2020 Review of incentives to improve the availability of generators

Issues Paper

24 April 2020

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WESTERN AUSTRALIA

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Invitation to make submissions

Submissions are due by 4:00 pm WST, Monday, 8 June 2020

The ERA invites comment on this paper and encourages all interested parties to provide comment on the matters discussed in this paper and any other issues or concerns not already raised in this paper.

We would prefer to receive your comments via our online submission form https://www.erawa.com.au/consultation

You can also send comments through:

Email: publicsubmissions@erawa.com.au
Post: PO Box 8469, PERTH BC WA 6849

Please note that submissions provided electronically do not need to be provided separately in hard copy.

All submissions will be made available on our website unless arrangements are made in advance between the author and the ERA. This is because it is preferable that all submissions be publicly available to facilitate an informed and transparent consultative process. Parties wishing to submit confidential information are requested to contact us at info@erawa.com.au.

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1. Introduction

The Wholesale Electricity Market rules require the ERA, in consultation with the Australian Energy Market Operator, to complete two reviews by 31 December 2020.[1] These requirements are stated in:

- Clause 4.11.1E:
  - The ERA must review the operation of clause 4.11.1(h), which allows the Australian Energy Market Operator (AEMO) to reduce a generator's certified reserve capacity if that generator's forced outage rate or combined planned and forced outage rate is greater than the threshold rates set out in clause 4.11.1D.
  - The ERA must review the threshold rates in clause 4.11.1D for the forced outage rate and the combined planned and forced outage rate.
- Clause 4.26.1D:
  - The ERA must review the limit for the Refund Exempt Planned Outage (REPO) count that is set in clause 4.26.1C. The REPO count limit is used by AEMO to determine if an approved planned outage for a scheduled generator is exempt or liable for refunds of capacity credits.

The market rules allow the ERA to also assess any other issues that it considers are relevant to the reviews.

These reviews will be used to determine whether these parts of the market rules are operating appropriately or should be changed to better meet the Wholesale Electricity Market (WEM) objectives. The market rules require the ERA to submit a rule change proposal if any changes are recommended.[2]

These are separate, one-off reviews required by the market rules. The ERA is conducting both reviews together because:

- Both reviews address the same underlying issue of generator availability in the South West Interconnected System (SWIS).
- This will reduce the administrative burden for market participants and interested parties as a single submission can be provided that covers the questions for both reviews.

The ERA must conduct the reviews in conjunction with AEMO and will discuss the analysis and any conclusions drawn from it with AEMO before publication of any reports.

1.1 Purpose of this issues paper

The ERA has conducted preliminary analysis of available market and outage-related data and information supplied by AEMO. The ERA is seeking feedback on:

- The operation of these clauses and effects on market participants and the WEM.
- Whether the design and operation of these clauses achieves the intent of increasing the availability of generator capacity in the WEM.

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1 Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Rule 4.11.1E and rule 4.26.1D (online).

2 Ibid. Rule 4.11.1F and rule 4.26.1E (online).

- Other issues relevant to the market rules under review and future implications for the WEM.

Information received during the consultation process will inform the ERA's report. The ERA invites submissions on the specific questions detailed in this issues paper and stakeholders' experiences with the relevant market rules.

1.2 Reporting context

Energy Policy WA is addressing reliability standards in one of its work streams: delivering the future power system. There is also an outage-related rule change proposal under consideration by the Rule Change Panel.[3] The ERA Secretariat has discussed the ERA's reviews with both parties and has confirmed that there is no overlap. The ERA's reviews are specific in their scope and assess only the availability of generating capacity. Energy Policy WA's work focuses on the technical reliability standards that guide generator operation. The Rule Change Panel's outage-related rule change covers many administrative matters relating to outages, for example logging outages in advance.

1.3 Concepts

The Reserve Capacity Mechanism (RCM) incentivises electricity providers to make their capacity available over the capacity year in return for capacity payments. Inherent to receiving payment for their capacity is the need for electricity providers to maximise the availability of their capacity. However, generators require time to maintain and repair their plant, and the availability of capacity is reduced when maintenance or repairs are conducted. If adequate maintenance or repairs are not performed, the plant is at risk of failure, which would create an outage.

Generators are able to log outages. AEMO then determines which outages are liable for capacity refunds within the RCM.

There are different types of outages:

- Planned outage – an outage of a generation facility (typically for maintenance work) that is approved by AEMO.[4] Once a planned outage is approved, a generator will generally not be subject to reductions in its capacity payments unless the planned outage is determined to be a refund payable planned outage.
- Refund payable planned outage – an approved planned outage that is in excess of the Refund Exempt Planned Outage (REPO) Count limit and attracts capacity cost refunds.[5] The REPO count is a relative measure of the amount of unavailable megawatts for a generator relative to the capacity that it is meant to provide in that trading interval.[6] The REPO count limit is calculated over 1,000 trading days.
- Forced outage – an outage of either a facility or item on the equipment list that has not received AEMO's approval.[7] These outages are liable for capacity credit refunds.

