rule change request, p. 16.

3.2.1 Commission's considerations on materiality

This section sets out the Commission's considerations in making its draft determination on why it considered the issue identified by the AER to be sufficiently material to the advancement of the NEO to justify a rule change.

System security implications

The Commission considered negative price curtailment by semi-scheduled generators without rebidding or waiting for an updated dispatch target to materially impact AEMO's ability to maintain power system security, for the following reasons.

Increased challenges for AEMO to maintain the power system in a secure state - AEMO maintains the power system in a secure state for the set of credible contingency events.[34] AEMO procures contingency FCAS and determines the constraints forming the technical envelope for this purpose. The power system is secure if it is sufficiently constrained with enough FCAS such that load shedding is avoided and voltage and frequency is maintained within acceptable limits following any credible contingency event. AEMO does not operate the power system in a secure state for non-credible events.[35]

AEMO has no visibility in advance of the negative price curtailment behaviours that motivated the AER's rule change request as generators do not inform AEMO of their change in availability before curtailing generation in response to negative prices. Rapid, un-forecast withdrawal of capacity by semi-scheduled generators is likely to introduce significant uncertainty into AEMO's ability to maintain the system in a secure state following a large unforeseen negative price curtailment event. This uncertainty increases the risk that the technical envelope may not sufficiently constrain the system to keep it in a secure state under some conditions. In particular, the technical envelope may not fully allow for a credible contingency that occurs following a negative price event which sees semi-scheduled generators curtail generation.

Contingency FCAS is procured on the general assumption that contingency events are independent of one another and there is a non-credible chance of another contingency occurring within the 30 minutes that is allowed to fully restore reserves following a contingency. When rapid changes occur multiple times a day, and over time grow in size as more participants start to act in this way, regulation FCAS, and possibly even contingency FCAS, are at risk of being insufficient to prevent load shedding following a credible contingency event. While negative price curtailment does not mean that FCAS will be insufficient, it increases the risk that the amount of FCAS procured by AEMO may be insufficient in some circumstances.

System security risks arising from co-incident curtailment by multiple semi-scheduled generating systems - Rapid curtailment of generation by a semi-scheduled generator may remove a material volume of generation from the power system in a very

34 A credible contingency event is generally the loss or removal from service of a single power system element. A secure power system is one where the loss of any single power system element does not result in load shedding.

35 This is because their probability of occurrence is too low to justify the costs of maintaining the power system in a secure state for their occurrence. The probability of the failure or removal from service of more than one power system element within 30 minutes is generally considered to be a non-credible event.

short space of time. This has a similar effect on the power system as a contingency event involving the failure or removal of service of a power system asset. As noted above, the power system is maintained in a secure state for the occurrence of any single credible contingency. Multiple contingency events are considered non-credible and the power system is not maintained in a secure state for their occurrence.

The Commission is aware that automatic dispatch systems are available that enable negative price curtailment. As the uptake of such systems increases, a number of semi-scheduled generating systems may invest in automatic dispatch systems which automatically curtail generation in response to the same regional reference price. As AEMO has no visibility over the intentions of these generators it is not able to introduce diversity into their responses. Therefore, a negative price may see number of semi-scheduled generators in a region curtail generation at the same time, leading to outcomes similar to the effect of a non-credible multiple contingency event.

The Commission did not consider the possibility of the above outcomes, although remote at this point, to be consistent with the promotion of system security in a way that maximises net benefits to consumers. The Commission therefore considers the system security implications of negative price curtailment by semi-scheduled generators to be material to the achievement of the NEO, particularly as the penetration of intermittent generation increases.

Market efficiency implications

The Commission considered negative price curtailment by semi-scheduled generators without rebidding or waiting for an updated dispatch target to have material implications for market efficiency. This is due to the potential of such behaviour to lead to:

- higher prices due to a more constrained power system
- less efficient market participation due to reduced forecast accuracy
- higher FCAS costs
- dispatch inefficiencies

Higher prices due to a more constrained power system - As described above, AEMO sets the technical envelope by constraining the power system to maintain it in a secure state. These constraints act to limit the dispatch engine's (NEMDE's) ability to utilise the least cost set of generating resources available. A more constrained power system, due to higher levels of uncertainty in semi-scheduled generation levels, may therefore use a higher cost set of generation resources to meet demand than would otherwise have been the case.

In addition, AEMO defines constraints in NEMDE which include offsets and confidence margins to account for uncertainty.[36] Increased uncertainty will lead to larger offsets and confidence intervals. This further increases the degree of constraint on the dispatch engine's solution leading to higher market costs than would have otherwise been the case.

36 The confidence level is expressed as the percentage of critical cases that are covered by the limit equation. A confidence level of 95% means that 95% of critical cases had less restrictive limits than predicted by the limit equation - AEMO, confidence levels, offsets and operating margins policy.

Consistent with the Commission's conclusions in 2008, when the semi-scheduled registration category was created, a more constrained system is likely to put upward pressure on prices. One rationale for the introduction of the semi-scheduled category in 2008 was to avoid reductions in market efficiency associated with higher operating margins (that would have occurred if intermittent generators were registered as non-scheduled generators). The Commission considered that reducing the operating margins on network constraint equations would increase the transfer capability of the network, thereby promoting trade both within and between regions. Increased trade would reduce dispatch costs in the NEM, putting downward pressure on energy prices and electricity costs over the long term.[37] The Commission also identified lower operating margins from increased network capability during times of supply shortfall. The Commission considered this would, all other things being equal, generally improve the reliability of supply to consumers of electricity and improve AEMO's ability to maintain system security for given levels of demand from consumers of electricity.[38]

Less efficient market participation due to reduced forecast accuracy - The AER was also concerned about the negative price curtailment diminishing market efficiency through less accurate price forecasts. The Commission agreed with AER's concerns in this area.

Market participant operating and investment strategies are informed by price and generation forecasts published by AEMO. These span dispatch, pre-dispatch, PASA, and ESOO timelines. Market participants' ability to formulate strategies that lead to greatest market efficiency is a function of the type and accuracy of the information available. Negative price curtailment by semi-scheduled generators without re-bidding or waiting for an updated dispatch instruction increases the uncertainty in the instantaneous active power balance thereby reducing the accuracy of AEMO's operational and price forecasting. This reduction in accuracy may compromise the ability of market participants to optimise their participation strategies thereby impacting overall market efficiency.

Increased uncertainty and less accurate information may also impact investment decision-making, by increasing the risk premium required for investment. Over time this will lead to higher market prices than would have otherwise been the case. Participants may also be more risk averse in their decision-making on operational participation to reflect a more uncertain set of outcomes. Both of these factors will also have a negative effect on overall market efficiency.

Higher FCAS costs - As already noted, negative price curtailment by semi-scheduled generators increases uncertainty in the instantaneous active power balance requiring more regulation and contingency FCAS than would otherwise have been required. The uncertainty introduced by rapid, withdrawal of generation by semi-scheduled generators in response to negative prices will increase the quantity, and therefore the cost, of both regulation and contingency FCAS procured by AEMO. This additional cost ultimately increases costs for consumers.

37 AEMC, semi-scheduled rule - final determination, 2008, p. 18.

38 Ibid.

In conclusion, the Commission did not consider the possibility of the above outcomes to be consistent with the promotion of market efficiency. The Commission therefore considered the market efficiency implications of negative price curtailment by semi-scheduled generators to be material to the achievement of the NEO, particularly as the penetration of intermittent generation increases.

3.2.2 Commission's considerations on scope

The Commission's draft determination was to make a more preferable draft rule with a scope in line with the AER's rule change request. That is, narrowly focused on amending existing arrangements to address the specific issue motivating the rule change.

In making its draft determination, the Commission considered whether future high penetrations of intermittent generation in the NEM justified a rule change with broader scope than that proposed by the AER. In particular, the Commission considered whether structural changes, such as removing the semi-scheduled generator registration category or reforming causer pays arrangements to enhance financial incentives for accurately following dispatch targets, would better promote the NEO than the AER's rule change proposal.

The Commission's view was that several current rule changes, and market reform programs, are the appropriate avenues to design the longer-term regulatory framework for integrating high penetrations of intermittent generation. The Commission's draft determination identified the ESB's demand side participation work stream and the AEMC's frequency work program as particularly relevant in this regard.

- **Future of the semi-scheduled registration category -** The ESB's demand side participation work stream is exploring a range of options for evolving registration and classification categories as an intermediate term (two to five years) task. Options include developing less complex registration processes, and developing a revised set of scheduling obligations and incentives that lower the barriers to currently non-scheduled participants becoming scheduled and encourage greater participation in central dispatch.[39] The role and future of the semi-scheduled registration category is an element of this work.
- **Causer pays and financial incentives for achieving dispatch targets** - The AEMC's frequency work program is considering changes to causer pays arrangements to incentivise semi-scheduled generators to minimise deviations from their dispatch targets. This work is part of a suite of changes to improve frequency control and efficiently integrate high penetrations of intermittent generation in the NEM.

In contrast to these long-term reform programs, the AER's rule change request is one of the ESB's interim security measures which are to be considered over the next 12 to 18 months. For this reason, the Commission considered the scope of this rule change should be limited to addressing the material issue identified by the AER. The Commission considered such an approach to be consistent with the assessment principle of proportionality, requiring that the

39 ESB, consultation paper, September 2020, p. 93.

rule change, and costs imposed on participants, be proportionate to the issue being addressed.

In making its draft determination, the Commission also noted broad stakeholder support, through the AER's consultation, for a rule change narrowly focused on addressing the issue of negative price curtailment, rather than one that makes structural changes to rules frameworks to achieve a broader purpose.

3.3 Stakeholder submissions to the draft determination

All ten submissions received to the draft determination supported the Commission making a rule to address the issue of semi-scheduled generator curtailment without re-bidding or waiting for an updated dispatch instruction.[40]

On the issue of scope, seven stakeholders supported the scope of the Commission's draft determination and rule or did not comment.[41] In specific comments:

- The Clean Energy Investor Group (CEIG) supported retaining the narrow focus on negative price curtailment issues for this proposed rule change, as advocated by the AER and supported by industry, and CEIG welcomed consultation by the AER and AEMC on those broader issues in the future.[42]
- ERM stated a more focused rule change is preferable to larger structural changes such as removing the semi-scheduled registration classification; matters related to the efficient integration of intermittent generation are better achieved through other market reforms currently being canvassed.[43]
- The Major Energy Users (MEU) supported the draft rule and considered it an appropriate response to inappropriate actions by some semi-scheduled generators.[44]

Two stakeholders supported the draft determination's scope but considered additional elements should be added.[45] One stakeholder opposed the scope put forward in the draft determination.[46] Their comments are summarised below.

