RCP Rule Change Panel
Market Advisory Committee

Minutes

Meeting Title:	RC_2019_03: Method used for the assignment of Certified Reserve Capacity to Intermittent Generators – Workshop 1 (Draft Rule Change Report)
Date:	10 May 2021
Time:	9:30 AM – 12:05 PM
Location:	Online via Microsoft Teams

Attendees	Representing	Comment
Stephen Eliot	RCP Support (Chair)	
Sara O'Connor	Economic Regulation Authority (**ERA**)	
Matt Shahnazari	ERA	
Liz Aitken	Aitken Energy	
Luisa Thorburn	APA Group	
Rebecca White	Collgar Wind Farm	
Oliver Nunn	Endgame Economics	
Chris Binstead	Synergy	
Martin Maticka	Australian Energy Market Operator (**AEMO**)	
Wendy Ng	ERM Power	
Matthew Bowen	Jackson McDonald	
Penny Ling	Metro Power	
Hugh Webster	Infrastructure Capital	
Kei Sukmadjaja	Western Power	
Peter Huxtable	Water Corporation	
Tom Frood	Bright Energy Investments	
Bobby Ditric	The Lantau Group	
Geoff Gaston	Change Energy	
Dora Guzeleva	Energy Policy WA (**EPWA**)	
Sandy Ng	AEMO	
Oscar Carlberg	Alinta Energy (**Alinta**)	
Daniel Ravikovitch	Jackson McDonald	
Jo-Anne Chan	Synergy	

Grace Liu	AEMO	
Rhiannon Bedola	Synergy	
Jacinda Papps	Alinta	
Sam Lei	Alinta	
Timothy Edwards	Metro Power	
Erin Stone	Point Global	
Edwin Ong	AEMO	
Naomi Donohue	APA Group	
Laura Koziol	RCP Support	
Jenny Laidlaw	RCP Support	
Adnan Hayat	RCP Support	
Vijeshni Ashna Nand	RCP Support	
Natalie Robins	RCP Support	

Item	Subject	Action

1 Welcome

The Chair opened the meeting at 9:30 AM and welcomed members and observers to the workshop. The Chair noted that the Rule Change Panel (**Panel**) was holding two workshops:

- One workshop on 10 May 2021 to discuss the Draft Rule Change Report for RC_2019_03, to give:
  - the Panel an early indication of Market Participants' concerns so that the Panel can get started on analysis of these issues; and
  - Market Participants an opportunity to discuss the Draft Rule Change Report to help them prepare their formal submissions.
- A second workshop on 11 May 2021 to review the drafting of the Amending Rules.

2 Discussion of the Draft Rule Change Report

The Chair indicated that there would be three presentations in the workshop – from RCP Support, Alinta and the ERA; and that there would then be time for questions and discussion after the presentations.

RCP Support's Presentation[1]

RCP Support slides 1-4:

- Ms Laura Koziol indicated that RCP Support's presentation would cover:

[1] RCP Support's presentation is available at https://www.erawa.com.au/cproot/21918/2/RC_2019_03----10-May-2021-MAC-Workshop----Workshop-Slides.pdf.

- calculation of the fleet's effective load carrying capability (**ELCC**);
- volatility of the ELCC;
- the target loss of load expectation (**LOLE**);
- the determination of the Relevant Levels for individual facilities;
- the treatment of small facilities;
- the Reserve Capacity Mechanism (**RCM**) timeline; and
- next steps for processing RC_2019_03.

- Ms Koziol indicated that RCP Support's presentation would not cover:
  - the Reference Period under the draft decision;
  - the distributed energy resources (**DER**) adjustment to historical load;
  - the Capacity Outage Probability Table (**COPT**);
  - treatment of proposed facilities; or
  - treatment of Early Certified Reserve Capacity (**CRC**) and Conditional CRC.

  The Chair indicated that Market Participants could ask questions about any of these issues after the presentations.

RCP Support slide 5:

- Ms Koziol indicated that the main inputs to the ELCC are system demand, the COPTs, and the output of the candidate facilities during the Reference Period. Based on the system demand and the relevant COPT, each Trading Interval (**TI**) is allocated a Loss of Load Probability (**LOLP**), and the sum of all LOLPs over the Reference Period is the LOLE.