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3 Independent Market Operator, 2014, *RC_2014_03: Administrative Improvements to the Outage Process* (online).

4 Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Rule 3.19.11 (online).

5 Ibid. Chapter 11

6 Ibid.

7 Ibid. Rule 3.21.1

Generators are paid to provide capacity to the market but only do so when they are available and not on outage. However, where generators are unavailable for excessive periods of time, such as for maintenance, this reduces the capacity available to the market. Not only are generators on outage unavailable, but if they have substantial installed capacity, they also reduce opportunities for other generators to obtain outages necessary to maintain their plant.

2. The outage threshold and availability mechanism

This section of the paper explores the scope, issues and preliminary analysis for the review under clause 4.11.1E.

2.1 Scope of the review

Clause 4.11.1E sets out the minimum requirements of its review and is reproduced here:

> 4.11.1E. The Economic Regulation Authority, in consultation with AEMO, must undertake a review, to be completed by 31 December 2020, of the operation of clause 4.11.1(h) in which it must consider the appropriate thresholds under clause 4.11.1D for Capacity Years from and including the 2022 Capacity Year. The review must include, at a minimum, an assessment of—
>
> (a) the availability performance of the generation sector in the Wholesale Electricity Market compared with analogous generating plants in other markets;
>
> (b) the number of Facilities in the SWIS to which the criteria in clause 4.11.1(h) have applied in each of the previous five Capacity Years; and
>
> (c) the impact on the Wholesale Electricity Market of decisions made by AEMO under clause 4.11.1(h) in the previous five Capacity Years.

Given the requirements in the market rules, the review will cover:

1. An assessment of the availability performance of the generation sector in the WEM with comparisons to other relevant markets and their generation fleet.

2. The number of facilities in the SWIS that could have had their certified reserve capacity reduced by AEMO in each of the last five capacity years prior to the 2022 capacity year.

3. The decisions made by AEMO where certified reserve capacity for a facility could have been reduced due to that facility's outage rate exceeding the thresholds in the market rules, for each of the five capacity years prior to the 2022 capacity year.

4. How AEMO exercises its discretion to reduce a facility's certified reserve capacity if its forced outage or combined planned and forced outage rate is higher than the stated thresholds.

5. Analysis of the thresholds for forced outage rates and combined planned and forced outage rates stated in the market rules and whether the rates are appropriate or should be changed.

2.1.1 Development of the market rules requiring a review of the outage thresholds and availability mechanism

At the start of the market, where a generator had a forced outage rate over 15 per cent or a combined planned outage and forced outage rate over 30 per cent (calculated over the preceding 36 months), the IMO (or later AEMO) had discretion to not assign certified reserve capacity to that generator. This was known as an 'all or nothing' approach. If the IMO (or later

AEMO) chose to exercise its discretion, then that generator's certified reserve capacity would either be reduced to zero or not reduced at all.

Clause 4.11.1E was inserted by the Minister of Energy and commenced on 1 June 2016. The clause required a review of how AEMO exercises its discretion in reducing a generator's certified reserve capacity if the stated outage thresholds are breached. In April 2018, when the IMO ceased operation, responsibility for this review was transferred to the ERA and the timeframe for the review was extended accordingly.

The outage rate level table is reproduced from the market rules in Table 1 for reference.

Table 1: Outage rate limit table in the market rules (%)

For AEMO decisions related to the capacity cycle	Forced outage rate percentage greater than	Combined planned outage rate and forced outage rate percentage greater than
Prior to 2015	15	30
2015	14	28
2016	13	26
2017	12	24
2018	11	22
2019 onwards	10	20

Source: Clause 4.11.1D of the market rules

There is a downward glide path for outage rates until the 2019 capacity cycle, from when the rates are fixed.

2.2 Application of outage thresholds to facilities in the SWIS

For AEMO to reduce a generator's certified reserve capacity, a facility would need either a forced outage rate or a combined planned and forced outage rate greater than the threshold set in clause 4.11.1D for the applicable capacity cycle. The outage rate is calculated over the 36 months prior to AEMO's determination of certified reserve capacity for that facility.

A preliminary assessment over the last four capacity cycles, based on market data, shows that few facilities have breached the outage thresholds in Table 1 (on page 5).

Table 2: Number of facilities that have breached outage thresholds by capacity cycle

Capacity cycle	2016	2017	2018	2019
No of facilities	2	2	2	3

Source: ERA analysis of market data

There were nine breaches, by four facilities, of the outage thresholds identified over the last four capacity cycles.