Stakeholders supporting the draft determination scope with additional elements included

Two additional elements were proposed to be included within the scope:

- AEMO proposed extending their powers to declare semi-scheduled generators non-conforming in dispatch intervals other than semi-dispatch intervals.[47]

40 Submissions to the draft determination: Origin, Major Energy Users, ERM, CEC, AER, AEMO, CEIG, Stanwell, Tilt Renewables, AGL.
41 Submissions to the draft determination: Origin, Major Energy Users, CEC, AER, CEIG, Tilt Renewables, AGL.
42 CEIG, submission to the draft determination, p. 1.
43 ERM, submission to the draft determination, p. 1.
44 MEU, submission to the draft determination, p. 2.
45 Submissions to the draft determination: AEMO, ERM.
46 Submissions to the draft determination: Stanwell.
47 AEMO, submission to the draft determination, p. 2.

- ERM requested the existing definition of 'semi-dispatch interval' be amended to clarify that dispatch offers, submitted by semi-scheduled generators, must be taken into account by AEMO when calculating a semi-scheduled generators dispatch target.[48]

AEMO considered that the existing Clause 3.8.23 (failure to conform to dispatch instructions) limits their ability to declare semi-scheduled generators non-conforming to semi-dispatch intervals. AEMO:

- proposed extending their power to declare semi-scheduled generators non-conforming with dispatch instructions by aligning requirements for semi-scheduled generators with existing arrangements for scheduled generators,
- identified this as a consequential change arising from the rule change imposing a requirement for semi-scheduled generators to comply with dispatch instructions in all intervals, and
- considered extending their non-conformance powers to be a useful tool in managing generator compliance, market efficiency, and the security of the power system.

ERM contended that the existing definition of 'semi-dispatch interval' is not clear that a generator's offers take precedence over the unconstrained intermittent generation forecast in giving rise to a semi-dispatch period. ERM's submission specifically requested that part (b) of the Chapter 10 NER definition of a 'semi-dispatch interval' be amended to include the following underlined text:[49]

- For a semi-scheduled generating unit, a dispatch interval for which either: <u>(b) where a semi-scheduled generating units current dispatch offer submitted in accordance with clauses 3.8.6, 3.8.9, 3.8.19 or 3.8.22 results in</u> the dispatch level specified in that dispatch instruction is less than the unconstrained intermittent generation forecast at the end of the dispatch interval

ERM further note that AEMO's dispatch procedure is not clear on this point.[50]

<u>Stakeholder that opposed the scope of the draft determination</u>

Stanwell considered the scope of the rule change should include changing the rules framework to remove the semi-scheduled generator registration category, or to set a clear path to transition capable semi-scheduled generators to scheduled generator classification.[51]

Stanwell's submission considered:

- the draft rule to be "anachronistic" and "insufficient" to address the system security risks arising from high penetrations of intermittent generation in the NEM. Stanwell therefore did not agree that the draft determination was proportionate to the issue being addressed.[52]

48 ERM, submission to the draft determination, p. 3.
49 Ibid.
50 Ibid.
51 Stanwell, submission to the draft determination, p. 14.
52 Stanwell, submission to the draft determination, p. 13.

- the Commission should remove the semi-scheduled generator registration category and apply the same obligations to semi-scheduled generators as apply to scheduled generators or to set a clear path to transition capable semi-scheduled generators to scheduled generator classification. [53]
- the draft rule was not appropriately technology neutral as it retained different arrangements for different types of generating systems. Stanwell sought clarification from the Commission what technology neutral drafting means in the context of the NEM. Stanwell also considered the differences set out in the draft rule to be anti-competitive.[54]

The Commission's considerations on each of these issues raised by stakeholders are set out in section 3.4.1.

3.4 Commission's final determination

The Commission has made a final determination and more preferable final rule that retains the same scope as the draft determination and rule. The Commission considers a rule change that is narrowly focused, on the specific issue of semi-scheduled generator curtailment without rebidding and waiting for an updated dispatch instruction, is the option that best advances the NEO. Following consideration of stakeholder submissions, the Commission:

- Notes that no stakeholder commented on the materiality of the issue motivating the rule change. All stakeholders supported the making of a rule to address the issue. The Commission therefore retains its view that the issue of curtailment by semi-scheduled generators is material for the advancement of the NEO.
- Retains its view that the scope of the rule change be limited to arrangements that address the specific behaviour by some semi-scheduled generators that motivated the rule change request. The Commission's response to stakeholder views on the scope of the rule change is provided in the following section.

The Commission also notes that expanding the scope of the rule change following publication of the draft determination would require additional consultation. Given that this is a fast-tracked rule change that addresses an important interim system security objective, the Commission has considered not to expand the scope of the rule change to include the additional elements proposed by stakeholders. The Commission does not consider it would promote the NEO to delay the rule change to allow another round of public consultation.

3.4.1 Commission considerations on stakeholder submissions

This section sets out the Commission's consideration of the issues raised by stakeholders regarding the materiality of the issue and scope of the draft determination.

Removal of the semi-scheduled generator registration category

The Commission's final determination is not to include Stanwell's suggestion to remove the semi-scheduled generator registration category and provide a clear path to transition capable

53 Ibid, pp. 8, 14
54 Ibid, p. 10.

semi-scheduled generators to scheduled generator classification in the scope of the rule change. In making its determination on this issue, the Commission notes the previous consideration of this issue in the AER's consultation and Commission's draft determination.

The AER considered removing the semi-scheduled classification to be a major structural change to the rules that would require the development of unique compliance arrangements for intermittent generators that could make broader enforcement actions problematic.[55] The AER further identified that there would be numerous legacy and transition issues to be dealt with under this approach. They identified special arrangements would be needed to facilitate these generators continuing to use Australian Wind Energy Forecasting System (AWEFS) or Australian Solar Energy Forecasting System (ASEFS) calculations to determine their dispatch, creating further complications. Neither the AER nor most stakeholders supported the option as a proportionate response to the issue of negative price curtailment by semi-scheduled generators.[56]

This rule change actions one of the ESB's recommendations for interim security measures, which are those changes required in the next 12 to 18 months. The Commission is cognisant that several current rule change and market reform programs are considering longer term structural arrangements. These include the ESB's demand side participation work stream and AEMC's frequency response work program. Given the initial time frame, the major reforms processes already underway (including examination of generator classifications), and industry's call for coordinated regulatory reform, the Commission remains of the view that the scope of this rule change should not extend to consideration of the removal of the semi-scheduled classification.

Extension of AEMO's powers to declare semi-scheduled generators non-conforming

The Commission's final determination does not include an extension to AEMO's powers to declare semi-scheduled generators non-conforming during dispatch intervals other than semi-dispatch intervals.

AEMO proposed extending their power to declare semi-scheduled generators non-conforming with dispatch instructions by aligning requirements for semi-scheduled generators with existing arrangements for scheduled generators. AEMO considered additional powers to declare semi-scheduled generators non-conforming to be a useful tool for managing generator compliance, market efficiency, as well as the security of the power system.

In coming to its final determination, the Commission weighed the potential benefits for AEMO against the system security implications of delaying implementation of the rule for additional stakeholder consultation. Given this is a fast track rule change, which aims to address an interim system security need, the Commission does not consider the practical benefit to the system that could be achieved by extending AEMO's powers to declare semi-scheduled generators non-conforming is sufficient enough to justify making this change.

55 AER, issues paper, p. 31.

56 AER, issues paper, pp. 31-32.

Amending the existing definition of semi-dispatch interval

The Commission's final determination does not include within its scope ERM's proposed amendment to the existing definition of semi-dispatch interval.

The Commission:

- agrees with ERM that a semi-scheduled generator's offers take precedence over the unconstrained intermittent generation forecast in giving rise to a semi-dispatch interval
- considers that existing arrangements should deliver the outcome sought by ERM
- notes ERM's observation that AEMO's dispatch procedure is unclear on whether a semi-scheduled generator's offers take precedence over the unconstrained intermittent generation forecast in giving rise to a semi-dispatch interval

The Commission understands that AEMO will be amending its dispatch procedure in response to this rule change and considers this matter would be best addressed with AEMO in the first instance.

The Commission's approach to technology neutrality

The Commission notes Stanwell's view that the rule is not technology neutral and Stanwell's request for clarification of what technology neutrality means in the context of the NEM.

Technology neutrality is one of the assessment framework principles the Commission has adopted in considering the AER's rule change request and applying the NEO. The Commission considers market arrangements that promote a level playing field between scheduled and semi-scheduled generators, to the extent possible given technology characteristics, to generally promote the NEO.

The Commission however does not interpret technology neutrality as treating all technology types the same. As a general rule, the Commission considers that it is desirable for market arrangements to be expressed in the same way for all technology types. However, the Commission recognises that there are inherent physical differences between technologies that must be recognised in market arrangements to avoid creating inefficient barriers to entry by those technologies. Market arrangements that do not take inherent physical differences of different technology types into account may, as a side effect, lead to inefficient barriers to entry by certain technologies that are not consistent with promotion of the NEO.

In assessing the AER's rule change request, the Commission has identified the arrangements applying prior to the publication of this final determination and rule as insufficiently technology neutral and considers the Commission's final determination and rule will enhance the technology neutrality of arrangements for scheduled and semi-scheduled generators in the NEM. Further details on the Commission's considerations in this area are provided in section 4.2.1.

4 OBLIGATION TO COMPLY WITH A DISPATCH LEVEL IN ALL INTERVALS

This chapter details the Commission's considerations in making a final rule to impose obligations on semi-scheduled generators to comply with a dispatch level in all dispatch intervals including flexibility to account for energy source availability. The Commission's final determination is summarised in Box 2.

BOX 2: FINAL DETERMINATION ON OBLIGATIONS TO COMPLY WITH A DISPATCH LEVEL IN ALL DISPATCH INTERVALS

The final determination and rule is:

- To require a semi-scheduled generator to comply with a MW dispatch level, defined at the end of the dispatch interval, contained in a dispatch instruction issued by AEMO, for all dispatch intervals.
- That a semi-scheduled generator is considered to have complied with its dispatch level, if:
  - it only varies from the dispatch level as a result of energy source availability, and
  - in the case of a 'semi-dispatch interval' does not exceed the dispatch level regardless of its energy source availability.

This chapter sets out the following on obligations requiring semi-scheduled generators to comply with a MW dispatch level:

- the AER's rule change proposal
- the Commission's draft determination
- stakeholder views on the draft determination and rule
- the Commission’s final determination.

