Our Ref: *DM#: 22653425*
Enquiries: Jo-Anne Chan
Telephone: 0436 861 538

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Ms Sara O'Connor
Economic Regulation Authority
PO Box 8469
PERTH BC WA 6849

Dear Sara

2020 Review of incentives to improve the availability of generators

Synergy welcomes the opportunity to comment on the 2020 review of incentives to improve the availability of generators (Issues Paper).

Although existing mechanisms act as effective incentives to improve the availability of base load generators, this is not necessarily true for other technologies. Further, the evolving generation mix in the Wholesale Electricity Market (WEM) means that facilities have had to operate differently to manage volatile loads. These changes have led to additional wear and tear to facilities that have not been considered in the current determination of outage thresholds.

It is critical to reassess the design of existing incentives and create limits to reflect the changes in the market and align more closely to industry standards. An increase in plant availability can generally be achieved through future investment on plant maintenance or technology upgrades and allowance for more generous limits for planned outages will promote cost reduction with better flexibility for generators to maintain the plant.

Question 1: Considering that AEMO has not reduced the certified reserve capacity of a facility that had outages rates in excess of the outage thresholds specified in the market rules, how do stakeholders view the efficacy and usefulness of the mechanism?

AEMO's decision to not reduce the certified reserve capacity of facilities which have exceeded outage thresholds does not deter from the efficacy and usefulness of the mechanism.

AEMO's past decisions, which considers the generator's operating regime and services provided to the Southwest Interconnected System (SWIS), have effectively balanced the need to incentivise generator availability with maintaining system security. However, the fact that AEMO has chosen not to impose penalties in the past does not mean that they will not do so in the future.

In section 2.4 of the Issues Paper, the ERA suggests that the "market rules need to balance the need for generators to perform maintenance against having reserve capacity available" and highlights that "if planned maintenance is reduced, this could increase the occurrence of forced outages as generators may trip if they have been insufficiently maintained."

Analysis of historical data suggests that outage incidents for facilities which have breached thresholds are typically linked to large, one-off events that result in the facility being reinstated. The ERA notes that the intent of the outage thresholds is to incentivise and "improve the availability of generators" and rectification of these large, one-off issues creates a reasonable expectation that there will be higher availability going forward.

As generators near retirement, it is expected that levels of planned and forced outages will increase. AEMO's ability to discretely manage penalties is a necessary measure to balance qualitative aspects and consider the lifecycle of the plant.

Further to this, there have been no instances whereby the SWIS has experienced a shortage of reserve capacity since the adoption of this mechanism, suggesting that the mechanism is performing as required despite AEMO's decisioning.

In fact, the rise in renewable generation has resulted in the current oversupply of capacity, which raises questions on the benefit of continuing this regime which was established primarily to facilitate the avoidance of supply shortage. Arguably, limits on planned outages are now less critical in the current state of the market and focus should instead be placed on minimising forced outage rates. Nevertheless, Synergy considers that the existing forced and combined outage thresholds retains its usefulness in providing a target for Market Participants when conducting operational planning for outages.

Question 3: What level of outage rates and what factors do stakeholders consider should be used to assess thresholds stated in clause 4.11.1D?

Factors:

Availability of a generation facility varies greatly depending on the type of fuel, the design of the facility, how the facility is operated/dispatched, and the stage of its lifecycle that the facility is at. Synergy recommends that these factors are considered during the determination of outage thresholds and explores some of these aspects further:

- **Age of the Facility:** The performance and efficiency of facilities naturally deteriorate over the lifetime of the facility. As the facility ages, an increase in planned outages would be anticipated. An excessively stringent outage threshold may result in the premature retirement of a facility which in turn may impact future investment decisions for existing and new Market Participants.

  In the same way that it would be inequitable to determine thresholds based on a newly built facility, it would be inappropriate to determine thresholds based on a facility nearing its end of life. If the methodology utilises an average availability over the lifecycle of the facility, it would be critical to ensure judgement is applied for older facilities which are at a higher risk of breaching thresholds.

- **Provision of ancillary services:** Facilities which are subject to high levels of cycling due to the provision of ancillary services will incur higher levels of wear and tear, expediting the rate of deterioration.

- **Frequency of run vs facility type:** Question 6 explores Synergy's response to considering different thresholds for technology types. Although there are distinct merits in this option, it is also worthwhile examining the potential to link outage rates to the frequency of starts.

