RCP | Rule Change Panel

Wholesale Electricity Market Rule Change Proposal Submission

RC_2019_03
Method used for the assignment of Certified Reserve Capacity to Intermittent Generators

Submitted by

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

In the draft rule change report, the Rule Change Panel (RCP) agreed with the ERA that the current relevant level method is inappropriate for measuring the contribution of intermittent generators to system reliability in the South West Interconnected System (SWIS) and should be replaced.[1] The RCP also endorsed the ERA's proposal to adopt the calculation of Effective Load Carrying Capability (ELCC) to determine the capacity value of the intermittent generation fleet.[2]

However, the RCP has proposed to amend some parts of the ERA's proposed rule change. This submission focusses on the ERA's concerns with two of the RCP's proposed changes to the relevant level method.

The RCP's draft decision is to allocate the intermittent generation fleet capacity value to individual facilities using the "delta method". The ERA is concerned that capacity credits

1 RCP, 2021, *RC_2019_03 Draft Rule Change Report*, p. 26 (online).

2 Ibid. p. 30.

allocated to individual intermittent generators using the delta method will not improve estimation of an individual generator's contribution to system reliability. These concerns are discussed further in section 1.1.

Another feature of the RCP's draft decision is to "scale" certified reserve capacity values in the Capacity Outage Probability Table (COPT) used in the relevant level method calculation. The ERA considers that this is inconsistent with the Wholesale Electricity Market (WEM) Rules and explores this further in section 1.2.

1.1. Using the Delta method to allocate intermittent generator fleet capacity value to individual facilities

The ERA's proposal

The ERA's relevant level method rule change proposed allocating intermittent fleet capacity value, as measured by ELCC, to each type of generation technology class. Currently, there are three classes: biogas, solar and wind generation. Capacity values are then distributed to individual intermittent generators within a technology class based on each generator's output during a sample of high demand and low capacity surplus periods in the SWIS.

The ERA proposed sampling the intermittent generators' average output during two sample sets representing the top 12 trading intervals:

- With the highest demand from separate days in each year in the past five years.
- With the highest demand net of the output of the intermittent generation fleet, estimated for separate days, in each year in the past five years.[3]

Currently, there is considerable overlap between the trading intervals identified in the two sample sets. However, with an increasing share of the capacity mix, intermittent generators can contribute to system reliability by providing their capacity at different times. Some intermittent generators such as solar farms can contribute when demand is very high, often during the early afternoon on hot days. This contribution from solar farms can move the period with the greatest loss of load probability from early to late afternoon. Wind farms typically tend to have higher output later in the afternoon when solar output has reduced. Depending on geographical location, some wind farms might have higher available capacity during both peak demand and low capacity surplus periods, when compared to other wind farms. Having a second sample set identifies the contribution of intermittent generators to system reliability when demand is high, but not necessarily highest, and the output of other intermittent generators, is lower.[4]

The RCP's alternative approach

In its draft rule change report, the RCP replaced the ERA's proposed allocation method with the delta method, which would base the allocation of the intermittent fleet capacity value to an individual facility on two estimates:

- First-in ELCC – this is the ELCC of the individual facility and is calculated assuming no other intermittent generator exists in the system.
- Last-in ELCC – this is the ELCC of the individual facility and is calculated assuming that it is the last facility entering the system. Therefore, its contribution to system reliability is

[3] The second sample is usually referred to a Peak Load for Scheduled Generation or peak LSG. It is demand, net of the output of intermittent generators, that has to be met by the scheduled generator fleet.

[4] The ERA's proposed allocation method accounts for this effect.

assessed based on meeting system demand net of the output of all other intermittent generation facilities in the system.

The RCP's analysis illustrated that applying the delta method produced significantly different capacity allocations compared to the ERA's proposed approach.

Comparison of capacity allocations using the different methods

Results of the analysis provided in the draft rule change report showed inconsistency between the average available capacity of intermittent generators during the stress periods sampled and the capacity value allocated to wind resources under the delta method.[5] For example, Yandin, Warradarge and Badgingarra wind farms had comparable or higher average available capacity during the sampled periods compared to Collgar wind farm but received substantially smaller capacity values than Collgar. The capacity value allocated to Albany and Grasmere wind farms was substantially larger than their average output during the sampled periods.