4.1 AER rule change request

The AER's rule change request proposed amending obligations applying to semi-scheduled generators to make curtailing generation without first re-bidding and waiting for an updated dispatch instruction clearly non-compliant. Specifically, the AER considered that the NER should be amended to clarify that:[57]

- 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

57 AER, rule change request, p. 23.

- 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.[58]

To minimise regulatory disruption, the AER proposed making only minor changes to the NER:[59]

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

The AER considered that these amendments will restrict the potential for large and rapid deviations from dispatch instructions and, in line with the request from the former COAG Energy Council, make semi-scheduled generators behave more like scheduled generators.[60]

The AER's rule change did not specify that semi-scheduled generators should linearly ramp to each dispatch target. The AER proposed the issue of linear ramping will be addressed by AEMO in its proposed changes to the dispatch procedure (PS_OP_3705).[61]

4.2 Draft determination

The Commission's draft determination was to make a more preferable draft rule that addressed the AER's rule change request. The draft rule required semi-scheduled generating units to follow their available resource except during a semi-dispatch interval, when the dispatch level also represents a cap in allowable generation. The draft determination established that:

- a dispatch instruction to a semi-scheduled generator in a:
  - non semi-dispatch interval will include a MW 'dispatch level' target for the end of the dispatch interval
  - semi-dispatch interval the dispatch level also represents an output cap expressed MW for the end of the dispatch interval

58 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.

59 Ibid.

60 Ibid.

61 AER, rule change request, p. 16.

- during non-semi dispatch intervals semi-scheduled generators would be able to generate above and below the target where the deviation is due to energy source 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 energy source availability in the dispatch interval.

In addition, the draft determination included a new glossary definition of 'resource' to provide clarity on the interpretation of that term as applied to semi-scheduled generators.

The draft determination and rule adopted the AER's proposed approach to intra-dispatch ramping obligations. Specifically, the draft determination and rule specified an obligation for semi-scheduled generators to comply with a MW dispatch level, defined at the end of the dispatch interval, for all dispatch intervals. The Commission accepted the AER's proposal for the issue of linear ramping to be addressed in a change to AEMO's operating procedures, in particular its dispatch procedure (PS_OP_3705).[62]

4.2.1 Commission's considerations in making its draft determination

The Commission made its draft determination on the basis that it:

- effectively addressed the issue motivating the rule change
- clearly articulated regulatory intent and provided a clear basis for the assessment of compliance
- provided for a more technology neutral approach
- better advanced the NEO than the alternative rule change options considered by the AER
- will achieve the system security and market efficiency benefits set out in Chapter 3.

Effectively addressed the leading issue

Existing arrangements (applying prior the publication of this final determination and rule) required semi-scheduled generators in the NEM to comply with dispatch levels in a dispatch instruction but only defined a dispatch instruction for a semi-scheduled generator in relation to a maximum level of power to be supplied by the generating unit over a semi-dispatch interval.[63] Under these arrangements, during non semi-dispatch intervals,[64] dispatch levels specified in AEMO dispatch instructions are simply estimates of generation and not binding on semi-scheduled generators.[65] Such arrangements therefore do not prohibit semi-scheduled generators from curtailing generation in response to negative prices without rebidding and waiting for an updated dispatch instruction from AEMO.

62 AER, rule change request, p. 16.

63 Clauses 4.9.8(a) and 4.9.2(a)(3) of the NER.

64 A semi-dispatch interval occurs when AEMO constrains a semi-scheduled generators output to be less than its forecast generation due to a binding constraint or the dispatch of the semi-scheduled generator being uneconomic based on its offers.

65 The rule definition of dispatch level that applied immediately prior to publication of this draft determination and rule specified that for a non semi-dispatch interval, the dispatch level is only an estimate of the active power at the end of the dispatch interval specified in the dispatch instruction.

The draft determination prevented a semi-scheduled generator from curtailing generation in response to negative prices without rebidding and waiting for an updated dispatch instruction from AEMO. Its effect was to require semi-scheduled generators to follow their available resource during non semi-dispatch intervals. This was achieved by requiring them to comply with a dispatch level reflecting the unconstrained intermittent generation forecast, accompanied by flexibility for deviations above and below the dispatch level due to underlying energy source availability. Under the Commission's draft determination, a semi-scheduled generator has the flexibility to generate below the dispatch level cap during a semi-dispatch interval but only where that deviation is due to energy source availability.

The draft determination promoted the NEO through enhanced system security and market efficiency

System security and market efficiency benefits that promote the NEO are achieved by preventing semi-scheduled generators from curtailing generation in response to negative prices without rebidding and waiting for an updated dispatch instruction from AEMO. These benefits are discussed in Chapter 3 and include:

- system security benefits due to an improvement in AEMO's ability to maintain the power system in a secure state
- market efficiency benefits by avoiding the need for a more constrained power system, more efficient market participation due to improved forecast accuracy, and lower FCAS costs.

Regulatory intent was clearly articulated and provided a clear basis for the assessment of compliance

The Commission's draft rule prescribed natural resource availability as a specific reason why a semi-scheduled generator is allowed to deviate from the dispatch level specified in its dispatch instruction. This was a clear requirement that can be easily interpreted by all parties. It clarified requirements for semi-scheduled generators to re-bid and wait for an updated dispatch instruction prior to curtailing generation in response to negative prices.

The Commission understands that the AER's proposal effectively formalised the regulatory intent in the 2008 semi-scheduled rule. The 2008 rule was made with an underlying assumption that semi-scheduled generators would seek to generate at the level consistent with the availability of their natural resource. The 2008 rule requirements did not contemplate the current level of penetration of renewable generation in the NEM and the commercial incentives created by regular negative price periods which incentivise semi-scheduled generators to engage in negative price curtailment.

Provided for enhanced technology neutrality

The Commission considered arrangements applying prior to the publication of this final determination and rule were not appropriately technology neutral. The ability to withdraw generation for economic reasons without re-bidding confers a competitive advantage on semi-scheduled generators given their registration category. In this regard, the Commission noted that these arrangements are discriminatory towards scheduled generators which are not provided with such flexibility.

While the AER's proposed rule would have the effect of marginally increasing exposure to negative prices for semi-scheduled generators engaging in negative price curtailment without rebidding or waiting for an updated dispatch instruction, this revenue adjustment simply acts to remove a technology-derived competitive advantage for these generators given their registration category, and bring them in line with the commercial opportunities available for scheduled generators.

4.3 Stakeholder submissions

Of the ten submissions received from stakeholders in response to the draft determination, eight supported the rule change including the requirement for generators to comply with a dispatch level accompanied by flexibility to account for energy source availability.[66] Two stakeholders that supported the draft determination and rule, requested clarification on certain issues.[67] Two stakeholders opposed the draft rule.[68]

Stakeholders requested the following:

- clarification that the dispatch level is both a target and a cap during a semi-dispatch interval
- additional flexibility providing for deviations from the dispatch level for 'sound technical reasons'
- that a material change in resource be required before semi-scheduled generators are allowed to deviate from their dispatch targets
- clarification on the drafting intent behind the use of the term 'intermittency'.

Rule should clarify that dispatch level is both a target and a cap, in a semi-dispatch interval

The AER's submission considered the draft rule unclear on the applicability of the dispatch level as a target during a semi-dispatch interval. The AER's submission to the draft determination considered that the effect of the Commission's draft rule would be to only cap semi-scheduled generation in semi-dispatch intervals, with no obligation to generate to a target. The AER considered the draft rule would provide leeway to generate at any level under the cap during a semi-dispatch interval compromising the objectives of the rule change.[69]

'Sound technical reasons' valid for deviating from dispatch level

In its submission to the draft determination, Tilt Renewables considered that a number of technical issues (including temperature de-rating, run-back, over-speed and other protection actions), constituted 'sound technical reasons' for deviating from dispatch instructions. They argued that the final rule should allow for these technical exemptions. Tilt Renewables'

66 Submissions to the draft determination: AGL, Origin, AEMO, AER, CEIG, MEU, ERM, CEC.
67 Submissions to the draft determination: AEMO, AER.
68 Submissions to the draft determination: Tilt Renewables, Stanwell.
69 AER, submission to the draft determination, p. 1

concern was that they would have to upgrade their control systems for technical limits, such as temperature de-rating, to remain compliant under the draft rule.[70]

Resource change to be material before semi-scheduled generators can deviate from their dispatch targets

Stanwell considered that the draft rule provides for any change in resource (small or large) to allow a semi-scheduled generator not to follow dispatch targets. Stanwell considered the rule could be enhanced by requiring that the resource change be material, prior to allowing any deviation from the specified dispatch level. Stanwell considered the importance of material changes has been acknowledged and is a well-established concept used by the AER in the 2017 and 2019 Rebidding and Technical Parameters Guidelines.[71]

Clarify the drafting intent of the term 'intermittency'

Stanwell's submission sought clarification from the Commission on whether the intent of the rule change is to move away from semi-scheduled generators being classified by output (intermittent) to input (resource).[72] Stanwell noted that the existing definition of 'intermittent' is in relation to generator output. The draft rule's proposed definition for 'resource' is in relation to the 'intermittent' energy source (such as wind or solar radiation), which is converted by a semi-scheduled generating unit into energy. Stanwell considered the use of 'intermittent', in this way, is inconsistent with its current use in the NER.

AEMO's submission also identified a need to clarify that intermittent describes the energy resource, noting that a semi-scheduled generating unit by definition has 'intermittent' output.[73]

4.4 Final determination

The Commission's final determination is to make a more preferable rule on obligations to comply with a dispatch level in all intervals. The rule is unchanged in its policy approach to the draft determination and includes amendments to clarify the policy intent.[74] The Commission's reasoning in making this final determination therefore remains as presented in section 4.2.1.

The final determination and rule is:

- To require a semi-scheduled generator to comply with a MW dispatch level, defined at the end of the dispatch interval, and contained in a dispatch instruction issued by AEMO, for all dispatch intervals.
- That a semi-scheduled generator is considered to have complied with its dispatch level, if:

70 Tilt Renewables, submission to the draft determination, p. 1.
71 Stanwell, submission to the draft determination, p. 14.
72 Stanwell, submission to the draft determination, pp. 13-14.
73 AEMO, submission to the draft determination, p. 1.
74 A transitional requirement for AEMO to update relevant operating procedures has been included in the final rule. This transitional requirement is considered in Chapter 5.

- it only varies from the dispatch level as a result of energy source availability, and
- in the case of a 'semi-dispatch interval' does not exceed the dispatch level regardless of its energy source availability.

The final determination and rule adopts the approach put forward in the AER's rule change request in respect of intra-dispatch ramping obligations. Specifically, the final determination and rule specifies an obligation for semi-scheduled generators to comply with a MW dispatch level, defined at the end of the dispatch interval, for all dispatch intervals. The Commission understands intra-dispatch ramping obligations are to be addressed in a change to AEMO's operating procedures, in particular its dispatch procedure (PS_OP_3705). The Commission considers this approach to promote the NEO as it will enable timely implementation of arrangements in a manner that minimises system changes and associated costs. Further discussion of AEMO's procedure change is provided in section 4.4.3.