Of the nine identified breaches of the threshold limits:

- Six of these breaches were for exceeding both the forced outage rate limit and the combined planned and forced outage rates.
- Three breaches were for exceeding only the combined planned and forced outage rate threshold.

AEMO has not reduced any facility's certified reserve capacity in any capacity cycle that had outage rates greater than the thresholds. The market rules set out a list of considerations for AEMO when deciding whether to reduce a generator's certified reserve capacity.[8] AEMO must also ensure this decision would not be contrary to the WEM objectives.

Question

AEMO (and the IMO previously) has not reduced the certified reserve capacity of a facility that had outage rates in excess of the outage thresholds specified in the market rules.

1. Considering the above, how do stakeholders view the efficacy and usefulness of this mechanism?

2.3 Generator availability in the WEM compared with other jurisdictions

Part of the ERA's review is to assess the availability performance of the generation sector in the WEM against the availability performance of other similar generating fleets in similar markets worldwide. Availability performance is a measure of the level of availability of a generating asset: the amount of time a generator is available relative to the total time in a capacity year.

The ERA will need to develop an approach to ensure consistent analysis and comparability of generator availability performance across jurisdictions. The ERA is considering repeating the approach suggested in the IMO's concept paper. That approach was to determine the availability of the generator fleet in the WEM in line with the Institute of Electrical and Electronics Engineers (IEEE) Standard 762, which was then used as a base case for comparing with other jurisdictions.[9] [10] The main benefit of this approach is that it allows for international comparability as it creates a common reference point to understand outage classifications and data from different jurisdictions.

8 Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Rule 4.11.1C (online).

9 Independent Market Operator, 2013, *CP_2013_01: Incentives to Improve Availability of Scheduled Generators*, (online) p 18.

10 The Institute of Electrical and Electronics Engineers [IEEE] 2016, *IEEE Standard 762-2016 IEEE Standard Definitions for Use in Reporting Electric Generating Unit Reliability, Availability, and Productivity*, (online) [accessed 19 March 2020].

Question

2. Do stakeholders consider that determining the availability of the generator fleet in the WEM in line with IEEE Standard 762 is appropriate for the ERA's review? What other approaches could be taken?

As AEMO has not reduced any facility's certified reserve capacity through the exercise of clause 4.11.1(h), there is no easily identifiable objective counterfactual scenario for comparison. Therefore, the ERA is considering conducting modelling to understand the WEM outcomes following the reduction of certified capacity for facilities that did breach the outage thresholds in the market rules. The ERA acknowledges that this will be a complex task and if it proceeds, external expertise may be required to assist with this part of the review.

Stating outage thresholds in the market rules provides a signal to the market on the level of availability and outages that are acceptable. The possibility of financial consequences for breaching those outage thresholds through reducing the level of certified reserve capacity a facility can receive provides an incentive to ensure that a facility remains below the threshold.

2.4 The outage threshold rates

The ERA's review includes an assessment of the outage threshold rates in clause 4.11.1D. However, the ERA has also considered whether specific outage rates are required in the market rules.

If there were no thresholds stated in the market rules, generators could be expected to maximise their availability so that they can maximise their reserve capacity payments. This may lead to a lower level of planned outages being scheduled. If planned maintenance is reduced, this could increase the occurrence of forced outages as generators may trip if they have been insufficiently maintained. The financial risk of the plant being on outage is borne by generators. However, there could be associated system security risks which would complicate the task of maintaining the WEM's system security if more unexpected forced outages occur.

As discussed in section 1.3, generators require time to maintain and repair their plant. The outage thresholds in the market rules indicate an acceptable outage rate for a facility to perform this maintenance before revenue from capacity payments may be affected. Since generators are paid to provide reserve capacity, the market rules need to balance the need for generators to perform maintenance against having reserve capacity available.

The use of outage thresholds in the market rules is one approach to addressing the need for facilities to maintain their plant and make that capacity available to the market. This is discussed further in section 2.4.2.1.

At the start of the market, the market rules contained outage thresholds of 15 per cent for forced outages and 30 per cent for combined planned and forced outages.[11] The IMO (later AEMO) could exercise its discretion to reduce a generator's certified reserve capacity if a generator breached these thresholds.