RCP's reasoning for changing the approach to capacity allocation

The RCP replaced the ERA's approach to capacity allocation because:

- Grouping generators by technology class did not capture the diversity in wind patterns across the SWIS and how different wind patterns may influence a wind farm's contribution to system reliability.[6]
- The sampling method proposed by the ERA to allocate technology-class ELCC to individual facilities did not represent the highest system stress periods.[7]

The draft rule change report states that basing the allocation on first-in and last-in ELCCs accounts for the interaction effects between the capacity contribution of an individual intermittent generator and other intermittent generation facilities, consistent with the contribution of a facility to the fleet ELCC.

The ERA has addressed each of the RCP's reasons for rejecting the ERA's proposed approach in sections 1.1.1 and 1.1.2 below. The ERA's conclusion on the proposed use of the delta method is provided in section 1.1.3.

1.1.1. Capturing diversity when valuing the capacity of the intermittent generator fleet

When valuing capacity, the purpose of creating facility classes, such as the technology classes proposed by the ERA, is to account for how the combination of different intermittent generators' contribute to system reliability. The ERA calls this the "interaction effect" in its rule change proposal. The capacity values of intermittent generators interact to support system reliability, such as by moving system stress periods or mitigating the likelihood that load is lost. For example, solar facilities mainly shift the periods of high reliability stress from early

5 The ERA used the data that the RCP published on its website to assess the results of the Delta method. This compared the historical average available capacity of intermittent generators during two sets of trading intervals: (a) the ERA's proposed sample set comprising 12 intervals with highest demand and 12 intervals with highest demand net of the output of all intermittent generators from separate days for each year over the past seven years, producing a sample size of 168, and (b) a sample set reflecting the RCP's preferred sampling for the allocation of capacity values to small intermittent generation facilities. This comprised the 50 trading intervals with the highest demand and 50 trading intervals with the highest demand net of the output of all intermittent generators over the past seven years.

6 RCP, 2021, *RC_2019_03 Draft Rule Change Report*, p. 44 (online).

7 Ibid. p. 44.

afternoon to later in the afternoon. Typically, wind farms have a higher output later in the afternoon and can reduce the likelihood that load is lost during the afternoon peak.

In the draft report, the RCP suggested that grouping intermittent generators by technology class did not capture the difference in wind patterns across the SWIS and how different wind patterns may influence a wind farm's contribution to system reliability. The RCP stated:

> The performance of Intermittent Generators depends on the applied technology and the weather at the location of the Facility. Accordingly, it is likely that the performance of Facilities of the same technology in similar locations will be well correlated but that the performance of Facilities of differing technology or in different locations will not. For this reason, some other jurisdictions (such as PJM and the Midcontinent Independent System Operator (MISO) in the US) divide their fleet of intermittent generators into groups by both technology and region.[8]

The ERA acknowledges that the contribution of individual generators within a technology class can differ by their geographical location, size and other technical parameters. However, the ERA's rule change proposal accounts for these variables. Any difference in the contribution of wind farms located in different areas of the SWIS to overall system reliability will be captured when the wind technology-class ELCC is allocated to individual intermittent generators, based on sampling the average available capacity of facilities during system stress periods. For example, if wind farms in the south of the SWIS have a higher output during system stress events than wind farms in the north of the SWIS then the southern wind farms will receive a higher allocation of capacity credits through the sampling method included in ERA's proposed relevant level method.

The ERA acknowledges the RCP's reference to how other jurisdictions group intermittent generators into facility groups. However, the allocation of facility groups to different regions in other jurisdictions is usually influenced by the design of capacity markets in those markets. Those markets typically have several reliability regions to account for the effect of network constraints. Capacity is procured in each region to meet the reliability target in each region. In comparison, the SWIS does not procure capacity for subsets of the system.

Should the RCP remain concerned that technology class does not adequately group intermittent generators with similar availability profiles, there are other options available to explore. The RCP could consider creating locational sub-classes within the wind technology class and compare the capacity values allocated to individual intermittent generators with the ERA's proposed approach.[9] However, there is a risk in creating multiple facility groups with only a few intermittent generators within each group. The benefit of grouping facilities with similar availability profiles is that the combined availability profile of the group is less variable than the availability profile of any single facility. This benefit is lost if the facility groups comprise only one or two generators. Therefore, facility grouping better enables identification of the interaction effect and the contribution of each the facility groups to system reliability.