  For instance, a facility may be allocated reserve capacity credits to generate in the 1 in 10 year instance of peak load. However, if this facility fails to generate during that one instance, repercussions would be insignificant as it would never breach current outage thresholds.

  It is worthwhile reviewing whether the frequency of starts should be factored into the determination of outage thresholds.

- **Market trends**: The current generation mix in the SWIS is a significant departure from when the initial thresholds were set. Increased renewable penetration and the issue of the duck curve has led to heightened levels of cycling for generators which were originally designed to provide base-load generation.

  Further, thermal generation facilities are experiencing more breakdowns due to rapid load changes. Increased maintenance, and therefore increased planned outages, are now typical occurrences for affected facilities, suggesting that current outage thresholds are no longer appropriate.

Outage rates:

Under clause 4.11.1D of the Wholesale Electricity Market Rules (WEM Rules), the current Forced Outage rate limit is set at 10% and the combined Planned Outage and Forced Outage rate limit is set at 20%.

Synergy recommends that the level of outage rates, based on a uniform outage rate for all technologies, should be amended to the following:

Proposed Combined Planned Outage and Forced Outage rate limit: 25%

In approving Planned Outages, System Management needs to ensure that there is sufficient margin available to ensure system security can be maintained – as such, if the Facilities had been needed, System Management would simply not have approved the Planned Outages. Increasing generator availability during these periods appears irrelevant as it has already been considered in AEMO's decisioning.

Generators need to undertake a certain level of Planned Outages in order to be able to provide a reliable service when required. These Planned Outages can include A-Class outages (turbine critical path), B-Class outages (boiler critical path) and maintenance outages. In addition to these outages there are a number of "special projects" that may need to be undertaken at various stages of a Facility's life cycle. These special projects could include replacement of obsolete and unmaintainable equipment, replacement of equipment that has become an unacceptable risk, enhancements of efficiency, enhancements of environmental performance, upgrading control performance to satisfy market performance requirements and life extension projects.

In addition, it is inappropriate to enforce targets that are more restrictive than what is expected in an international standard.

The current combined outage threshold only allows for a maximum of 10% of Planned Outages after accounting for a maximum Forced Outage rate of 10%. This is insufficient to accommodate for major outages, special projects and an appropriate level of maintenance outages, which have been described explicitly in Verve Energy's initial submission to the Independent Market Operator on Incentives to Improve Availability of Scheduled Generators (RC_2013_09[1]). Unless limits are increased, this may lead to perverse market outcomes, further outlined in Synergy's response to Question 14 of this submission.

2018 generating unit statistics[2] published by the North American Electric Reliability Corporation (NERC), reveals an average (72 units surveyed) combined planned outage factor (POF: 7.03%) and maintenance outage factor (MOF: 5.84%) of 12.87% based on Fossil Coal Primary units with a 200-299MW generation nameplate capacity, which is the same categorisation as Synergy's Muja 5-8 facilities.

This suggests that the average coal generator within this category surveyed in the NERC is likely to breach the thresholds currently set in the WEM.

Synergy considers that a combined threshold of 25%, which would allow for a 5% increase in Planned Outages, is more appropriate.

Unit Type	MW Trb/Gen Nameplate	# of Units	FOF	POF	MOF	
FOSSIL Coal Primary	All Sizes	599	5.6	8.46	4.48	
FOSSIL Coal Primary	001-099	71	4.7	4.99	3.38	
FOSSIL Coal Primary	100-199	111	4.38	6.58	4.44	
FOSSIL Coal Primary	**200-299**	**72**	**7.53**	**7.03**	**5.84**	**Muja 5-8**
FOSSIL Coal Primary	**300-399**	**55**	**5.62**	**9.11**	**5.04**	**CPS**
FOSSIL Coal Primary	400-599	126	5.52	9.97	3.92	
FOSSIL Coal Primary	600-799	110	5.26	9.42	4.56	
FOSSIL Coal Primary	800-999	42	7.26	10.79	4.78	
FOSSIL Coal Primary	1000 Plus	12	6.89	14.24	4.75	

***Source**: NERC Generating Unit Statistical Brochure 1 2018 – Units Reporting Events*

Proposed Forced Outage rate limit: 8%

Synergy contends that unreliability (i.e. a facility tripping in service or unplanned events) are the most costly events to the market. Planned outages, when taken at the appropriate time, are almost benign. High Forced Outage rates are therefore comparatively more detrimental to system security and should be strictly managed, particularly during high SWIS load periods.