Table 4.1: **Elements of the final rule relevant to an obligation to comply with a dispatch level in all intervals**

RULE CLAUSE	DRAFT RULE PROVISION
Dispatch instructions for semi-scheduled generators (**Clause 4.9.2(a) of the NER)**	To implement central dispatch AEMO may give dispatch instructions nominating: • in the case of a semi-scheduled generating unit, the dispatch level, to be supplied by the generating unit over the specified period.
General responsibilities of registered participants **(Clause 4.9.8(a2) of the NER)**	A *Semi-Scheduled Generator* is taken to have complied with a *dispatch level* in a *dispatch instruction* if the *active power* of the relevant *semi-scheduled generating unit* at the end of the relevant *dispatch interval*: 1. only varies from the *dispatch level* as a result of energy source availability; and 2. in the case of a *semi-dispatch interval*, does not exceed the *dispatch level,* regardless of energy source availability.
Definition of dispatch level **(Chapter 10 of the NER - Glossary)**	In respect of a *dispatch instruction*, the amount of electricity to be *supplied* by a *semi-scheduled generating unit* for a *dispatch interval*, specified as the target *active power* at the end of the *dispatch interval*.

Source: AEMC

4.4.1 Differences between the draft and final rule

The Commission has amended the drafting of the final rule relative to the draft rule to address stakeholder feedback in the following key areas:

- **Rule should clarify that dispatch level is both a target and a cap, in a semi-dispatch interval (AER)**- The final rule provisions set out in clause 4.9.8(a2) clearly

specify the dispatch level as a MW target that applies at the end of the interval for all dispatch intervals; both semi-dispatch intervals and non semi-dispatch intervals. This arrangement limits semi-scheduled generators from deviating below their dispatch level during a semi-dispatch interval for reasons other than intermittent resource availability.

- **Clarify the drafting intent of the term 'intermittency' (Stanwell) -** The final rule has omitted the Chapter 10 definition of 'resource' that was part of the draft rule.

The more preferable final rule definition of 'dispatch level' has also been amended between the draft and final determination. This amendment is addressed in Chapter 5 on implementation.

4.4.2 Commission considerations on issues raised in submissions

This section presents the Commission's considerations on the issues raised by stakeholders in their submissions to the draft determination.

Rule should clarify that dispatch level is both a target and a cap, in a semi-dispatch interval

The AER's submission to the draft determination considered that the effect of the draft rule will be to only cap semi-scheduled generation in semi-dispatch intervals with no obligation to generate to a target.

The Commission agrees with the AER that this core element of the final determination's policy intent needs to be clarified in the final rule. The Commission's final determination is to make a final rule that clearly requires semi-scheduled generators to comply with a MW dispatch level, acting as a target, in all dispatch intervals, including semi-dispatch intervals where the dispatch level also acts as a cap. The final rule therefore limits the circumstances where a semi-scheduled generator can deviate below its dispatch level during a semi-dispatch interval to cases when this deviation is the result of energy source availability.

'Sound technical reasons' valid for deviating from dispatch level

Tilt stated the final rule should provide for a number of technical exemptions for deviating from dispatch instructions.[75]

The Commission notes Tilt's concerns but considers that existing rule arrangements provide flexibility for semi-scheduled generators to deviate from their dispatch targets for technical reasons. The general obligation to comply with dispatch instructions also has a technical and safety exception. Clause 4.9.8(a) of the NER does not require registered participants to follow dispatch instructions if it materially risks damaging equipment or is a hazard to public safety. That provision applies in cases where a plant is forced offline for a technical reason including protection system operation. The AER also has discretion to account for unavoidable technical issues in how it enforces compliance under the rules. Further information is available in the AER's compliance and enforcement policy.[76]

75 Tilt Renewables, submission to the draft determination, p. 1.

76 For more information on the AER's compliance and enforcement policy: https://www.aer.gov.au/system/files/AER%20Compliance%20%26%20Enforcement%20Policy%20-%20July%202019_1.pdf

In respect of temperature de-rating, existing rule requirements require a semi-scheduled generator to provide information to AEMO on availability and plant parameters for the purposes of the unconstrained intermittent generation forecast under 3.7B of the NER. In particular clause 3.7B(b) of the NER requires that a semi-scheduled generator submit to AEMO, plant availability information 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. This provision provides for temperature de-rating effects to be accounted for in the unconstrained intermittent generation forecast from which a semi-scheduled generator's dispatch level is determined during a non-semi dispatch interval.

For these reasons, the Commission considers Tilt's concerns to be adequately addressed through existing rule arrangements and the AER's compliance and enforcement discretion.

Resource change to be material before semi-scheduled generators can deviate from their dispatch targets

The Commission has considered Stanwell's proposal that the change in resource should be material before allowing a semi-scheduled generator to deviate from its dispatch level.[77]

The Commission's policy intent is to prevent semi-scheduled from curtailing generation in response to negative prices without first re-bidding and waiting for an updated dispatch instructions. The final rule achieves this by requiring semi-scheduled generators to follow their available resource except during a semi dispatch interval, when output is limited to the cap specified by AEMO.

A requirement for a 'material' change in resource prior to a semi-scheduled generator departing from their dispatch target is likely to impose significant costs on semi-scheduled generators. The Commission therefore does not consider it a proportional response to addressing the issue motivating the rule change.

Clarify the drafting intent of the term 'intermittency'

The Commission has considered the concern about the use of term 'intermittent' and agrees that its use in the draft determination's definition of an input natural 'resource' is inconsistent with the existing definition of intermittent as a generating unit whose output is not readily predictable.

The final rule has omitted the proposed Chapter 10 definition of 'resource' included in the draft rule. In making this decision, the Commission noted the potential for confusion in the interpretation of 'intermittent' and instead considers using the undefined terminology 'energy source availability', which is already used several times throughout the rules to be preferable.

4.4.3 AEMO operating procedure amendment

The AER's rule change does not specify that semi-scheduled generators should linearly ramp between dispatch levels. The Commission understands that the AER discussed linear ramping with AEMO prior to submitting its rule change request, and that AEMO agreed to amend its

77 Stanwell, submission to the draft determination, p. 14.

dispatch procedure to deal with intra-dispatch interval ramping. In the more preferable final rule:

- the dispatch level is therefore specified as a MW target applying at the end of the dispatch interval
- AEMO required to amend any relevant power system operating procedure to take into account the requirements of the final rule.

Under existing clause 4.9.5(a)(3) of the NER, AEMO is able to, in the case of a dispatch instruction under clause 4.9.2, specify a ramp rate (if applicable) which is to be followed by a semi-scheduled generating unit or a specific target time to reach the outcome specified in the dispatch instruction. AEMO has utilised this existing rule arrangement to impose default ramp rate requirements for semi-scheduled generators during a semi-dispatch interval.

Section 5.2 of AEMO's dispatch procedure (SO_OP_3705) currently specifies that, absent a specified ramp rate in a dispatch instruction, semi-scheduled generating units with suitable controls (consistent with their performance standards) are expected to ramp linearly from their initial active power output to their semi-dispatch cap in semi-dispatch intervals. Otherwise (in non semi-dispatch intervals), the dispatch procedure currently indicates that semi-scheduled units are free to generate at any level.

AEMO has informed the Commission that it expects that changes to the procedure would clarify that linear ramping is required across the duration of a dispatch interval when a semi-scheduled generating unit's output is limited by a semi-dispatch cap or an applicable local limit. At other times, semi-scheduled units would need to either ramp linearly to their target or generate in accordance with the availability of their energy resource. In all cases these requirements would be subject to energy source availability, AGC action, physical and control system limitations, and frequency response obligations.

5 IMPLEMENTATION APPROACH

This chapter details the Commission's considerations on implementing the rule change. Implementation issues addressed in this chapter include the timeline for commencement of the rule, transitional arrangements regarding supporting changes to AEMO procedures, and the approach to drafting aspects of the final rule that do not have policy implications.

The Commission's final determination on implementation issues is summarised in Box 3.

BOX 3: THE COMMISSION'S FINAL DETERMINATION ON IMPLEMENTATION

- The final rule includes a minimalist 'least change' approach to implementing the rule change in the NER. Changes to rule drafting are therefore limited to those solely relating to obligations applying to semi-scheduled generators.
- The final rule provides for timely implementation as it does not require material adjustment of AEMO or market participant systems. Schedule 1 of the final rule, which contains the substantive obligations applying to semi-scheduled generators, will therefore commence on Monday 12 April 2021, 32 days after the final determination and rule is published.
- The final rule includes a transitional provision requiring AEMO, by 12 April 2021, to amend and publish any relevant power system operating procedure as is required to take into account the rule change.

This chapter sets out the following on implementation issues:

- the implementation approach put forward in the rule change request
- the Commission's draft determination
- stakeholder submissions
- the Commission's final determination and transitional requirements.

5.1 The implementation approach put forward in the rule change request

The AER proposed that changes should be implemented within the current structure of the NER. In order to minimise regulatory disruption, the AER proposed making only minor changes to the drafting in the NER to address the material issue motivating the rule change. On this basis, the AER proposed the following changes to the NER:[78]

- clause 4.9.2 to remove the reference to maximum dispatch for semi scheduled generators
- clause 4.9.8 to include a new paragraph (a2), to provide for circumstances when a semi scheduled generator's failure to comply with dispatch instructions due to resource availability is permitted

78 Ibid.

- the defined term "dispatch level", to clarify obligations during semi-dispatch and non semi-dispatch intervals
- inclusion of a new defined term "resource"

The AER's rule change request identified the following objectives regarding implementation:[79]

- The rule change as described should only affect the negative price shut down behaviours that occur without warning but require intervention, either manually or through software.
- Rewriting procedures and re-educating operating staff for those sites where the intervention is manually initiated should not be unduly burdensome. The AER understood 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 these objectives, the AER considered that before the rules commence a relatively short transitional period 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.

5.2 Draft determination

The Commission's draft determination and more preferable draft rule reflected the AER's proposed implementation approach. Specifically:

- The more preferable draft rule was significantly as proposed by the AER in its rule change request and represented a minimalist 'least change' approach to implementing the rule in the NER. This drafting was limited to changes solely applying to semi-scheduled generators.
- The draft determination provided a 30 day transition period following publication for AEMO and stakeholders to amend systems and processes prior to the rule coming into effect, reflecting the limited changes required.

5.2.1 Commission considerations in making the draft determination

The Commission identified the following factors relevant to its draft determination approach to implementation:

- The assessment framework principle of proportionality which requires the rule change to be proportionate to the issues being addressed.
- The time and cost of updating stakeholder and AEMO systems required to comply with the rule. This factor is relevant to the assessment framework principle of promoting a secure power system at lowest cost.
- Regulatory certainty/clarity – regulatory intent should be clearly articulated in the rules, and provide a clear basis for the assessment of compliance.