RCP Support slide 6:

- To give an indication of the how the LOLPs are distributed in the seven-year Reference Period from 2013 to 2020, Ms Koziol presented a graph that shows the LOLP of the 50 TIs with the highest system demand.
- Ordered from highest LOLP to the lowest, the first 20-30 TIs have a much higher LOLP than the later ones, and the later TIs have very low LOLPs. This reflects the peakiness of the Wholesale Electricity Market (**WEM**).
- The graph shows that a change of only 100-200 MW in system demand makes for a very steep drop in LOLP.

RCP Support slide 7:

- Ms Koziol showed a graph of the Fleet ELCC for different Reference Periods that shows that the top 20-50 TIs are the most relevant to the

Fleet ELCC. This shows that the few TIs with the highest system demand are the driver for the ELCC for the whole period.

RCP Support slides 8 and 9:

- Ms Koziol used these slides to show how the ELCC calculation works.

RCP Support slide 10:

- Ms Koziol indicated that the draft decision was to use the ELCC method to set the capacity value of the fleet of candidate facilities. The ELCC method finds the TIs with the highest system stress and accounts for the right factors:
  - the steep load duration curve in the WEM;
  - the unpredictability of the number of higher system stress TIs; and
  - that most TIs during the Reference Period do not have a material effect on the ELCC.

RCP Support slide 11:

- Ms Koziol noted that the South West Interconnected System (**SWIS**) has peaky system demand and that high system stress events are rare, which can lead to high volatility of the Fleet ELCC and of individual facility allocations.
- Ms Koziol noted that there is no guarantee that the historical performance of the fleet in the TIs that set the ELCC will be similar to its performance in future high system stress events.
- Ms Koziol indicated that one way to address this issue would be to model the output of candidate facilities during alternative scenarios of high system stress. Ms Jenny Laidlaw indicated that AEMO had suggested that this might be possible in future, and Ms Koziol indicated that the Relevant Level Method (**RLM**) could be adjusted to do this in the future, but that the changes could not be implemented in time for the 2021 Reserve Capacity Cycle (**RCC**).
- Ms Koziol indicated that another alternative would be to base the value of the fleet and the individual allocations on a larger set of actual values, taking into account performance during intervals that are not high system stress, but the Panel considered this to be inappropriate because the RCM is intended to cater for periods of high system stress.

RCP Support slide 12:

- Ms Koziol noted that the WEM Rules do not state a target LOLE, that the Panel's proposal was to use the original LOLE as the target and that this could over or under value candidate facilities.
- Ms Koziol noted that the WEM Rules have an implicit target LOLE and that the draft decision was to scale the COPTs so that the sum of

non-intermittent facilities' CRCs equals the Reserve Capacity Requirement, and then use the resulting LOLE as the target LOLE.

RCP Support slides 13-16:

- Ms Koziol noted that the draft decision was to use the Delta Method to allocate the Fleet ELCC to candidate facilities, and that the ERA originally proposed a different allocation method. The Panel's main concerns with the original proposal are that it does not reflect:
  - the actual performance of facilities during periods of high system stress;
  - the benefits of diversity (e.g. having different facilities in different locations with different performances during different times); and
  - the saturation effects of having similarly performing Intermittent Generators in a single location.
- Ms Laidlaw indicated that:
  - A facility will do well if it performs well in all the high stress intervals. If a Facility cannot perform in all the high stress intervals, then its capacity value is dependent on how well its performance fits with the load and with other intermittent resources on the system. If several intermittent resources have similar output because they are located in the same place, then when they fail to deliver, they will fail to deliver in unison, so their capacity value will decrease as their average output increases.
  - On the other hand, if you have diverse resources that can fill each other's gaps, then the fleet will do better overall, and can have a higher combined capacity value.
- Ms Laidlaw indicated that the concern with the ERA's proposed allocation method is that it if you allocate capacity value purely on average output, then you ignore that the average capacity value starts to degrade if there is too much capacity with the same technology in one location.
- Ms Koziol indicated that the Delta Method addresses these concerns and reflects the contribution of individual facilities during high stress intervals. The Delta Method does not arbitrarily select the high-stress TIs up front.
- In response to a question from Ms Rebecca White:
  - Ms Laidlaw indicated that the capacity value for Intermittent Generators with highly correlated output around peak times will reduce relative to their average output as you get more of them. Having several Intermittent Generators grouped together can decrease the capacity value of all Intermittent Generators on average.

- Ms Koziol indicated that, if you looked at the scenarios presented in the Draft Rule Change Report, adding another resource that complements existing resources can increase the capacity value of the existing resources, while the adding a resource that performs the same as an existing resource can decrease the capacity value of the existing resources.
- Ms Laidlaw indicated that the Delta Method makes the allocation of the fleet value to the individual generators better reflect how they contribute to the overall capacity value.