Applying the delta method at the facility class level could improve capacity valuation

Alternatively, the RCP could consider applying the delta method at the facility group level. The RCP could retain the technology class groupings proposed by the ERA, or create their own facility groups and use the delta method to calculate first-in and last-in capacity values for each technology class.

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[8] Ibid. p. 43-44.

[9] The ERA's rule change proposal allowed AEMO to create new technology groups, as and when AEMO considered it appropriate to do so. Refer to Part A: paragraph (d) of the ERA's proposed amendments to the market rules, (online).

The ERA's calculation of ELCC for a technology class is consistent with the first-in ELCC calculated in the delta method. This is the calculation of ELCC for a technology class assuming that no other intermittent generators exist in the system. For example, the capacity value of the wind fleet can be estimated by excluding the excluding the output of solar and biogas facilities. The capacity value of the solar fleet can be estimated by excluding the output of wind and biogas facilities and the capacity value of biogas facilities can be estimated excluding the output of wind and solar facilities.

First-in ELCC mainly accounts for how the capacity value of intermittent generators contributes to shift periods of high reliability stress from peak demand periods, typically happening early in the afternoon. Relying only on first-in ELCC risks over-estimating the contribution of solar facilities and assigning more capacity credits than is warranted. This is because solar facilities typically have a large first-in ELCC given their high output during periods of peak demand.

Calculating the last-in ELCC for each technology class identifies the marginal contribution of the technology class to system reliability assuming all other intermittent generator technology classes are already in the system. Using information about the last-in ELCC of a technology group may better identify the contribution of the technology groups in mitigating the likelihood of loss of load events. An example may be the output of the wind fleet during the later afternoon peak.

Adopting the delta method at the technology group level may be an improvement on the ERA's recommended approach as the delta method expressly accounts for the contribution of the technology class in shifting periods of high reliability stress (first-in) and mitigating the likelihood of a loss of load event (last-in). The ERA recommends that the RCP explore the use of the delta method to determine technology-class/facility group ELCC before making its final decision on the rule change proposal.

As noted in the draft rule change report, the RCP adopted its allocation approach from a report by Energy and Environmental Economics (E3) and explained that the PJM Interconnection had applied to the Federal Energy Regulatory Commission (FERC) in the United States to implement the delta method for application from mid-2021.

However, the delta method in the form proposed by the RCP is not used or proposed to be used in any other jurisdiction. Instead PJM proposed using the delta method differently. PJM's proposal classified facilities into groups based on the similarity of their output profile and calculated the ELCC for these pre-defined facility classes rather than individual facilities. This allocation approach:

- Uses the facility group ELCC values (first-in and last-in ELCCs) to apportion intermittent fleet capacity value and account for the interaction effect between the capacity values of different facility groups.
- Allocates the facility group ELCC values in proportion to their average available capacity during reliability stress periods sampled from historical data – this comprises the periods of high demand and periods of high demand net of the output of intermittent generators.[10]

The approach proposed by PJM, with classification of facilities into groups based on the similarity of their output profile and then allocation to individual facilities based on a sample of their average output over peak demand and peak LSG periods, is consistent with the ERA's

[10] PJM, 2020, *Response of PJM to FERC Staff's December 22, 2020 Information Request*, P. 113 (online)

rule change proposal.

If the RCP were to adopt the delta method to calculate ELCC at the technology-class/facility group level, it would still need to identify a method for allocating group ELCC to individual intermittent generators. This is discussed in the next section.

1.1.2. Choice of sampling method for allocating capacity to individual intermittent generators

The RCP considered that the performance of intermittent generators during the trading intervals with the highest system stress was the most important factor in determining the facilities' contribution to system reliability. The ERA agrees with the RCP on this point. However, over the past decade there were no trading intervals in the SWIS with a level of demand equal to or greater than system operator's forecast of one-in-10 year peak demand. The ERA used a sample of trading intervals as a proxy to forecast the average available capacity of intermittent generators during system stress periods, as noted in section 1.1.1.