[1] See pages 7-9, https://www.erawa.com.au/cproot/16949/2/Verve%20Energy.pdf

[2] Generating Unit Statistical Brochure 1 2018 – Units Reporting Events, https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx

If the combined Planned and Forced outage limit is increased to the proposed 25%, the level of Forced Outages in the WEM is anticipated to decrease and Synergy would recommend a reduction in the Force Outage limit from 10% to 8%. However, Synergy does not support any reduction if the current combined threshold is maintained.

Irrespective of the proposed limits, Synergy strongly recommends AEMO to continue exercising discretion in its application of penalties.

Question 4: Is the possibility of breaching the outage thresholds a strong incentive to raise a generator's availability or retire the asset?

Synergy considers that the incentive is strong for base load generators which have comparatively higher fixed costs but not necessarily for other technologies.

A gas turbine which provides electricity for limited periods during the year will not be incentivised under the current mechanism to retire as they are unlikely to ever breach the set thresholds. This is true for other technologies including, but not limited to DSMs, Tesla batteries and renewable generators.

However, base load generators are more likely to breach outage thresholds due to the relatively higher amount of time they generate and cycle. Proportional to their run time, base load generators will require more planned outages for maintenance purposes and will be subject to more forced outages due to the constant cycling of the plant.

The combination of high fixed costs, the risk of reduced certified capacity credits and foregone energy payments compound the need for Market Participants with base load generators to optimise the facility's availability.

However, despite potentially strong financial incentives to retire thermal facilities which have been penalised for breaching outage thresholds, the imminent threat of low load and support for South Country requires availability from base load generators including Muja, Collie, Kemerton and Bluewater units. The distinct advantage that Muja units have in terms of a low minimum generation level means that the notion of removing these facilities from the SWIS may cause detriment to system stability.

Question 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?

The existence of outage thresholds and the possibility of AEMO exercising its discretion to reduce a facility's certified reserve capacity provides a stronger incentive for Market Participants with base load generators to raise a generator's availability or retire the asset to maintain financial viability.

In contrast, the efficacy and usefulness of the mechanism would be compromised by indiscriminately reducing the certified reserve capacity for all facilities that breach the outage thresholds. Such action is a huge risk to Market Participants and may promote adverse behaviour that will reduce generator availability.

For instance, a market participant may be compelled to:

- reduce their planned outages and incur forced outages depending on their proximity to breaching the outage thresholds;
- delay planned outages to remain within outage thresholds; and
- prematurely retire plant which is critical to system security due to economic impacts.

These perverse market outcomes are not in line with Market Objectives.

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?

The one-size-fits-all approach of the outage thresholds unfairly penalises base load generators which continuously provide electricity to the SWIS. In contrast, underperforming peak generation plants bear limited repercussions. This issue is clearly illustrated in the explanation under section 2.4.2 of the Issues Paper where "a generator may have a lower level of availability than the standard for the technology type and still be below the outage threshold".

As suggested in the Issues Paper, the WEM objectives require the avoidance of discrimination in the market against particular energy options and technologies (Market Objective (c)). However, application of the existing outage limit mechanism has negligible impact on other technologies outside of base load generators which can be interpreted as a form of discrimination.

For instance, this can be seen in the data published by NERC on 2018 outage factors[3] for Gas Turbines where the average combined forced (FOF), planned (POF) and maintenance outage factors (MOF) is 10% lower relative to coal generators (10.34% vs 20.4% respectively).

Unit Type	MW Trb/Gen Nameplate	# of Units	FOF	POF	MOF	FOF + POF + MOF	
FOSSIL Coal Primary	200-299	72	7.53	7.03	5.84	20.4	Muja 5-8
GAS TURBINE	020-049	131	5.85	2.94	1.55	10.34	Frame 6
GAS TURBINE	50 Plus	435	4.34	4.62	2.8	11.76	Frame 9

Source: NERC Generating Unit Statistical Brochure 1 2018 – Units Reporting Events.

Theoretically, outage thresholds should therefore vary depending on the technology used. However, careful consideration would be required to determine technology categories and associated thresholds. Although an advocate of the concept, Synergy reserves support of this revised mechanism until details of such a proposal is formally released for commentary.

Question 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?