- Dr Matt Shahnazari indicated that he disagreed with this viewpoint and that as the penetration of Intermittent Generators with correlated output increases, their capacity value in terms of percentage of installed capacity decreases. Ms Koziol and Ms Laidlaw considered that this statement was consistent with their comments.
- Ms Naomi Donohue asked if RCP Support was saying that, if all generators were treated the same, regardless of technology, this would skew the calculations and imply that the WEM has sufficient capacity, but fail to address that renewables are not always available and often not available at the same time.
  - Ms Laidlaw indicated that if you just have one Intermittent Generator, there is a reasonable chance that it will not perform at any particular time, while a diverse fleet of Intermittent Generators will reduce the probability that the facilities will not perform at any particular time, particularly at peak intervals. More complementary individual resources will increase the probability that they will be available when they are needed. Facilities that are highly correlated will be less likely to be able to meet peak requirements – if one fails to perform then they will all fail.
- Mr Tom Frood indicated that, because wind and solar farms typically consist of several smaller units, outages tend to only take out part of the facility, whereas an outage for a gas or a coal plant tends to take out the whole plant. Mr Frood asked whether this had been considered.
  - Ms Koziol indicated that the COPT assumes either full outages or no outages for non-intermittent generators, and that treatment of Intermittent Generators is based on their historical output, so the method does not make any assumptions about outages.
  - Mr Frood was not sure that this fully addressed his question and agreed to further discuss this with RCP Support offline.
- Ms White asked whether a decision by a generator to locate in an area where its output would be correlated with existing generators would affect the capacity value of generators in another part of the network.

- Ms Laidlaw indicated that it could, but that the Delta Method will better deal with this impact. If a new wind farm locates next to an existing wind farm, as in one of the scenarios provided in the Draft Rule Change Report, then this would usually reduce the ELCC of the existing co-located wind farms but would have a smaller effect on wind farms whose output is not correlated, such as those in another region.

- Ms Rhiannon Bedola indicated that she understood that estimated values are currently used in the RLM for logged outages. Ms Bedola asked whether an adjustment was done for Intermittent Generators if they have a partial outage in their history that was logged?
  - Ms Laidlaw indicated that the Rule Change Proposal proposed to use estimates for Consequential Outages but not for Forced Outages and that this approach was not changed in the draft decision.
- Ms White commented that sending the right incentives for diversification across the network seemed to be an important principle.
- Mr Oliver Nunn noted that there was a lot of discussion about the benefits of diversity and asked to what extent diversity was driving the results? That is, how important was it in comparison to performance of an individual wind farm as a portion of the Fleet?
  - Ms Koziol indicated that the Delta Method calculates two ELCC values for each Facility (or group of Facilities for biogas facilities, and small wind farms and solar farms):
    - A First-In ELCC, which is based on the baseline demand profile that does not include any reduction from any capacity, from any candidate facility. The First-In ELCC assumes that the candidate facility is the only facility assessed and calculates the ELCC for that facility.
    - A Last-In ELCC, which is based on the baseline demand profile, reduced in each TI by the contribution of all the other candidate Facilities, and then calculates the ELCC for that facility.

    The Delta Method allocates the Fleet Interactive Effect to each Facility in proportion to difference between their First-In and Last-In ELCCs. So, the Delta Method will always allocate an ELCC between the First-In and Last-In ELCC. That is, the difference between the Fleet ELCC and the sum of all Last-In the ELCCs is allocated between the different individual facilities.
  - Ms Koziol noted that facilities in similar locations to other facilities typically have a higher First-In ELCC than Last-In ELCC, so their allocation will be lower than their First-In ELCC.

- As an example, Ms Laidlaw pointed out that Collgar and Warradarge have similar First-In ELCCs, that the facilities have similar sizes, and that their average output is not substantially different; but there is quite a difference between their Last-In ELCCs. This was because there are many other generators in the general vicinity of Warradarge with similar output to Warradarge.