In the draft rule change report, the RCP noted that a period of high system stress does not occur in each 12-month period included in the ERA's proposed sampling method. The RCP concluded that:

> The performance of the Candidate Facilities is irrelevant during most of the 168 Trading Intervals that the ERA proposes to consider for the allocation of the Fleet Relevant Level to the individual Candidate Facilities.[11]

The delta method proposed in the draft rule change report allocates capacity directly to individual intermittent generators based on the calculation of first-in and last-in ELCC for each generator. The delta method – when applied to individual facilities – is highly likely to produce results that do not reflect the capacity value of facilities because:

- Calculating first-in ELCC for an individual intermittent generator ignores any correlation between the output of the individual facility and the output of any other intermittent generators and system demand.
- Calculating last-in ELCC identifies the individual intermittent generator's marginal capacity contribution, assuming the facility's contribution to system reliability is to cover demand net of the output of other intermittent generators. However, in practise generators simultaneously contribute to reliability so that the order of entry into the market is irrelevant.

The application of the delta method at the facility level is highly likely to produce overly variable results because first-in and last-in ELCC values are driven by the average available capacity of facilities over a small set of (around three) trading intervals.[12]

The historical output of individual intermittent generators is a proxy for output during periods of high reliability stress in the future. It is important that a suitable sampling method is used to ensure a reasonable forecast of the average available capacity of resources in a future period.

Use of the delta method can exacerbate the possible data sampling problem identified by the RCP. The average available capacity of an individual intermittent generator – which drives first-in and last-in ELCCs - during just three trading intervals is not likely to reflect its average output during system stress periods in the future.

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[11] RCP, 2021, *RC_2019_03 Draft Rule Change Report*, p. 44 (online).

[12] Alinta, 2021, *Presentation at MAC workshop on 10th May 2021*, slides 13-19, (online)

The ERA considers that its sampling method is appropriate because it covers intermittent generators output during peak demand and peak demand net of the output of intermittent generators and is consistent with the sampling method used in the current relevant level method. The ERA's allocation method takes sample outputs from separate years and so captures any variation in weather patterns between years. The ERA's allocation method takes sample outputs from separate days and so ensures a representative sample.[13]

Given its concerns about the ERA's proposed sampling method, the RCP could explore how other jurisdictions allocate technology-class ELCC to individual intermittent generators. This may help alleviate the RCP's concerns with the ERA's method or determine if any of the other methods in use would be preferable to implement in the SWIS.

To the ERA's knowledge, there is no mathematically proven or universally adopted method used to allocate intermittent fleet ELCC to individual facilities.[14] In practice, jurisdictions adopt different allocation methods. For example, the Midcontinent Independent System Operator allocates fleet ELCC to individual facilities based on the facility's output over the eight highest demand days for each year over 15 years, a sample size of 120.[15] Recently, PJM proposed to base the allocation of technology group ELCCs to individual facilities on the historical average available capacity of facilities during 200 largest demand and 200 largest demand net of the output of intermittent generators (peak load for scheduled generators) over the past 10 years, a sample size of 400.[16]

Despite its concerns with the ERA's proposed sampling and allocation method, the RCP has suggested a very similar approach to that proposed by the ERA for intermittent generators below 10 MW. The draft report stated:

> To account for modelling restrictions, this amended Model groups Facilities with a Nameplate Capacity below 10 MW into one of the following groups:
>
> - biogas, and
> - small wind and solar farms.
>
> The Relevant Levels for the individual Facilities in these groups are determined by allocating the respective group ELCC between the Facilities in the group based on the Facilities' relative performance in:
>
> - the 50 Trading Intervals with the highest LOLP; and
> - the 50 Trading Intervals with the highest LOLP excluding the contribution of all other Candidate Facilities from the system demand.[17]

All intermittent generators contribute to system reliability. To use different capacity valuation methods for intermittent generators may be discriminatory and inconsistent with the WEM objective:

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13 Average outputs sampled on the same day, say across consecutive trading intervals would be highly correlated and not representative of future output.

14 To the ERA's knowledge capacity markets in other jurisdictions have not identified a capacity valuation approach that can be proved mathematically, all allocation approaches in practise contain assumptions on intermittent generators availability.