In light of these factors, the Commission's approach to implementation in making the draft determination and rule was:

79 AER, rule change request, p. 24-25.

- **focused on addressing the specific issue motivating the rule change**. This narrow focus on arrangements that address the curtailment of generation by semi-scheduled generators without rebidding or waiting for an updated dispatch instruction is consistent with a fast tracked rule change. Arrangements for the implementation of the rule change's policy intent, in drafting and participant systems, should therefore also be limited to this narrowly defined scope.
- **involved the least possible change to the drafting of the NER required to implement the policy intent of the rule change**. The Commission considered such an approach to be consistent with the interim nature of this rule change that addresses a specific issue in advance of structural market changes that may be made through the ESB's 2025 market design process.
- **supported quick implementation -** The AER requested a 'fast tracked' rule change to address an emerging system security challenge. Consistent with a 'fast tracked' rule change, the Commission has chosen an approach to implementation that provides for the rule to come into effect in a timely manner.

5.3 Stakeholder submissions to draft determination

Of the ten submissions received from stakeholders in response to the draft determination, five stakeholders commented on implementation related issues in the following areas:

- AEMO proposed drafting amendments to simplify implementation of arrangements for both scheduled and semi-scheduled generators.[80]
- Concerns about the extent of semi-scheduled generator system changes required to comply with the rule change.[81]
- A desire for additional information on how compliance will be assessed.[82]

Arrangements applying to both scheduled and semi-scheduled generators

AEMO proposed the following changes:[83]

- Replace the term 'dispatch level' with a new definition of 'dispatch target', which would apply to active power dispatch for both scheduled and semi-scheduled generation. AEMO considered this avoided confusion between the required output specified in a dispatch instruction and the alternative use of 'dispatch level' to mean the current or intended level of output (also in 'self-dispatch level').
- Make additional consequential amendments to enable use of the term 'dispatch target' instead of 'dispatch level' in other clauses of the NER.
- Amend new clause 4.9.8(a2), to make it clear that semi-scheduled generation output is allowed to deviate from the dispatch target due to intermittent resource availability, but in a semi-dispatch interval the dispatch target cannot be exceeded.

80 AEMO, submission to the draft determination, p. 1.
81 Tilt Renewables, submission to the draft determination, p. 1.
82 Submissions to the draft determination: Origin, AGL, Stanwell.
83 AEMO, submission to the draft determination, p. 1.

AEMO proposed drafting changes to the following NER clauses in addition to those set out in Chapter 4 of this determination:[84]

- Clause 3.8.19 - Dispatch inflexibility
- Clause 3.12.2 - Affected Participants and Market Customers entitlements to compensation in relation to AEMO intervention
- Clause 3.15.6A - Ancillary service transactions
- Clause S5.2.5.14 - Active power control
- Chapter 10 - definition of energy conversion model
- Chapter 10 - definition of semi-dispatch interval

Concerns about the extent of semi-scheduled generator system changes required to comply with the rule change

As outlined previously, Tilt Renewables considered that to remain compliant under the draft rule, semi-scheduled generators would be required to make control system upgrades to account for technical limits such as temperature de-rating for the purposes of dispatch. Tilt considered that approximately one year would be required to scope, design, implement and test such systems. On this basis, Tilt Renewables did not consider a 30 day transition period to be sufficient.[85]

Additional information on how compliance will be assessed

Several stakeholders expressed a wish for additional information on how compliance with the rule (if made) will be assessed.[86] In particular:

- AGL identified a need for further guidance on technical compliance-related matters including the configuration of local limit signals and acceptable classes of equipment for SCADA required to comply with the draft rule. AGL suggested it may be appropriate for AEMO to issue guidance on the required equipment classes, and for this guidance to be made under the NER.[87]
- Origin requested the AER provide guidance on what factors will be used in determining whether to request relevant data from generators for the assessment of compliance with the rule.[88]
- Stanwell requested clarification from the Commission about how compliance will be assessed, noting that the AER's rule change request did not provide examples of how this would be achieved. Stanwell's submission identified a range of questions on how the AER will monitor and assess compliance.[89]

AGL further identified a need for the AER to provide renewed industry guidance on compliance for semi-scheduled generators during a semi-dispatch interval. AGL was

84 AEMO, submission to the draft determination, pp. 3 - 8.
85 Tilt Renewables, submission to the draft determination, p. 1.
86 Submissions to the draft determination: AGL, Stanwell, Origin.
87 AGL, submission to the draft determination, p. 2.
88 Origin, submission to the draft determination, p. 1.
89 Stanwell, submission to the draft determination, pp. 12 - 13.

concerned that, under the draft rule, a semi-scheduled generator's output can only be less than the dispatch cap, where that lesser MW output is the result of resource availability. Thus, in the absence of a resource availability issue, the generator is precluded from taking action in good faith to ensure the cap is not exceeded. AGL was concerned that the draft rule may be interpreted as requiring perfect compliance at all times, which was not considered possible.[90]

AGL suggested that either the rule make reference to generators acting in good faith, or that the AER provide the market with some assurance that their approach to enforcing compliance with the new rules will recognise where generators are taking all reasonable steps in order to comply with both of these rules.[91]

5.4 Final determination

The Commission has made a final determination and rule that retains the same approach to implementation as the draft determination and rule. Specifically:

- The final rule includes a minimalist 'least change' approach to implementation with changes to rule drafting limited to obligations applying to semi-scheduled generators.
- The final rule provides for timely implementation as it does not require material adjustment of AEMO or market participant systems. Schedule 1 of the final rule, which contains the substantive obligations applying to semi-scheduled generators, will commence on Monday 12 April 2021, 32 days after the final determination and rule is published.
- The final rule includes a transitional provision requiring AEMO to, by 12 April 2021, amend and publish any relevant power system operating procedure as is required to take into account the rule change.

The Commission's final determination is for Schedule 1 of the final rule to commence 32 days following publication of this final determination and rule, rather than 30 days as provided in the draft determination. This change allows for arrangements to commence on a Monday rather than a Saturday.

5.4.1 Commission considerations on stakeholder views

This section sets out the Commission's consideration of stakeholder views in making its final determination on implementation issues.

Implementing arrangements applying to both scheduled and semi-scheduled generators

The Commission appreciates the potential for NER drafting to be simplified in the manner suggested by AEMO given the partial alignment between the obligations for semi-scheduled and scheduled generators active power dispatch achieved by this rule change. While AEMO's proposed changes to NER drafting do not intend to alter substantive arrangements applying

90 AGL, submission to the draft determination, p. 2.
91 Ibid.

to scheduled generators, they alter the expression of those arrangements. The Commission considers that scheduled generators should be provided with the opportunity to comment on changes to the rule expression of obligations applying to their participation. The Commission however considers an extension to the time for the rule change would be required for additional consultation to include the changes suggested by AEMO. As this is a fast track rule change, the Commission has considered not to extend to time frame for this rule change to provide for additional public consultation on this matter.

Further, as AEMO's proposed changes were not included in the draft determination, and the scope of the policy changes were limited to arrangements applying to semi-scheduled generators, the Commission considers that the final rule should retain the approach taken in the draft rule which is to minimise the changes to the NER to those required to specifically achieve the objective of the rule change.

Concerns about the extent of semi-scheduled generator system changes required to comply with the rule change

As discussed in Chapter 4, the Commission considers existing NER clauses and the AER's compliance and enforcement discretion provides sufficient scope to address Tilt's concerns regarding sound technical reasons for deviating from dispatch. The Commission therefore does not consider one year is required to amend market participation systems to be compliant with the final rule.[92]

The Commission considers additional guidance from the AER on its approach to assessing compliance, given technical reasons for deviating from dispatch, would likely address Tilt's concerns more effectively than changes to final rule implementation time frames.

Additional information on how compliance will be assessed

The Commission considers that additional AER guidance on its approach to compliance would assist market and industry confidence in the rule and the AER's enforcement of compliance. The Commission considers the AER is the party best positioned to provide this additional information to stakeholders as part of its existing ongoing industry engagement.

While the Commission notes AGL and Stanwell's suggestion for the NER to provide clarity and additional obligations for guidance, the Commission does not consider it appropriate for specific obligations to be placed on the AER in respect of its information provision, compliance, and enforcement activities as part of this rule change.

5.4.2 Transitional requirement

The final rule includes a transitional provision requiring AEMO to, by 12 April 2021, amend and publish any relevant power system operating procedure as is required to take into account the rule change.

92 The Commission identifies temperature de-rating is something that the intermittent generators are supposed to manage through the information they supply to AEMO for the unconstrained intermittent generation forecast (UGIF). Temperature effects can be managed under the same arrangements as apply to the availability of the plant including on issues when a portion of the wind turbines are out for maintenance.

The Commission understands that AEMO is amending its dispatch procedure to require intra-dispatch ramping requirements, in response to this transitional rule. The Commission is of the view that this change would complement the more preferable final rule, and assist in preventing semi-scheduled generators from curtailing generation in response to price without re-bidding and waiting for an updated dispatch instruction. Chapter 4 sets out the Commission's understanding of AEMO's proposed amendments to its dispatch procedure.

ABBREVIATIONS

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
Commission	See AEMC
MCE	Ministerial Council on Energy
NEL	National Electricity Law
NEO	National electricity objective
MW	Megawatt
MWh	Megawatt-hour
ESB	Energy Security Board
ASEFS	Australian Solar Energy Forecasting System
AWEFS	Australian Wind Energy Forecasting System
UGIF	Unconstrained Intermittent Generation Forecast
COAG EC	Council of Australian Governments - Energy Council

A LEGAL REQUIREMENTS UNDER THE NEL

This appendix sets out the relevant legal requirements under the NEL for the AEMC to make this final rule determination.

A.1 Final rule determination

In accordance with s. 102 of the NEL the Commission has made this final rule determination in relation to the rule proposed by AER, A summary of the more preferable final rule is set out in section 2.1.1 of this final determination and further details are set out in sections 3.4, 4.4 and 5.4 of this final determination.

The Commission's reasons for making this final rule determination are set out in section 2.4 and Chapters 3, 4 and 5 of this final determination.

A copy of the more preferable final rule is published with this final rule determination.

A.2 Power to make the rule

The Commission is satisfied that the more preferable final rule falls within the subject matter about which the Commission may make rules. The more preferable final rule falls within s. 34 of the NEL as it relates to the operation of the national electricity market and the operation of the national electricity system for the purposes of safety, security and reliability of that system.

A.3 Commission's considerations

In assessing the rule change request the Commission considered:

- it's powers under the NEL to make the rule
- the rule change request
- submissions received by the AER in response to its consultation process
- submissions received in response to the draft determination, and
- the Commission's analysis as to the ways in which the proposed rule will or is likely to, contribute to the NEO.

There is no relevant Ministerial Council on Energy (MCE) statement of policy principles for this rule change request.[93]

The more preferable final rule is compatible with AEMO's declared network functions because it does not amend or affect those.