The thresholds were set at a time when the average forced outage rate for conventional generation in the SWIS was around 4 per cent and planned outages at approximately 10 per cent. The combined forced and planned outage threshold of 30 per cent was reflective of the

[11] Independent Market Operator, 2015, *Wholesale Electricity Market Rules (WA), 30 November 2015*, Rule 4.11.1(h) (online).

worst-performing generation plants in the SWIS at that time. Evidence of this comes from the IMO's concept paper:

> It is likely that the original designers of this clause [4.11.1(h)] considered it improbable that the threshold would be breached by a Scheduled Generator in normal commercial operation.[12]

2.4.1 Incentive to increase generator availability

The introduction of the thresholds in clause 4.11.1D was to:

- Provide an incentive to the worst-performing scheduled generators to raise their availability.
- Reduce the incentives to retain unreliable and inefficient generation assets.
- Introduce a transitional period to allow generators to gradually improve their availability by setting a glide path to the target threshold rates that would exist from the 2019 capacity year.[13]

The outage thresholds and the option for AEMO to exercise its discretion in certifying reserve capacity, creates three scenarios for generators:

1. A generator breaches the outage thresholds in the market rules and may have its certified reserve capacity reduced.

2. A generator is close to the outage threshold and may breach the outage threshold in future years if the threshold is reduced or the generator's availability decreases.

3. A generator has outage rates well below the thresholds making a breach of the thresholds unlikely.

In scenarios one and two above, the ERA is seeking to determine the strength and effectiveness of these thresholds in prompting generators to increase their availability. Additionally, the ERA is considering whether the outage thresholds levels in the market rules are appropriate or if change is necessary as the generation fleet is evolving and that these thresholds will apply to all future capacity cycles.

12 Independent Market Operator, 2013, *CP_2013_01: Incentives to Improve Availability of Scheduled Generators*, (online) p 17.

13 Ibid. pp 18-19.

Questions

3. What level of outage rates and what factors do stakeholders consider should be used to assess the outage thresholds stated in clause 4.11.1D?
4. Is the possibility of breaching the outage thresholds a strong incentive to raise a generator's availability or retire the asset?
5. Do the outage thresholds, and the possibility of AEMO exercising its discretion to reduce a facility's certified reserve capacity, strike an appropriate balance between signalling for generators to exit and motivating other generators to ensure an adequate level of availability?

2.4.2 Technology classes and technology neutrality

Having one set outage rate for forced outages and one rate for combined planned and forced outages is a one-size-fits-all approach for all generators on the SWIS. It does not account for different technology types and their associated forced and planned outage rates. If the intent is to improve generator availability, then it can be questioned whether the outage threshold rates should change to reflect the generation mix in the WEM as more efficient and available plant enter the market.

Non-scheduled generation in the WEM has grown significantly but accounting for this change in the generation mix is challenging under the existing market rules. This is because of how outages for non-scheduled generators are treated within the RCM. As non-scheduled generators have zero reserve capacity obligations under the market rules, the RCM treats them as effectively not having any outages for the purpose of capacity refunds.[14] This limitation essentially removes non-scheduled generation from the generator availability market rules.

With intermittent generators excluded, the setting of the outage thresholds is limited to only examining scheduled generators in the WEM. The ERA's review will examine the appropriateness of a one-size-fits-all approach. As the scheduled generation mix in the WEM changes, the threshold rates could be amended to reflect this change. However, such a change would inherently discriminate against certain technologies. For example, if the contribution of energy into the WEM from coal technology decreases from 45 per cent to 10 per cent and gas technology expands from 40 per cent to 75 per cent, having thresholds reflective of a mostly gas-powered fleet would discriminate against the outage requirements for coal technology.

However, not adjusting the threshold has implications for generating technologies that do not have outage rates close to the outage thresholds in the market rules. This is explained in the box below.

[14] Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Rule 4.26.1 (online).

Explanation

Clause 4.11.1D states that the combined planned and forced outage rate threshold for the 2019 capacity cycle is 20 per cent.

For this example, assume that gas generators as a technology class have an expected combined forced and planned outage rate of 10 per cent.

If a gas generator is installed on the SWIS and its combined forced and planned outage rate is 15 per cent, it is higher than what is expected from gas generators as a technology class but is still below the 20 per cent outage threshold for the 2019 capacity cycle. Therefore, a generator may have a lower level of availability than the standard for that technology type and still be below the outage threshold.

Even though the gas generator is below the outage threshold, AEMO could not reduce that facility's certified reserve capacity despite it delivering a lower level of availability than is expected for that technology type.

The WEM objectives include a requirement:

> To avoid discrimination in that market against particular energy options and technologies, including sustainable energy options and technologies such as those that make use of renewable resources or that reduce overall greenhouse gas emissions.[15]

The ERA will consider technology neutrality as part of the assessment of the incentives to improve generator availability and the appropriateness of the one-size-fits-all approach for the outage thresholds within the market rules.

Question

6. What are stakeholders' opinions on the one-size-fits-all approach of the outage thresholds in the market rules? If the incentives to increase availability are being met, how important should the composition of the WEM's generating fleet be in assessing the outage thresholds?