- Dr Shahnazari commented that:
  - The ERA's proposed allocation method accounts for the physical factors, including locational differences. These factors influence the average output of facilities during stress periods. The ERA's allocation method uses a sampling method to calculate average output of facilities during stress periods having consideration for representativeness of the sample and variation of results.
  - The calculation of technology groups' ELCCs is important to ensure that the allocation of diversity benefits considers the contribution of resources to:
    - shifting the periods of high-reliability stress from peak demand to peak load for scheduled generation (**LSG**); and
    - the contribution of resources to mitigating the probability of loss during peak LSG periods.
- Mr Oscar Carlberg agreed with Dr Shahnazari's points.
- The Chair noted that this issue was probably going to be the biggest point of discussion and that the presentation was over time, and suggested that the workshop move on and return to this point in the discussion period.
- Ms Koziol presented an example of how the First-In and Last-In ELCC calculations would work for two facilities.
- Ms Koziol presented an illustrative example of how the Delta Method works, but this was not reviewed due to time constraints. It was agreed that this information is provided in the Draft Rule Change Report and that stakeholders could contact RCP Support if they wanted to review this method on a one-on-one basis.
- In response to a stakeholder question, Ms Laidlaw indicated that the Fleet Interactive Effect is about 50 MW.

RCP Support slide 17:

- Ms Koziol indicated that determination of Relevant Levels under the Delta Method could be problematic for small facilities because the 0.1 MW granularity of the COPTs can create rounding problems, so the Panel had proposed two groups for small facilities – biogas and non-biogas (wind and solar).

- The Chair asked stakeholders to comment in their submissions on whether AEMO should be allowed to include Semi-Scheduled Facilities in one of the groups of small facilities.

RCP Support slide 18:

- Ms Koziol noted that AEMO had raised issues with the RCM timeline and that it proposed an earlier close of the CRC application window to provide more time between the close of the CRC application window and the notification of the outcome. The Panel's concern was that there would be only one week between the publication of the Electricity Statement of Opportunities and the close of CRC application window. A later notification of CRC to applicants would lead to:
    - compressed timeframes for subsequent steps in the RCM; and/or
    - publishing the allocation of Capacity Credits and Network Access Quantities (**NAQ**) at a later time.
- The Chair asked stakeholders to comment in their submissions on the implications of compressing the timeframes and later publication of the results, and what timing would be acceptable.

RCP Support slide 19:

- The Chair indicated that:
    - stakeholders should contact RCP Support if they would like a one-on-one discussion on RC_2019_03;
    - submissions on the Draft Rule Change Report were due on 19 May 2021;
    - this gave the Panel to 17 June 2021 to finish the Final Rule Change Report, which left only nine business days to spare for the Panel to finalise the report by 1 July 2021;
    - if the Panel did not meet this timeline, then the decision on the Final Rule Change Report would transfer to the Coordinator and the proposal would not be able to be implemented for the 2021 RCC; and
    - the Panel currently proposed commencement of the Amending Rules on 6 August 2021, but this was still being considered.

Alinta's Presentation[2]

Alinta slides 4-6:

- Mr Nunn presented the CRC allocations to individual Facilities and the implied capacity factors of these allocations, and pointed out that the Delta Method results in very different outcomes from the ERA's proposal – some facilities get large increases (Albany and Grasmere

[2] Alinta's presentation is available at https://www.erawa.com.au/cproot/21919/2/RC_2019_03----10-May-2021-Workshop----Alinta-Presentation.pdf.

each get a 52% increase and Collgar gets a 17% increase), while others get large decreases (like Mumbida and Walkaway).

Alinta slide 7-9:

- Mr Nunn showed a chart with the average output profile for Walkaway, Albany and Grasmere over the course of a day and indicated that Walkway has a large dip in average output in the middle of the day, but higher average output during peak times.
- Mr Nunn compared the Capacity Credit allocations for Walkaway at about 10-12% of nameplate capacity versus Albany and Grasmere at upwards of 75-80%.
- Mr Nunn observed that the Delta Method has enormous consequences:
    - the 80% capacity factors for Albany and Grasmere seemed implausible, as they suggested that the facilities are almost firm resources;
    - Grasmere was receiving about the same number of Capacity Credits as Walkaway even though it was about one-sixth the size of Walkaway;
    - the results seemed vastly different from what the average output profiles would suggest; and
    - this was a significant shift from the current RLM.

Alinta slides 10-12:

- Mr Nunn suggested that the definition of the high stress intervals is driving the results and is responsible for setting the average capacity factor of the plant.
- Mr Nunn indicated that the ERA's method looks at the top 12 TIs with the highest demand from 12 separate days – 12 different days in each year in the past five years, compared to the Delta Method that uses around about 20 top TIs.
- Mr Nunn also noted that the ERA method uses two sets of TIs, one based on the highest demand, and the other based on the highest demand net of intermittent generation. Mr Nunn pointed out that there is a strong overlap between these two sets of data, and that 10 of the top 12 demand TIs are also top LSG intervals.
- Mr Nunn pointed out that the Panel's analysis made it clear that the results are being driven by a very small number of TIs.
- Mr Nunn presented a cut-off demand duration curve and suggested that it indicates that the ERA's method considers a large set of periods off the top of the demand duration curve, whereas the Delta Method is very focused on a very small number at the very top. Mr Nunn indicated that there are gaps between the TIs selected by

the ERA's method – it does not select just the highest TIs, it selects TIs that are spread out across several days.