93 Under s. 33 of the NEL the AEMC must have regard to any relevant MCE statement of policy principles in making a rule. The MCE is referenced in the AEMC's governing legislation and is a legally enduring body comprising the Federal, State and Territory Ministers responsible for energy. On 1 July 2011, the MCE was amalgamated with the Ministerial Council on Mineral and Petroleum Resources. The amalgamated council is now called the COAG Energy Council.

A.4 Civil penalties

The Commission cannot create new civil penalty provisions. However, it may recommend to the ministerial forum of Energy Ministers (formerly COAG Energy Council)[94] that new or existing provisions of the NER be classified as civil penalty provisions.

The more preferable final rule does not amend any clauses that are currently classified as civil penalty provisions under the NEL or National Electricity (South Australia) Regulations. The Commission does not propose to recommend to the ministerial forum of Energy Ministers (formerly COAG Energy Council) that any of the proposed amendments made by the more preferable final rule be classified as civil penalty provisions.

A.5 Conduct provisions

The Commission cannot create new conduct provisions. However, it may recommend to the ministerial forum of Energy Ministers (formerly COAG Energy Council) that new or existing provisions of the NER be classified as conduct provisions.

The final rule does not amend any rules that are currently classified as conduct provisions under the NEL or National Electricity (South Australia) Regulations. The Commission does not propose to recommend to the ministerial forum of Energy Ministers (formerly COAG Energy Council) that any of the proposed amendments made by the final rule be classified as conduct provisions.

94 On 29 May 2020, the Prime Minister announced the establishment of the National Federation Reform Council and the disbanding of COAG. New arrangements for the former COAG Energy Council will be finalised following the National Cabinet Review of COAG Councils and Ministerial Forums which is due to provide recommendations to National Cabinet by September 2020. The Prime Minister has advised that, while this change is being implemented, former Councils may continue meeting as a Ministerial Forum to progress critical and/or well developed work.

B INTRODUCTION TO FRAMEWORKS FOR SEMI-SCHEDULED GENERATOR DISPATCH

This appendix describes the semi-scheduled generator registration category and - arrangements applying to semi-scheduled generators.

B.1 The semi-scheduled generator registration category

The semi-scheduled generator registration category was implemented in the Commission's central dispatch and integration of wind and other intermittent generation rule (semi-scheduled rule change) made in 2008.[95] The Commission made the semi-scheduled rule in response to emerging system security challenges from increasing penetrations of wind generation in the NEM, chiefly in South Australia.[96] In making the rule, the Commission identified the challenges wind farms were beginning to create for network congestion and AEMO's (then NEMMCO) efficient management of a secure power system.[97]

All of the pre -2005 wind farms installed in the NEM were non-scheduled and were therefore not integrated into central dispatch. In 2005, in response to increasing penetrations of large non-scheduled wind farms in South Australia, the South Australian Essential Services Commission mandated, amongst other things, registration as scheduled generators so AEMO could effectively control network flows within secure operating limits.[98]

It was identified in 2008 that a requirement for large wind farms to register as scheduled generators was inappropriate as they were not practically able to comply with rule requirements such as following a dispatch targets due to the intermittency of their natural energy resource.[99] The semi-scheduled rule change therefore imposed a set of obligations for intermittent generators to participate in the central dispatch, and to limit their output at times when that output would violate secure network limits or be uneconomic to dispatch. The rule thereby allowed AEMO to integrate intermittent generation by controlling network flows within secure limits through the action of constraints in the central dispatch process without creating inefficient barriers to their integration in the NEM by requiring them to register as scheduled generators.[100]

The 2008 semi-scheduled rule reflected semi-scheduled generator capabilities and market circumstances at that time. In making the 2008 semi-scheduled rule, the Commission used current obligations applying to non-scheduled generators as a starting point and added obligations that applied at that time to scheduled generators only where necessary for semi-scheduled generators to participate in the market.[101] There have been no material

95 AEMC, central dispatch and integration of wind and other intermittent generation rule - final determination, 1 May 2008. Further information available at: https://www.aemc.gov.au/rule-changes/central-dispatch-and-integration-of-wind-and-other.

96 In 2008 approximately 550 MW of wind capacity was connected in the NEM of which 386 MW was installed in South Australia.

97 AEMC, semi-scheduled rule change - final determination, p. vi.

98 AEMC, semi-scheduled rule change - final determination, p. 13.

99 Ibid, p. 1.

100 Ibid.

101 AEMC, semi-scheduled rule change - final determination, p. 25.

amendments to arrangements applying to semi-scheduled generators since the semi-scheduled rule was made.

In making the semi-scheduled rule change in 2008, the Commission considered that the rule would enhance the efficient use of, and efficient investment in, electrical services by improving AEMO's ability to securely integrate higher penetrations intermittent generation in the NEM. The Commission made the rule on the basis that it promoted the long-term interests of consumers of electricity through lower prices for energy, market ancillary service and network charges, and higher levels of reliability and security of the national electricity system. These benefits relate to the improved efficiency of the dispatch process and the improved certainty to investors in NEM.[102]

B.2 Arrangements formerly applying to semi-scheduled generation dispatch

Arrangements for semi-scheduled generators in the NEM (that applied prior to the publication of this final determination and rule) included a set of obligations requiring them to:

- make offers and participate in central dispatch
- limit their output at times when that output would violate secure network limits or be uneconomic to dispatch
- participate in causer pays arrangements (as an incentive for them to minimise their adverse effect on power system frequency)

Arrangements in each of these areas are introduced below as background and context to the Commission's assessment of the AER's rule change request.

Requirement to make offers and participate in central dispatch

In contrast to non-scheduled generators, semi-scheduled generators are required to participate in the central dispatch process, including submitting offers and, under certain circumstances, responding to dispatch instructions from AEMO.[103] Existing arrangements require semi-scheduled generators to provide price and availability offers in 10 bands for each dispatch interval in the same manner as scheduled generators.[104] Semi scheduled offer requirements also include ramp rate limits.[105]

The requirement to make offers and participate in central dispatch allows AEMO to economically schedule both scheduled and semi-scheduled generators, as well as manage semi-scheduled generator output when binding constraints apply.

Compliance with dispatch instructions during semi and non semi-dispatch intervals

102 Ibid, p. 20.
103 Clause 4.9.2(a) of the NER.
104 Clause 3.8.6(g) of the NER.
105 Clause 4.9.5(a) of the NER.

Compliance with dispatch instructions is a strict obligation for scheduled generators, except where compliance would, in the generator's reasonable opinion, be a hazard to public safety or materially risk damaging equipment.[106] However, arrangements that applied prior to publication of this final determination and rule imposed more limited obligations for semi-scheduled generators; they only imposed a cap on their output if AEMO determines that a dispatch interval is a 'semi-dispatch' interval.[107]

AEMO declares a semi-dispatch interval when either one of the following conditions apply:[108]

- 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
- 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.

During a semi-dispatch interval AEMO's dispatch instruction includes a dispatch level that formerly specified the maximum level of a semi-scheduled generating unit's MW generation. The semi-scheduled generating unit was free to generate at any level up to the dispatch level but not to exceed it.

There was no restriction under arrangements that formerly applied on deviating below the cap during semi-dispatch intervals. A semi-scheduled generating unit was also permitted to disregard the dispatch level and generate at any level during non-semi-dispatch intervals.[109]

Unconstrained intermittent generation forecast (UGIF)

Ongoing arrangements require AEMO to calculate an unconstrained intermittent generation forecast (UGIF).[110] Unlike scheduled generating units, a semi-scheduled generating unit's plant availability for operation does not necessarily equal its available capacity for dispatch. It is the role of the UIGF to take the plant availability data from the semi-scheduled generator and compute the available capacity for dispatch given solar and wind conditions at the applicable generation site.[111]

Forecasts of semi-scheduled generation through the UGIF is the basis on which AEMO determines the MW capacity available for dispatch, pre-dispatch, and PASA for semi-scheduled generating units. Semi-scheduled generators still offer their capacity into the market in the same way as scheduled generators, in 10 price-volume bands, but AEMO determines their maximum available capacity for dispatch through the UGIF.

106 Clause 4.9.8 of the NER.

107 Glossary - Chapter 10 of the NER, definition of semi-dispatch interval and dispatch level; clause 4.9.5(a)(6) of the NER.

108 Chapter 10 of the NER, Glossary definition of semi-dispatch interval.

109 AEMC, semi-scheduled rule change - final determination, p. 50.

110 Clause 3.7.1(c)(2) NER.

111 AEMO calculates the UGIF using the Australian Wind Energy Forecasting System (AWEFS) and, Australian Solar Energy Forecasting System (ASEFS) as well as generator self forecasts.

Semi-scheduled generators also provide AEMO with information on the availability of the individual units making up the generating system. This information is necessary for AEMO's wind forecasting system to produce accurate UIGF forecasts.

Provisions for rebidding

Ongoing arrangements include rebidding which allows participants to adjust bids in response to new information as it becomes available. This could include changes in weather, consumer demand, generator performance, network constraints or the bids of other participants.

Semi-scheduled generators are able to rebid capacity between price bands in the same manner as scheduled generators.[112] As semi-scheduled generators submit changes to availability through the UIGF, they only need to make rebids when moving capacity between price bands. Generators in the NEM are able to rebid up to the next five-minute dispatch interval.

Rebidding by participants, including rebids made very close to the time of dispatch, is a central design component of the NEM's wholesale market. Rebidding provides generators with the flexibility to adjust their position to accommodate changes in market conditions. Rebidding is the mechanism through which semi-scheduled generators should respond to negative prices. The AER's rule change is motivated by negative price curtailment by semi-scheduled generators without re-bidding and waiting for an updated dispatch target.

Causer pays

Ongoing arrangements include semi-scheduled generators in causer pays arrangements. "Causer pays" provides a disincentive for generators in the NEM to deviate from their dispatch targets. It does this by allocating to generators a share of the costs of procuring regulation FCAS required to address that frequency deviation.[113]

Specifically, causer pays provisions under clause 3.15.6A incentivise a semi-scheduled generator to ramp (increase or decrease) its actual generation at a uniform rate. Any deviations from a uniform rate of change that contribute to frequency deviation will add to the regulation FCAS causer pays factors for that generating unit, thereby increasing the proportion of regulation FCAS costs attributable to that generating unit.[114]

Making semi-scheduled generators responsible for the full cost of the regulation FCAS that they create incentivises each generator to minimise their contribution to frequency deviation. Options include investing in more advanced active power control technology, and providing their most accurate information available to AEMO for the UIGF.

112 Clauses 3.8.22 and 3.8.22A of the NER.
113 Clause 3.15.6A of the NER.
114 Clause 3.15.6A(k)(5) of the NER.

C MATERIALITY OF THE ISSUE

This appendix summarises the AER's claims of materiality in respect to the curtailment by semi-scheduled generators in response to price without rebidding or waiting for an updated dispatch instruction.