15 MISO, 2019, *Planning year 2020-2021, Wind and solar capacity credit, December 2019*, p. 12 (online)

16 PJM, 2020, Response of PJM to FERC Staff's December 22, 2020 Information Request, p. 113 (online)

17 RCP, 2021, *RC_2019_03 Draft Rule Change Report*, p. 45 (online).

> 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.[18]

As generators within the small wind and solar farm category increase, they are likely to have a combined size larger than a standalone wind or solar farm. Therefore, the ERA encourages the RCP to ensure a consistent approach to valuing capacity for all members of the intermittent generation fleet.

1.1.3. Conclusion on use of the delta method

The ERA encourages the RCP to not apply the delta method in the form presented in the draft rule change report.

Instead, the ERA suggests that the RCP bases the allocation to individual facilities on the average available capacity of facilities during system reliability stress periods, after allocating the fleet ELCC to facility groups formed based on their overall availability profile. This avoids undue variations in results while accounting for facility contributions based on their physical characteristics and forecast availability of capacity. As noted in section 1.1.1, the RCP could explore creating facility groups based on technology and location, such as North SWIS wind, South SWIS wind, apply the delta method at the technology-class level, or apply the delta method to a new set of facility classes.

Given the deadline for completing this rule change proposal, the RCP could retain the use of technology classes for this rule change. The RCP could request that in the next review, the ERA considers:

- Introducing intermittent facility groups based on technology and location.
- Applying the delta method to technology/facility groups to determine if either approach improves capacity valuation for intermittent generators.

When compared to applying the delta method directly to individual facilities, the allocation method based on facility class ELCCs and average available capacity of resource provides advantages:

- The calculation of facility group ELCCs provides for the allocation of the effect of interaction between the capacity value of intermittent generators based on the overall contribution of each facility group to shifting the periods of high reliability stress and reducing the expectation of loss of load events.
- Given their dependency on the weather, individual intermittent generators have variable output profiles. The overall output variation is reduced when individual generators with similar output profiles are grouped together. Therefore, the variation of facility group ELCCs calculated is smaller than that calculated under delta method.
- Allocation of facility group ELCCs to individual facilities would be conducted based on a sample that would better represent the average available capacity of resources during system stress periods in the future, also having consideration for the variability of results.
- The allocation does not rely on first-in and last-in ELCC values calculated for individual facilities that do not consider the capacity contribution of the intermittent generators within the wider intermittent portfolio.

Provided that the sampling method used is reasonable, a two-step allocation method based on facility group ELCCs and individual facility's average available capacity would provide more

[18] Wholesale Electricity Market Rule (1 February 2021), rule 1.1.2(c), (online).

stable results when compared to those determined when the delta method is applied directly to individual intermittent generation facilities.

Allocation based on the two-step process would also provide for better acceptance of results by facility owners. This is because the two-step allocation approach ensures facilities within the same facility group receive the same portion of their average available capacity during system stress periods as their capacity value.

1.2. Capacity outage probability table calculation with scaled capacities

The numerical model proposed by the ERA to estimate the ELCC of the fleet of intermittent resources comprises four main calculation steps. The model is outlined in the ERA's final report and simplified below.[19]

- Step 1 – The ERA calculated a capacity outage probability table (COPT) to determine the probability of a certain amount of scheduled capacity or demand side program being on outage. The inputs to the COPT included the maximum capacity during reliability stress periods and the expected forced outage rate of scheduled generators. The COPT comprised a list of outage states, expressed in megawatts, and their respective probabilities.
- Step 2 - Using the COPT in conjunction with a time series of demand, the ERA calculated the loss of load expectation of the SWIS – without the contribution of the intermittent fleet.
- Step 3 - The time series of a sum of the output of intermittent generators was deducted from demand to estimate a net load series. The loss of load expectation of the system in this step was lower than that estimated previously because of the contribution of the fleet of intermittent resources to the system.
- Step 4 – The ERA then iteratively increased load across all trading intervals by a fixed amount until the loss of load expectation in step 3 reached the loss of load expectation calculated in step 2. The increase in load in this step was the effective load carrying capability of the fleet of intermittent resources.

The creation of a COPT is central to the ERA's proposed method and the RCP has retained this to determine the ELCC of the intermittent generator fleet. However, the RCP has proposed changing the COPT and the ERA considers that the changes are inconsistent with the requirements of the WEM Rules and will create distorted capacity values for intermittent generators.