2.4.2.1 Technology class and the Benchmark Reserve Capacity Price

The benchmark reserve capacity price incorporates the costs incurred in building and operating a reference generation technology as the benchmark for setting the reserve capacity price. Currently, the benchmark reserve capacity price is based on a liquid-fuelled open cycle gas turbine generator. This technology has associated planned outage rates for adequate maintenance and forced outage rates that show the probability of unplanned faults, that could be incorporated into the calculation of the benchmark reserve capacity price.

[15] Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Rule 1.2.1(c) (online).

Questions

7. Should the reference technology for establishing the benchmark reserve capacity price be used to set the availability thresholds in the market rules? What are the benefits and problems of this approach?
8. Should the assessment for setting the benchmark reserve capacity price also incorporate considerations for capacity availability and outage rates?

2.4.3 Distinction between forced and planned outage rates

The market rules specify two separate outage rates - a forced outage rate and a combined planned and forced outage rate - when determining whether AEMO can use its discretion to reduce a facility's certified reserve capacity. This distinction between outage rates has existed since the start of the market rules.

The ERA is considering whether there needs to be separate rates for forced outages and for combined planned and forced outages. If the intent of the market rule for reducing a facility's certified reserve capacity based on its outage rate is solely availability, a single combined forced and planned outage threshold rate could be used. If this were the case, AEMO would only have to assess the combined rate of outage for each facility seeking certified reserve capacity and not differentiate between outage types. The threshold rate would have to be set at a level that reflects a satisfactory level of availability for facilities operating in the WEM that participate in the reserve capacity mechanism.

Having two separate outage rates assists AEMO to identify facilities that may have a higher likelihood of their capacity becoming unexpectedly unavailable due to a forced outage. For example, assume that there are two identical facilities with the same overall combined outage rate, one facility having mostly forced outages and the other mostly planned outages. Both facilities are unavailable for the same amount of time over a capacity year. The difference is that AEMO expects the facility with planned outages to be unavailable at a given time and the time of the planned outage can be set to periods where the marginal value of capacity in the system is low. The facility with mostly forced outages does not know when their capacity will be unavailable. Therefore, it is more difficult for AEMO to maintain system security when forced outages occur. Forced outages have a greater effect on the WEM and system security, as other generation needs to be dispatched to cover the sudden unavailability of electricity. This affects the price and payments that the market needs to make to compensate for the shortfall caused by forced outages.

Practically, if there was only a combined planned and forced outage threshold rate, then the determination of an appropriate level of forced outages for a facility would need to be addressed in a different market rule. This market rule would not be concerned with the matter of availability but would set a rate of forced outages that is appropriate from both a system security perspective and to ensure adequate reserve capacity is available.

As part of the assessment of this part of the review, the ERA will examine how often a facility has breached one threshold and not the other and also where a facility breaches both thresholds for the same capacity year.

Question

9. Should there be a distinction between forced outage rates and planned outage rates as currently stated in the market rules? What are the implications of using a combined planned and forced outage rate threshold instead of the two separate outage threshold levels?

2.5 AEMO's discretion to reduce a facility's certified reserve capacity where their outage rates exceed the outage thresholds

Currently, the market rules give AEMO the discretion to assign a lesser quantity or no certified reserve capacity to a facility than the amount it would otherwise assign if the facility has breached the stated outage thresholds.

Clause 4.11.1(h) is split into two parts and applies depending on whether a facility has been in commercial operation for at least 36 months.

- Sub-clause (i) states that where a facility has been in commercial operation for at least 36 months, then the forced outage rate or combined planned and forced outage rate is calculated over the preceding 36 months.
- Sub-clause (ii) applies where a facility has not been in commercial operation for at least 36 months or is yet to commence commercial operation. If AEMO has cause to believe that, over the first 36-month period of commercial operations for that facility, the forced outage rate or combined planned and forced outage rate is greater than the outage thresholds, then AEMO may exercise its discretion to reduce that facility's certified reserve capacity.

The 36-month period for calculating the outage rates has existed since market start.

Currently, the market rules state that when AEMO is assigning certified reserve capacity to a scheduled generator, the assignment must not exceed AEMO's reasonable expectation of that capacity to be available at 41 degrees Celsius.[16] This does not require AEMO to explicitly consider a facility's outage history but AEMO may consider outage history when discerning what a reasonable expectation is for that facility.

The inclusion of clause 4.11.1(h) ensures that AEMO must consider facilities' forced and planned outage rates when assessing their certified reserve capacity. However, this consideration is limited as AEMO has discretion only where the forced outage rate or combined planned and forced outage rate breaches the relevant outage threshold in the market rules.

2.5.1 Relevance of historical outages

The outage thresholds in the market rules set a reference point for the level of availability of a facility that is deemed satisfactory. Facilities with outage rates below this reference point are not at risk of having their certified reserve capacity reduced. The reduction in the thresholds

[16] Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Rule 4.11.1(a) (online).

from the 2015 capacity cycle to the 2019 capacity cycle signalled that the level of availability in the WEM was to be raised.