C.1 AER's claim of materiality

This section sets out the AER's assessment of the issue's materiality.

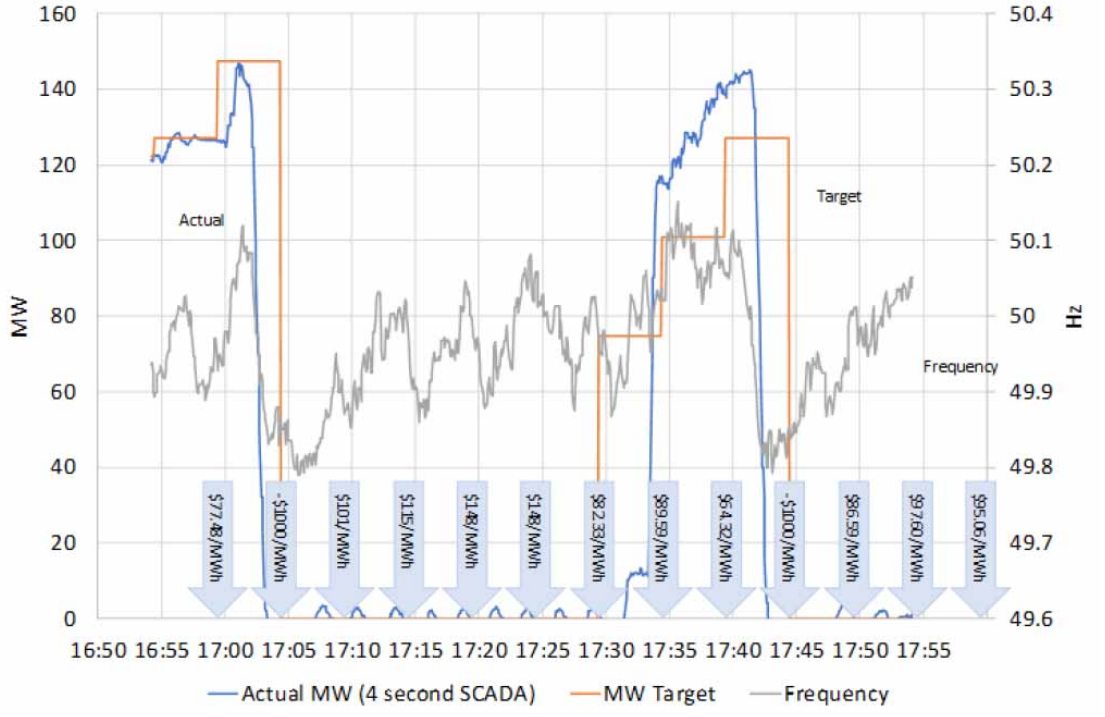
The AER's rule change request identified negative implications for power system security and market efficiency from recent practice, by some semi scheduled generators, to depart significantly from their dispatch instructions without rebidding and waiting for an updated dispatch target from AEMO. The AER considered these deviations from semi-scheduled generators' dispatch instructions are far in excess of plausible variation in their resource, and are a response to negative market prices.[115]

Example of negative price curtailment

The AER's rule change request provided details of a recent case to illustrate negative price curtailment behaviour. This case, shown in Figure C.1, involves a wind farm rapidly ceasing production during a dispatch interval in response to a negative market price in that interval.[116]

115 AER, rule change request, p. 1.
116 AER rule change request, p. 5.

Figure C.1: Example of semi-scheduled negative price shutdown



AER rule change request, p. 5

The orange line in Figure C.1 shows the MW target for the unit, that is, the dispatch instruction. The blue line shows the unit's MW output. The grey line shows the power system frequency during that time (referenced against the right-hand axis), and the light blue arrows showing the regional dispatch price, and when it was published in pre-dispatch for the subsequent dispatch interval.

The AER's example included the following details:[117]

- 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 next dispatch interval forecast in pre-dispatch. 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

117 AER, rule change request, p. 6.

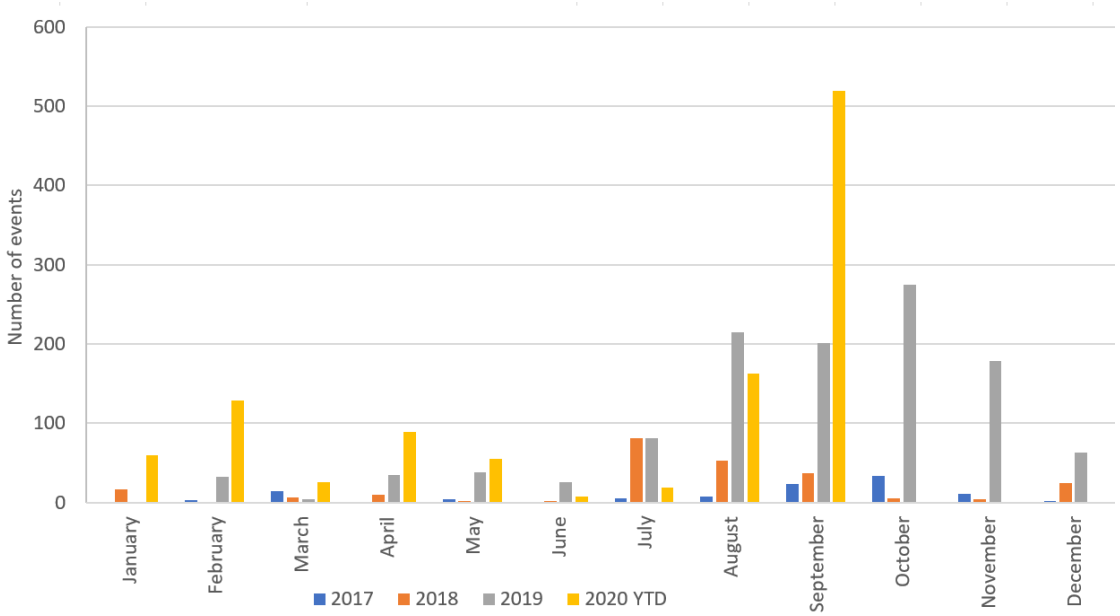
technical limitations. SCADA data indicates the number of turbines available remained relatively constant and the wind speed fell only slightly.

- 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. 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.
- This example also shows the impact of this behaviour power system frequency, which is a barometer of the supply demand balance. As the generator reduced its capacity and deviated from AEMO's forecast target, power system frequency (grey line) fell outside the normal operating frequency band (of between 49.85 and 50.15 Hz, right-hand axis). The AER notes that the impact would have been more substantial if multiple generators concurrently operated in this way.

The AER's issues paper also identified an increase in the frequency of large deviations by semi-scheduled generators during negative price events. Figure C.2 shows the number of events where semi-scheduled generators deviated more than 20 MW below their dispatch target when the dispatch price was negative, in each month over the last three years in South Australia. The AER chose the 20 MW threshold since it considered it was a large enough deviation from a generator's dispatch target that it would not normally be explained by a sudden change in the resource, beyond the change predicted in the forecasting systems.[118] While the results shown in Figure C.2 also capture the effect of other factors that can lead to large deviations from dispatch targets during negative price intervals, the significant increase in the frequency of such events in the last two years across almost all months (grey and yellow columns) may indicate increasing occurrence of negative price curtailment by semi-scheduled generators.

118 AER, issues paper, p. 19.

Figure C.2: Frequency of >20 MW variation by South Australian semi scheduled generators in a single dispatch interval when the price is negative



AER, updated with August and September data

Implications of semi-scheduled generator curtailment in response to price

The AER's rule change request identified system security and market efficiency implications from semi-scheduled generator curtailment in response to negative prices.

The AER identified that 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 NEM's wholesale market arrangements effectively assume all generators will follow their targets. AEMO manages system security on that basis. The optimisation of dispatch through NEMDE also presumes all generators comply with dispatch instructions.[119]

The AER identified the following benefits of the rule change which illustrate the materiality of the economic and security issues created by negative price curtailment.[120]

- 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**, given constraints and limitations on the system, contributing to the National Electricity Objective (NEO). The materiality of this outcome is expected to only increase as the generation mix continues to change, such as to include a higher penetration of intermittent generation.

119 AER, rule change request, p. 5.
120 AER, rule change request, p. 26.

- 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 **reduce the cost of supplying electricity,** benefit customers and therefore promote the NEO. In the absence of the rule change, increased volatility in frequency is likely to create risks to system security, this is managed by AEMO adjusting the FCAS requirement. This would increase the cost to provide that FCAS service and that incremental cost would flow through to customers.

The AER cited the following observation from AEMO's renewable integration study on the system security challenges of managing increasing uncertainty associated with intermittent generation levels for the operation of the NEM.[121]

> "...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."

Growth in issue materiality given higher penetrations of intermittent renewable generation

The AER identified the potential for the materiality of the issue to increase with the growth of intermittent generation in the NEM.[122] In particular, the AER noted 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.[123] Due to rapid expected increase in the amount of

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

122 AER, rule change request, p. 7.

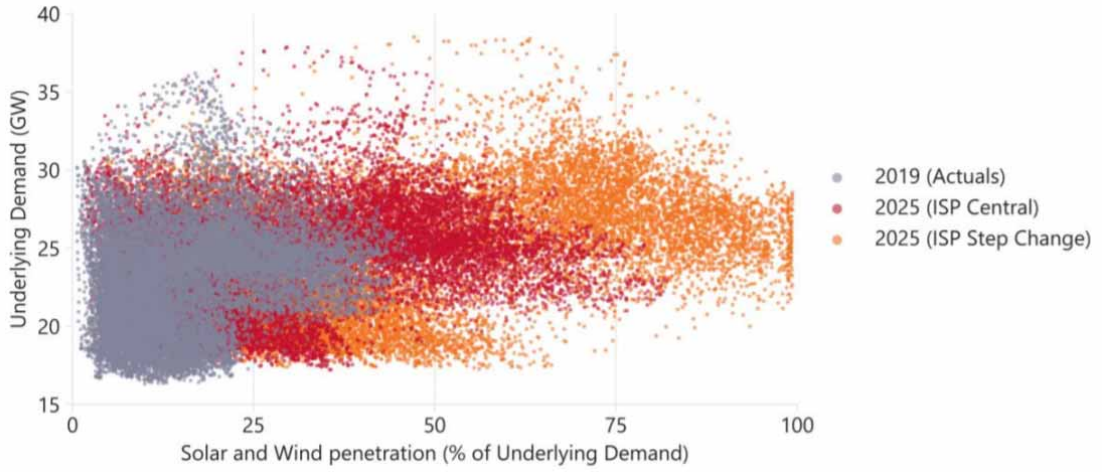
123 AEMO, 2020, Central scenario, 2020 Integrated System Plan, www.aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2020-integrated-system-plan-isp

semi-scheduled generation, the AER considered the limited obligations required of semi-scheduled generators under existing arrangements are no longer appropriate.