Question 8: Should the assessment for setting the benchmark reserve capacity price also incorporate considerations for capacity availability and outage rates?

[3] Generating Unit Statistical Brochure 1 2018 – Units Reporting Events, https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx

Fundamental issues exist in using the reference technology for establishing the benchmark reserve capacity price to set the availability thresholds in the market rules. For the same reasons, capacity availability and outage rates should also not be used to inform the assessment for setting the benchmark reserve capacity price.

The benchmark reserve capacity price utilises an open cycle gas turbine as its reference technology whereas the outage limits are based on the attributes of a thermal generator. It would be difficult and inequitable to require Market Participants to meet the unavailability targets of a gas turbine which typically exhibits lower outage rates compared to existing thresholds stated under clause 4.11.1D of the Market Rules.

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?

The distinction between forced outage rates and planned outage rates should be maintained as the impact of forced outages on system reliability is far more severe relative to planned outages.

Forced outages, by nature, are unexpected and unapproved outages that represent potentially critical impacts to network reliability. Conversely, planned outages are approved and act as an effective mechanism to allow Market Participants to improve generator availability during a period in which the absence of the facility does not impact system security.

Reliance on purely the combined planned outage rates may inadvertently result in adverse behaviour as there would no longer be an incentive to fix plant on scheduled planned outages. Increasing the flexibility around scheduled outages would not only promote economic efficiency through the reduction of forced outages, it would also reduce the long-term cost of supplying electricity, thereby better facilitating the Wholesale Market Objectives.

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

Adoption of separate outage thresholds by technology may assist in incentivising availability of generation capacity across a broader range of technologies. However, the combined impact of the existing mechanisms listed below are more than sufficiently strong to promote increased availability for baseload and mid-merit generation facilities:

- **REPO Limits**: Market Participants that breach the current 8,400 REPO count limit are subject to capacity refunds for planned outages;

- **Outage Thresholds**: AEMO has the discretion to reduce reserve capacity credits if a facility breaches the outage threshold. Market Participants risk significant financial ramifications if penalties are imposed;

- **Market Reports**: Irrespective of AEMO's decision to enforce reduced reserve capacity credits upon a facility's exceedance of outage limit thresholds, enforcement of performance reports on Market Participants to outline maintenance practices and

actions to reduce outage rates to below thresholds presents a significant administrative burden. The costs involved in the time to produce these reports, consultancy fees and maintenance work is a significant incentive for Market Participants to keep from falling foul of outage targets; and

- **Other**: There exists natural (and very strong) incentives to be available in a predominantly bilateral contract market.

On a separate note, to increase the availability of generation capacity during critical periods, flexibility on planned outages should be promoted during the shoulder period in which an excess of generation is observed as there will be limited impact on the market. Meanwhile, the mechanism should incentivise maintenance of low forced outages during high SWIS load periods.

Question 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?

Recognition that existing outage limit thresholds are restrictive compared to industry characteristics fosters the need to uplift the current combined planned and forced outage limit threshold. If these thresholds are increased, the REPO Count limit should also be elevated accordingly.

Further, the application of the REPO Count limit penalties is not subject to AEMO's discretion and is arguably irrelevant for certain technologies which seldom generate. Synergy recommends that the ERA assesses whether AEMO discretion and separate REPO count limits by technology should be adopted. If this approach is pursued, Synergy reserves its right to comment until further details are released.

Question 14: What are the repercussions of the REPO count limit on scheduled generators in the WEM, particularly for operational and investment decisions?

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?

Although it unlikely that a Market Participant would risk plant failure by failing to undertake necessary maintenance, the presence of a REPO count limit may incumber Market Participants from prudently scheduling planned outages at the most opportune times. Instead of undergoing planned maintenance as soon as possible, Market Participants may be incentivised to delay maintenance to avoid breaching the REPO count limit. Alternatively, Market Participants may be inclined to compress maintenance within the shortest time rather than taking the required time to effectively conduct the outage.

Although by itself, REPO count limits may not have a significant bearing on investment decisions, the compounded impact from the multitude of market mechanisms in place to incentivise generator availability through penalising unavailability may influence future investment into scheduled generators.

Thank you again for the opportunity to make a submission on this issue. Should you require additional information regarding the submission, please contact Jo-Anne Chan, Senior Regulatory Analyst, at jo-anne.chan@synergy.net.au.

Yours sincerely

ANDREW EVERETT
MANAGER ENERGY TRADING