- In response to a question from Ms Laidlaw, Mr Nunn indicated that he was referring to using a small number of TIs to determine the Fleet ELCC but more intervals to allocate the Fleet ELCC.

Alinta slides 14-19:

- Mr Nunn presented a chart that shows the average capacity factor of Grasmere and Walkaway over the top 1,000 TIs. Mr Nunn suggested that this indicates that Grasmere performs well over the top 1,000 TIs compared to Walkaway, particularly in the top 50 TIs, which is what is driving the results – Grasmere was producing and Walkaway was not.
- Mr Nunn showed a second chart that showed that Collgar and Albany also perform well in top 50 periods.
- Mr Nunn indicated that the changing profile of the capacity factors of the facilities in the top 12-20 TIs is what drives their CRC.
- Mr Nunn pointed out that the top 12 TIs have occurred over the course of three days – 8 February 2016, 14 March 2016 and 4 February 2020. Mr Nunn pointed out that what is driving the results is that in these days:
  - Grasmere and Albany performed very well in all three days;
  - Collgar did not perform well on one day, performed very well on another day, and averagely on the third day; and
  - Walkaway performed poorly on two out of the three days, and about average on the other day.

Alinta slides 20-21:

- Mr Nunn indicated that the outcomes on these three days are highly correlated with one another. What is concerning is that the Delta Method is really looking at three observations of wind farm output, and that this is too small a sample that is not going to be robust.
- Mr Nunn indicated that Alinta is also concerned that the results could be prone to drastic changes. A single high demand day or heatwave could lead to drastic revisions to the capacity values of facilities, and could occur in any year with entirely different outcomes for all wind farms. It was possible that there could be a heatwave next year, all of the wind farms could fail simultaneously, and get zero capacity value as a result.
- Mr Nunn expressed concern that the Delta Method seems to be driven by so few observations that it is not fit for purpose.
- Ms Koziol agreed with Mr Nunn that wind farms would get a smaller allocation if a scenario occurred with a heatwave and the wind farms did not produce well, but indicated that this would be a result of the

ELCC method arriving at a lower Fleet ELCC, not the Delta Method allocation.

- Mr Carlberg indicated that it was his understanding that the Fleet ELCC is less volatile than the individual allocations, and that the Fleet ELCC is based on the lowest of the median and the full period results to reduce volatility, but the same approach is not used for individual facilities, so the volatility for the Fleet is counteracted, but the same is not done for the individual Facilities.
    - Ms Koziol indicated that this was not the draft decision. The draft decision was to use the ELCC for the full Reference Period, which is driven by the exact same TIs that drive the Delta Method. There was no averaging and no median used in the method under the draft decision. The Rule Change Proposal was to use the lower of the median for the full period and the median of the separate years. The Panel considered that this approach will put too much emphasis on TIs in times that are low system stress.
    - Mr Carlberg asked whether the Fleet ELCC would be less volatile because it was a fleet and composed of a lot more generators that were going to be more diversified?
    - Ms Koziol indicated that RCP Support did not have enough data to confirm this.
    - Ms Laidlaw indicated that the Fleet ELCC should be less volatile in theory, but the question was whether it is materially less volatile. The WEM does not have the thousands of facilities that exist in some American jurisdictions, it has 26 facilities that are dominated by six large wind farms, of which five are more or less in the same area. The WEM could experience a high stress day when the northern wind farms and Collgar fail at the same time, but it could also have a high stress event where Collgar and the northern wind farms do extremely well, which would drive an artificially high ELCC that could be a problem from a system reliability point of view. These were both risks, and the law of large numbers does not apply in the WEM as much as you would like in these circumstances.
    - Dr Shahnazari indicated that the variation of the fleet of Intermittent Generators is much smaller than variation of a single Intermittent Generator. This is widely discussed in different jurisdictions and is why the proposal is to start with the calculation of fleet ELCC rather than just looking at each individual generator.
    - Dr Shahnazari also pointed out that there is no guarantee that any resource in the system will always be available, even Scheduled Generators fail, and when they do, a large chunk of

capacity is lost. The scenarios that the Panel tested in the Draft Rule Change Report did not show much variation in terms of ELCC.