In addition to the growth in generation capacity, the AER supported its claim on the materiality of the issue by referencing the increasing proportion of demand met by renewable generation. The AER pointed to information from AEMO's Renewable Integration Study (RIS). The study 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).[124]

The AER also noted a primary conclusion of the RIS report is that, by 2025, instantaneous intermittent renewable penetration levels in the NEM will be such that they will be constrained to between 50%-60% of the time unless a range of initiatives are implemented.[125]

Figure C.3: Instantaneous penetration of wind and solar generation, actual in 2019 and forecast for 2025 under ISP Central and Step Change generation builds



AEMO, renewable integration study, p. 6.

C.2 Shortcomings in existing arrangements identified by the AER

The AER identified that the rules as applied prior to publication of this final determination and rule did not prevent a semi-scheduled generator from rapidly reducing their output to zero during negative price dispatch intervals without an instruction from AEMO or valid rebid.[126] Arrangements only required semi-scheduled generators to observe a cap in their generation

124 Note: Penetration on this graph represent NEM half-hourly wind and solar generation divided by the underlying demand which includes demand response, energy storage, and coupled sectors such as gas and the electrification of transport.

125 AER, rule change request, p. 7.

126 AER, rule change request, p. 8.

during semi-dispatch intervals. These arrangements therefore did not prevent semi-scheduled generators from rapidly reducing generation at any time and for any reason.

The AER considered that when the semi-scheduled classification was introduced there was limited experience of the impact of resource variations, and wind generation forecasting was immature. Further, semi-scheduled generators were expected to be relatively 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. According to the AER, 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.[127]

The AER considered that the situation has now changed. The following factors necessitate changes to the requirements on semi-scheduled generators:[128]

- the cost of intermittent renewable generating technologies are now significantly cheaper and have evolved significantly, supported by precise control system software facilitating both very fast ramping and close control of output.
- grid demand is static or falling and conventional generation is retiring and not being replaced by generators of equivalent capability. There is now enough intermittent renewable generation to meet all of a region's demand in some periods.
- negative prices are occurring more frequently and more recent contracts are likely to require these generators to take some exposure in negative price periods.
- automated dispatch software is now available and being used by some generators – in some cases this may be occurring without integrating with dispatch offers or without allowing for appropriate ramping across a dispatch interval.
- wind and solar forecasting have improved markedly due to generators' experience and the increased capabilities of computers and learning software.

127 AER, rule change request, p. 4.

128 AER, rule change request, p. 4.

D OTHER OPTIONS CONSIDERED BY AER

The AER considered and consulted on a range of rule change options for addressing the issue of negative price curtailment by semi-scheduled generators. The set of options identified by the AER is relevant to the Commission's considerations on whether there are alternatives that better achieve the NEO than the AER's proposed rule change.

In its issues paper, the AER consulted on the following rule change options:[129]

- amending causer pays factors for ancillary services to increase economic incentives for semi-scheduled generation to follow dispatch instructions
- removing the semi-scheduled classification
- amending existing arrangements for semi-scheduled generation including:
  - amending dispatch instructions for semi-scheduled generators to be MW target for the 5-minute interval which would automatically incorporate the effect of a cap on output if necessary
  - defining an energy target be defined to provide for variations in resource within 5-minute intervals, and
  - operating as an inflexible generator and advising AEMO of a fixed megawatt level for the dispatch interval.

The Commission has considered these options, and the AER's reasons for rejecting them in favour of its rule change proposal. These options are briefly introduced below along with the AER's reasons for not accepting them. Further information is provided in the rule change request and the AER's issues paper.

D.1 Alternate rule change options considered

The AER considered the following alternative options for changing the rules.

Amending causer pays factors for ancillary services to increase economic incentives for semi-scheduled generation to follow dispatch instructions

Semi-scheduled generators are subject to causer pays which allocate a share of the regulation FCAS costs required to manage the impact of intermittent generator output on power system frequency.[130]

The AER's assessment of this option was that arrangements that applied prior to publication of this final determination and rule did not create a material incentive to follow a dispatch instruction as if it were a target. The AER identified that while in principle a new causer pays approach could be designed to provide sufficient incentives for semi scheduled generators to follow their dispatch targets, it would require a major overhaul of the calculation and

129 AER, rule change request, p. 5.
130 AER, issues paper, p. 29.

application of these factors and may have other unintended consequences. The AER therefore did not consider this option to be a practical solution in context of this problem.[131]

Removing semi-scheduled registration category

The AER consulted on removing the semi-scheduled generation registration category and requiring all intermittent generators above a certain size to register as scheduled generators and follow dispatch instructions accordingly. The AER considered removing the semi-scheduled classification to be a major structural change to the rules that would require the development of unique compliance arrangements for intermittent generators that could make broader enforcement actions problematic.

The AER further identified that there would be numerous legacy and transition issues to be dealt with under this approach. Special arrangements would be needed to facilitate these generators continuing to use Australian Wind Energy Forecasting System (AWEFS) or Australian Solar Energy Forecasting System (ASEFS) calculations to determine their dispatch, creating further complications. Neither the AER nor stakeholders supported the option as a proportionate response to the issue of negative price curtailment by semi-scheduled generators.[132]

Amending existing arrangements applying to semi-scheduled generation

The AER consulted on three sub-options for retaining the semi-scheduled registration category while also imposing requirements for semi-scheduled generators to respond to dispatch instructions in a manner more closely aligned with scheduled generation. These sub-options were:[133]

- Dispatch instructions for semi-scheduled generators to be MW target for the 5-minute interval which would automatically incorporate the effect of a cap on output if necessary. This was the AER's preferred approach put forward in its issues paper.
- Dispatch instructions for semi-scheduled generators to be defined as an energy target (MWh) for the 5-minute interval which would automatically incorporate the effect of a cap on output if necessary.
- Semi-scheduled participants to develop and advise AEMO of their preferred dispatch and subject to system security requirements these preferences will become their target via an instruction back to the generator.

The AER's preferred option was for semi-scheduled generators to receive and comply with a MW dispatch instruction based on forecast resource availability for the end of the 5-minute interval which would automatically incorporate the effect of a cap on output and a ramp rate.[134] This option also required semi scheduled generators to (linearly) progress to a MW target for the end of a dispatch interval, and increasing their output above target in the presence of an increased resource would not be allowed. The feedback from submissions to

131 AER, issues paper, p. 5.
132 AER, issues paper, p. 32.
133 AER, issues paper, p. 5.
134 AER issues paper, p. 34.

the issues paper was not supportive of this approach citing material revenue impacts for semi-scheduled generators, and requirements for additional raise FCAS.[135]

Neither of the other two options were considered desirable either by the AER or stakeholders. While the AER considered expressing the target in terms of MWh energy would effectively provide flexibility to account for resource availability, while addressing the issue of negative price curtailment, a number of drawbacks were identified. For instance, complications in causer pays calculations, and the disadvantage of adopting an approach different to the MW target specified for scheduled generators.[136]

The fourth option, of semi-scheduled generators specifying their preferred dispatch level, also had a range of drawbacks and was considered would likely lead to inefficient outcomes.[137]

Require a self reported 'bonafide reason' for the deviation

In their submissions to the issues paper, a number of stakeholders cited arrangements in New Zealand. These require intermittent generators to self report a 'bonafide reason' for a significant deviation from dispatch targets. Stakeholders considered this to be a simpler approach to addressing the challenge of negative price curtailment than the options put forward by the AER in its issues paper.

The AER was not supportive of this approach. It considered the 'self reporting' model presented a range of monitoring and compliance issues. The AER preferred a discretionary AER-initiated 'please explain' method linked to clear rule obligations. The AER consideredthis 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.[138]

D.2 Non rule change options considered

The AER's rule change request considered a number of alternative options that would address the issue but not require a rule change.[139] The non-rule change options considered relevant to the Commission's consideration are:

- limiting the use of systems and procedures for negative price curtailment through AEMO's registration conditions, or
- addressing the issue in other rule change processes currently being considered.

Limiting the use of systems and procedures for negative price curtailment through registration conditions

In the issues paper, the AER considered the option of limiting the use of facilities or procedures that lead to rapid reduction in output in response to price through the generation

135 AER, rule change request, p. 18.
136 AER, issues paper, p. 37.
137 AER, issues paper, p. 38.
138 AER, rule change request, p. 16.
139 These are set out in the AER's rule change request section 4.

registration process. AEMO currently manages the registration process and can impose conditions on the registration of new generating systems. In principle the conditions attached to the registration of semi-scheduled generators could include restrictions to address generators dramatically changing their output without a corresponding dispatch instruction.[140]

The AER did not consider this approach a substitute for a rule change as it was not clear that AEMO's current powers to impose conditions on generators when they register extend to prohibiting the operation of control systems and manual procedures that allow for a rapid change in output. In addition, the AER noted that imposing conditions would not apply to existing registrations/conditions thereby creating inconsistencies in the registration arrangements applying to different generators in the same registration category.[141]

Whether the issue is best addressed in rule change processes currently being considered or implemented

Stakeholder responses to the AER's issues paper highlighted the importance of assessing the need for a rule change at this time given potential changes being developed through the ESB's post 2025 work, as well as recent amendments to require Mandatory Primary Frequency Response (MPFR).[142]

Regarding the MPFR, several stakeholders questioned whether a rule change was required given the MPFR rule places an obligation on all scheduled and semi-scheduled generators to operate their plant in accordance with Primary Frequency Response Requirements (PFRR) that require all generating systems (including semi scheduled generators) to respond to frequency deviations from 50Hz by ±0.015Hz at the connection point.[143] Some stakeholders considered these requirements would address the issue as semi scheduled generators operating in frequency responsive mode will respond to frequency deviations and be unable to manually change their energy output in these situations.[144]

The AER considered and countered this view. The AER noted that 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, the AER considers its rule change proposal will remove 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 is consistent with the MPFC and should reduce the overall requirement allowing existing FCAS and MPFR to operate more efficiently.[145]

In regards to potential changes being developed in the ESB's NEM 2025 work, the AER also notes that the request from COAG Energy Council to the AER to consider two of the six interim security measures which the ESB considered needed to occur within the next 12 to 18 months, prior to the large market reforms underway in the post 2025 market design. The

140 AER, issues paper, p. 38.
141 Ibid.
142 AER, rule change request, p. 13.
143 Where those generating systems have been dispatched at greater than 0 MW.
144 Ibid, p. 14.
145 Ibid.

AER is cognisant of the changes to the design of the NEM and considers this amendment to the current design to be relatively minor and does not detract from the range of options being considered by the ESB in its post 2025 market design work.[146]

146 Ibid.