Historical outage information may not be indicative of future availability. This is because of the time lag between the setting of a facility's certified reserve capacity and the capacity year when capacity must be available. An example is where a facility undergoes a major refurbishment. The facility would be on outage during the refurbishment and the length of the outage may mean the facility would breach the thresholds in the market rules. However, the maintenance is to ensure that the capacity is available for the target capacity year and beyond.

Similarly, a principal aim of the clauses that incentivise increasing facility availability is to allow facilities to improve their availability for the future.[17]

The ERA's review will examine the relevance of historical data, and the timing of major planned maintenance events, in determining the future availability of capacity and also the implications if there are changes to the 36-month calculation period.

Questions

10. Do stakeholders consider that a facility's historical outage rates should be a material consideration for AEMO when setting certified reserve capacity for a future capacity year?
11. What has been market participants' experiences of using a facility's prior 36-month forced and planned outage rate as a predictor of future generator availability?

The scope of this review permits modifying or replacing the market rules on incentivising generator availability. Other jurisdictions have different arrangements to incentivise generator availability. For example, in the Pennsylvania-New Jersey-Maryland (PJM) market there is a pay-for-performance scheme, which requires participants to deliver their energy or demand reduction during system emergencies or else incur significant penalties for non-performance.

Question

Currently, the market rules seek to incentivise capacity availability by allowing AEMO to reduce a facility's certified reserve capacity if that facility has breached the outage rates specified in the market rules.

12. What other mechanisms or incentives could be used to increase the availability of generation capacity?

[17] Independent Market Operator, 2013, *CP_2013_01: Incentives to Improve Availability of Scheduled Generators*, (online) p 20.

3. The refund exempt planned outage count limit

This section of the paper explores each of the different parts required to be reviewed under clause 4.26.1D; the refund exempt planned outage count. This review assesses planned outages of scheduled generators only.

Currently, clause 4.26.1C in the market rules guides AEMO in determining whether a scheduled generator's planned outage is exempt from capacity refunds or liable for them by using a refund exempt planned outage (REPO) count.[18] [19] The REPO count is a measure of the number of unavailable Megawatts from a generator's planned outage relative to the capacity that that generator was meant to provide in that trading interval.[20] [21] The box below gives examples.

Examples:

To calculate the REPO count for a trading interval

If a facility has 100 MW of capacity unavailable because of a planned outage and has 100 MW of capacity credits usually available for that trading interval:

100 / 100 = 1

The REPO count for that trading interval would be 1.

If that same facility has only a partial planned outage of 50 MW unavailable capacity against 100 MW of capacity credits for a trading interval:

50 / 100 = 0.5

The REPO count for that trading interval would be 0.5.

To calculate if the REPO count breaches the limit

To determine if a facility's REPO count breaches the 8,400 REPO count limit, the facility's REPO count for all trading intervals in the 1,000 trading days prior to the next planned outage is summed.[22] If the REPO count for those 1,000 trading days is greater than the limit, the planned outage will be liable for refunds.

The REPO count limit is currently 8,400. If a facility's REPO count, summed over 1,000 trading days prior to that facility's next planned outage, is lower than this limit, the next planned outage is exempt from capacity refunds.[23] Alternatively, if that facility's REPO count is greater than the REPO count limit, that planned outage will be a refund payable planned outage.[24]

18 Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Rule 4.26.1C (online).

19 A REPO is a planned outage where a facility is not required to pay capacity credit refunds.

20 Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Chapter 11 (online).

21 A REPO count for a scheduled generator will be zero if the trading interval occurred before 8:00 AM on 1 June 2016 or if no capacity credits were associated with that facility for that trading interval.

22 The calculation is stated in: Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Rule 4.26.1C(a) and Chapter 11 (online).

23 Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Rule 4.26.1C(a) and Chapter 11 (online).

24 Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Chapter 11 (online).

3.1 Scope of the review

Clause 4.26.1D sets out the minimum requirements of its review and is reproduced here:

> 4.26.1D. The Economic Regulation Authority, in consultation with AEMO, must undertake a review, to be completed by 31 December 2020 of whether the limit for the Refund Exempt Planned Outage Count referred to in clause 4.26.1C should be modified to better address the Wholesale Market Objectives. The review must include, at a minimum, an assessment of:
>
> (a) variations in Planned Outage rates and Forced Outage rates of Scheduled Generators since the introduction of the limit on Refund Exempt Planned Outages;
>
> (b) for each Scheduled Generator and each year since the introduction of the limit on Refund Exempt Planned Outages—
>
> i. the number of Equivalent Planned Outage Hours for which Facility Reserve Capacity Deficit Refunds were payable; and
>
> ii. the total amount of Facility Reserve Capacity Deficit Refunds associated with Refund Payable Planned Outages; and
>
> (c) the level of participation by Scheduled Generators in the Reserve Capacity Mechanism in each year since the introduction of the limit on Refund Exempt Planned Outages; and
>
> (d) changes in the mix of Scheduled Generators that have participated in the Reserve Capacity Mechanism in each year since the introduction of the limit on Refund Exempt Planned Outages.