The RCP's draft rule change report stated that:

> The Planning Criterion is designed on the assumption that the Reserve Capacity Target will be met with most of the Capacity Credits assigned to Scheduled Generators and only a few assigned to Intermittent Generators and DSPs.[20]

To fulfil this assumption, the RCP considered it appropriate:

> To adjust the COPT so that the total number of capacity credits of all facilities in the COPT equals the Reserve Capacity Requirement. The RCP considers that, in such a scenario, the observed LOLE would reflect the LOLE implied by the Planning Criterion for any reference system demand.[21]

[19] ERA, 2019, *Relevant level method review 2018 – Capacity valuation for intermittent generators: Final report*, p. 46 (online)

[20] RCP, 2021, *RC_2019_03 Draft Rule Change Report*, pp. 37–38 (online).

[21] Ibid. p. 38

The ERA suggests that the RCP's proposal to adjust the COPT is inconsistent with the WEM Rules. The WEM Rules:

- Do not discriminate against generation types when assigning capacity credits to meet the reserve capacity target.[22]
- Specify that AEMO must determine the minimum capacity required to be provided by availability class 1 capacity if power system security and power system reliability is to be maintained.[23]

The WEM Rules require a minimum amount of the reserve capacity target to be covered by availability class 1 facilities. However, all generators have availability class 1, including intermittent generators, which suggests part of the reserve capacity target should be met by intermittent generators. This is included in WEM rule 4.5.12 below:

> 4.5.12. For the second and third Capacity Years of the Long Term PASA Study Horizon, AEMO must determine the following information:
>
> (a) [Blank]
>
> (b) the minimum capacity required to be provided by Availability Class 1 capacity if Power System Security and Power System Reliability is to be maintained. This minimum capacity is to be set at a level such that if:
>
> i) all Availability Class 2 capacity (excluding Interruptible Load used to provide Spinning Reserve to the extent that it is anticipated to provide Certified Reserve Capacity), were activated during the Capacity Year so as to minimise the peak demand during that Capacity Year; and
>
> ii) the Planning Criterion and the criteria for evaluating Outage Plans set out in clause 3.18.11 were to be applied to the load scenario defined by clause 4.5.12(b)(i), then it would be possible to satisfy the Planning Criterion and the criteria for evaluating Outage Plans set out in clause 3.18.11, as applied in clause 4.5.12(b)(ii), using, to the extent that the capacity is anticipated to provide Certified Reserve Capacity, the anticipated installed Availability Class 1 capacity, the anticipated Interruptible Load capacity available as Spinning Reserve and, to the extent that further Availability Class 1 capacity would be required, an appropriate mix of Availability Class 1 capacity to make up that shortfall; and
>
> (c) the capacity associated with Availability Class 2, where this is equal to the Reserve Capacity Target for the Capacity Year less the minimum capacity required to be provided by Availability Class 1 capacity under clause 4.5.12(b).

Scaling up the capacity values in the COPT to meet the reserve capacity target excludes the contribution of intermittent generators to system reliability and so is inconsistent with the requirements of the above rule.

There are other implications from scaling capacity values in the COPT because:

- Adjusting the calculation of the COPT can distort the capacity value of intermittent generators because their capacity value would be assessed based on a reliability risk target beyond (or more reliable than) the target reliability risk level specified in the planning criterion. This approach is likely to underestimate the capacity value of intermittent generators.
- Once the RCP scales the capacity of generators in the COPT (non-intermittent generators), outage state probabilities calculated in the COPT no longer represent the outage state probabilities of the generators in the SWIS.