Given the requirements in the market rules, the ERA's review will cover an assessment of:

1. The REPO count limit (currently 8,400) and whether it is appropriate or if the limit should be changed in the interests of better fulfilling the WEM objectives.

2. The variations in planned outage rates and forced outage rates for scheduled generators in the WEM.

3. Facility reserve capacity deficit refunds for planned outages by scheduled generators since the introduction of the REPO count limit and periods prior to its introduction (for comparison).[25]

4. The level of participation and changes in the mix of scheduled generators in the reserve capacity mechanism since the introduction of the REPO count limit and periods prior to its introduction (for comparison).

3.1.1 The development of the REPO count clause

At the start of the market, the IMO had discretion under the market rule to intervene when facilities had excessive planned outages.[26] However, these clauses were complex in their

[25] Facility reserve capacity deficit refunds are calculated based on the amount of reserve capacity available in a trading interval. Generally, the greater the reserve capacity available, the lower the reserve capacity deficit and vice versa. Full details are available in: Rule Change Panel, 2020, *Wholesale Electricity Market Rules (WA), 22 February 2020*, Clause 4.26.1A and Chapter 11 (online).

[26] Independent Market Operator, 2012, *Wholesale Electricity Market Rules (WA), 6 June 2012*, Section 4.27 (online).

application and only applicable in certain specific sets of circumstances which limited their usefulness as a means of incentivising generator availability.

In 2013, a few scheduled generators took excessive amounts of planned outages, which made their capacity unavailable for large amounts of time over a capacity year. To help address this, the IMO submitted a rule change proposal that introduced a refund exempt planned outage cap of 7,800 trading intervals (which equated to 3,900 hours or 23.2 weeks of planned outages) over three years. This was equivalent to an average annual planned outage rate of 14.8 per cent. [27]

The IMO revised the refund exempt planned outage calculation in its draft rule change report. This was in response to submissions by Verve Energy and Bluewaters Power, which suggested a range of between 17 per cent to 20 per cent averaged over 36 months. This would be sufficient to allow a scheduled generator to undertake a 12-week major overhaul, or eight weeks for a minor overhaul and five weeks for other maintenance during any 1,000-trading day period. The IMO adjusted the REPO count limit to 8,400, calculated over 1,000 trading days, which equated to a planned outage rate of 17.5 per cent.

Clause 4.26.1D was inserted by the Minister of Energy and commenced on 1 October 2017. This change set the REPO count limit at 8,400. The clause also required the IMO to undertake a review of the REPO count limit by 31 December 2020. Responsibility for this review was transferred to the ERA when the IMO ceased operations.

Questions

13. What are market participants' opinions on the REPO count limit of 8,400 and the associated calculation period of 1,000 trading days prior to a scheduled generator's planned outage? Is this limit and calculation period appropriate?
14. What are the repercussions of the REPO count limit on scheduled generators in the WEM, particularly for operational and investment decisions?

3.2 Outage rates of scheduled generators and facility reserve capacity deficit refunds since the introduction of the REPO count limit

The ERA's review must assess:

- Variations in the planned outage and forced outage rates of scheduled generators.
- Facility reserve capacity deficit refunds for planned outages by schedule generators.

The REPO count limit commenced from 1 October 2017 and has been in operation for only three years. This limits the data available for the ERA's review. Therefore, the ERA intends to also examine data prior to the introduction of the REPO count limit to identify any changes in the WEM from when it was introduced. This will assist in determining what effect, if any, the REPO count limit has had on whether scheduled generators participate in the RCM and if certain technology types of scheduled generators do not participate because of this limit.

[27] Independent Market Operator, 2013, *RC_2013_09: Incentives to Improve Availability of Scheduled Generators – Rule Change Proposal*, (online).

3.2.1 Participation by scheduled generators in the RCM since the introduction of the REPO count limit

Table 3 shows the capacity credits assigned in aggregate to all scheduled generators by capacity year. The 2017 capacity year column is shaded grey to denote the start of the REPO count limit.

Table 3: Capacity credits assigned to scheduled generators by capacity year

Capacity year [(a)]	2013	2014	2015	2016	2017	2018	2019	2020	2021
Capacity credits assigned	5,382	5,387	5,025	4,952	4,978	4,639	4,639	4,642	4,606
Change in capacity credits		5	(362)	(73)	26	(339)	0	3	(36)

Source: ERA analysis of market data

(a) – A capacity year begins at 8:00 AM on 1 October of that year.

The material changes to capacity credits allocations between capacity years are due to the following facilities no longer applying for capacity credits:

- In capacity year 2015, Kwinana generators 5 and 6.
- In capacity year 2016, Worsley cogeneration plant and Geraldton gas turbine.
- In capacity year 2018, Muja generators 1, 2, 3 and 4, Kwinana gas turbine 1, Mungarra gas turbines 1, 2 and 3, and Kalgoorlie gas turbines 2 and 3.[28]

The data shows that the amount of capacity credits assigned to scheduled generators decreased until the 2018 capacity year. From that point on, the amount of capacity credits for scheduled generators has remained relatively steady.

Question

15. What has been the experience of scheduled generators participating in the reserve capacity mechanism since the introduction of the REPO count limit? Has the REPO count limit had positive, detrimental or negligible effects on scheduled generator planned outage planning?

3.2.2 Change in the mix of scheduled generators participating in the reserve capacity mechanism since the introduction of the REPO count limit

The ERA has reviewed the composition of the scheduled generation fleet by analysing the number of facilities by fuel type and the proportion of capacity credits for a generator by fuel type (Appendix 2).

[28] The mass retirement of generation plant was a reduction in Synergy's portfolio as directed by the Minister for Energy – Government of Western Australia media statement, 5 May 2017, 'Synergy to reduce electricity generation cap by 2018', (online) [accessed 18 March 2020].

Examining just the number of scheduled generator facilities shows that the proportion of each fuel source has remained relatively stable since the introduction of the REPO count limit. Most of the change in the generation mix occurred during 2017 when the Minister for Energy directed Synergy to retire over 330 MW of scheduled generation. Despite these retirements, the mix of scheduled generators from 2018 onwards has not been significantly different to the mix in 2017.

based on the amount of capacity credits assigned to scheduled generators, the proportions of assigned capacity credits by scheduled generator fuel type has stayed about the same since the introduction of the REPO count limit.

Question

16. What are market participants' experiences of changes in the mix of scheduled generators within the WEM prior to and since the introduction (1 October 2017) of the REPO count limit?

Appendix 1 List of Tables

Appendix 2 Reference Tables

Number of scheduled generators by fuel type

Table 4 shows the number of scheduled generators within the SWIS that were assigned capacity credits in the associated capacity year. The 2017 capacity year column is shaded grey to denote the start of the REPO count limit.

Table 4: Number and proportion (%) of scheduled generators with capacity credits by fuel type by capacity year

Capacity Year	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total scheduled generator facilities	52	52	50	48	48	39	39	39	38
Fuel type:									
Coal	11	11	11	11	11	7	7	7	7
Proportion	21%	21%	22%	23%	23%	18%	18%	18%	18%
Diesel/Oil	7	7	7	7	7	7	7	7	7
Proportion	13%	13%	14%	15%	15%	18%	18%	18%	18%
Dual fuel	19	19	19	19	19	17	17	17	17
Proportion	37%	37%	38%	40%	40%	44%	44%	44%	45%
Gas	13	13	13	11	11	8	8	8	7
Proportion	25%	25%	26%	23%	23%	21%	21%	21%	18%
Tri-fuel (coal, gas and oil)	2	2	0	0	0	0	0	0	0
Proportion	4%	4%							

Source: ERA analysis of market data

Capacity credits by type of scheduled generator

The ERA has also analysed the number and proportion of capacity credits held by scheduled generators by fuel type and by capacity year in Table 5.

Table 5: Number and proportion of capacity credits per scheduled generator fuel type by capacity year

Capacity Year	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total scheduled generator capacity credits	5,382	5,387	5,025	4,952	4,978	4,639	4,639	4,642	4,606
Fuel type:									
Coal	1,771	1,777	1,778	1,778	1,781	1,561	1,561	1,561	1,561
Proportion	33%	33%	35%	36%	36%	34%	34%	34%	34%
Diesel/Oil	147	147	147	149	149	149	149	149	149
Proportion	3%	3%	3%	3%	3%	3%	3%	3%	3%
Dual fuel	1,603	1,608	1,615	1,637	1,658	1,623	1,623	1,623	1,623
Proportion	30%	30%	32%	33%	33%	35%	35%	35%	35%
Gas	1,499	1,494	1,485	1,389	1,390	1,305	1,305	1,309	1,273
Proportion	28%	28%	30%	28%	28%	28%	28%	28%	28%
Tri-fuel (coal, gas and oil)	362	362	0	0	0	0	0	0	0
Proportion	7%	7%							

Source: ERA analysis of market data