22 Wholesale Electricity Market Rules (1 February 2021), rule 1.2.1(c), (online).

23 Ibid. rule 4.5.12.

The RCP also included demand side providers and battery storage in its COPT. The WEM Rules identify demand side providers as availability class 2 resources and there is no requirement for the reserve capacity target to be met by availability class 2 resources.[24] Consequently, demand side providers are incorrectly included in the adjusted COPT as part of the RCP's assumption that the capacity values of all generators in the COPT should be equivalent to the reserve capacity target.[25]

Consistent with conventional system adequacy modelling practice, the ERA's COPT used the maximum capacity of non-intermittent generators during system stress periods. This is because the COPT calculates the outage probabilities based on two availability states and respective probabilities for a generator being in each state: a generator being fully available at its maximum capacity and a generator being on full outage and not available. The RCP's COPT uses each generator's certified reserve capacity. However, the maximum capacity of non-intermittent generators is not necessarily equal to their certified reserve capacity. For example, under the WEM Rules AEMO can discount the certified reserve capacity of a generator below its maximum capacity.[26] The ERA's proposal accounted for this difference by requiring the method to use the maximum capacity of generators when calculating the COPT.

The lack of an explicit loss of load expectation for use in the relevant level method is problematic. To prepare its rule change proposal, the ERA relied on Energy Policy WA's assessment of the duration of loss of load events likely to happen in the SWIS and proposed a target loss of load expectation of four hours, based on the information available.

AEMO will soon develop system adequacy models for short-term and medium-term adequacy assessments and will be able to determine the expected duration of shortfall events in the SWIS at the target level of adequacy risk specified in the planning criterion. The final rule change could request that AEMO produce a target loss of load expectation to be used for the relevant level method. In the longer term, Energy Policy WA could consider introducing an explicit target loss of load expectation for the SWIS when it reviews the method used to determine the long-term projected assessment of system adequacy.

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

The ERA suggests that the introduction of the delta method to assign the capacity value of the intermittent fleet to individual intermittent generators and proposed adjustments to the COPT will not improve how the WEM meets the wholesale market objectives.

(a) *to promote the economically efficient, safe and reliable production and supply of electricity and electricity related services in the South West interconnected system.*

The ERA's proposed changes to the RLM will increase the economic efficiency and reliability of the SWIS. The proposed changes will provide a more reliable forecast of the capacity

[24] Energy Policy WA has confirmed that standalone battery storage facilities are also going to be classified as availability class 2.

[25] The ERA did include demand side providers in its COPT but did not assume that the reserve capacity target should be met by non-intermittent generators first. Instead the ERA assumed that the reserve capacity target would be met through a contribution of all generators, battery storage and demand side providers.

[26] Wholesale Electricity Market Rules (1 February 2021), rule 4.11.1(h), (online).

contribution of intermittent generators in the SWIS than the current method and this will avoid over- or under-procurement of capacity due to the use of the current RLM.

Using the delta method to allocate capacity to individual intermittent generators relies on sampling the average output of the intermittent generator over a very small number of trading intervals. Basing capacity allocation on a small number of historical observations is unlikely to provide an indication of the output of the facility in future system stress periods. This can lead to a less reliable forecast of the capacity contribution of intermittent generators in the SWIS. An over- or under-procurement of capacity around what is required will negatively affect the economic efficiency of the SWIS.

(b) *to encourage competition among generators and retailers in the South West interconnected system, including by facilitating efficient entry of new competitors.*

The ERA's proposed RLM is transparent and technology neutral. Market participants and new entrants to the system can replicate the method and assess the contribution of their capacity to the reliability of the SWIS and forecast the number of certified reserve capacity they can receive.

As the capacity allocations resulting from application of the delta method are based on a small sample the capacity allocated to individual generators is likely to vary significantly within the intermittent fleet and between years. This will make it difficult for prospective new entrants to assess their entry into the market and for existing market participants to assess their operational or exit decisions.

(c) *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.*

The ERA's proposed method is technology neutral and does not discriminate against any supply technology. The basis of calculation is to measure the expected contribution of a facility to meeting the dominant reliability planning criterion in the WEM Rules. The method can suitably be used to determine the capacity contribution of existing technologies such as biogas, solar, and wind generators, and new technologies such as wave generation and offshore wind turbines.

The proposed changes to the COPT in the draft rule change report discriminates against intermittent technologies by assuming that the reserve capacity target is met by the scheduled generators and demand side providers included in the COPT. As noted in section 1.2, the ERA considers that the proposed changes to the COPT are inconsistent with the WEM Rules. The capacity contribution of intermittent generators is assessed against a lower loss of load expectation that is indicated by the planning criterion. This creates discrimination against renewable energy technologies.

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

Not applicable to the ERA.

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

Not applicable to the ERA.