- Ms Koziol pointed out that the scenarios that the Panel analysed were based on the same seven years of data and that none of the scenarios had additional peak periods. The Panel did not have any data to look at how robust the fleet value would be over time.
- Mr Frood indicated that he would be surprised if you did not get the same results if you looked at more intervals because the weather that drives the results for Albany and Grasmere is very different from the weather affecting Yandin, Warradarge and Badgingarra.
  - Mr Nunn indicated that Alinta's analysis shows you do get drastically different average capacity factors if you expand the number of intervals. This is not to say that Grasmere and Albany do not have better capacity factors, it is just the quantum.
  - Mr Frood suggested that it is important to account for the diversity benefits.
  - Mr Nunn indicated that Alinta also did its analysis for LSG, and that it made no difference to the results, which suggests that the diversity benefits are minimal.
- Ms Koziol pointed out that the chart of the Delta Method results from the Draft Rule Change Report shows that the north country wind farms and Collgar complement each other quite well. If you look at the First-In ELCC and the Last-In ELCC for Grasmere and Albany, they are quite similar, they actually produce very well during all these intervals.
- Mr Nunn agreed that the Delta Method incorporates the element of the diversity factor, but indicated that the results are driven by a small number of TIs, and the question is whether it is appropriate to use such a small number of TIs, which are effectively three separate observations when autocorrelation is considered.
- Ms Koziol agreed – but indicated that this is an issue with the Fleet ELCC, not with the Delta Method.

- Ms Bedola asked if the number of intervals used for allocation should be expanded but the number of intervals for setting the Fleet ELCC should be kept shorter?
  - The Chair pointed out that the Panel is basing the Fleet ELCC on the full seven-year period. The ELCC method selects a small number of intervals because these are the only intervals that are

relevant to the calculation. The question then becomes whether to allocate based on a different set of intervals, which would include intervals that, according to the ELCC method, are not critical intervals?

- Ms Laidlaw pointed out that Dr Shahnazari is correct that the average output of each generator is indicating some locational effects but indicated that allocation based on averages is not picking up diversity effects.

- Ms White asked how demand in interval 100 compares to demand in interval one (e.g. is interval 100 still peaky?).
  - Mr Nunn indicated that the peak is about 3,000 MW in the lowest TI under the ERA method, which is substantially lower than at the very peak.
  - Ms Koziol indicated that this is what RCP Support is saying - the ELCC method does not calculate a high LOLP for these TIs, it is the LOLPs for the first 50 TIs that matter.
- Mr Nunn indicated that there is not enough data. Mr Nunn doubted that AEMO would have any confidence in using 12 TIs as the basis for system forecasts, so how can there be confidence in using such a small number of TIs to allocate large amounts of capital for the purposes of investment?
  - Ms Laidlaw pointed out that the Fleet ELCC sets the number of Capacity Credits allocated to intermittent facilities and the Fleet ELCC is determined from the same three events that drive the results for Collgar and the northern wind farms, and asked Mr Nunn if that means that the Panel should be thinking hard about adopting ELCC as our fleet capacity measure?
  - Mr Nunn indicated that, in the absence of a lot of information, that it may make more sense to use a proxy, which is what the ERA is proposing. It recognizes the limited information that is available and uses a proxy rather than something that is razor-sharp and could drastically change from one year to the next.
- The Chair asked whether that means the Panel should accept that a small number of TIs will set the ELCC, but should not accept using the same TIs for allocation?
  - Mr Nunn indicated that if the fleet value for the ELCC could be changed to very low numbers next year if all of the wind farms rolled over, then that does not sound like it is a good method.
  - Mr Carlberg indicated that it is his understanding that the Fleet ELCC is less volatile and that the ERA has discussed a number of methods to deal with this volatility, so it may be worth revisiting those methods.

The ERA's Presentation[3]

ERA slides 1-3:

- Dr Shahnazari indicated that the ERA has two points to discuss:
  - issues related to the Delta Method, where the ERA has similar concerns to those raised by Mr Nunn; and
  - the Panel's proposed method to adjust the COPT to have a total capacity equal to the Reserve Capacity Requirement, where the ERA thinks that approach may undermine system reliability.

ERA slides 3-8:

- Dr Shahnazari indicated that there are substantial differences between the results of the current RLM, what the ERA proposes and the Delta Method. The ERA looked at average performance during the TIs selected by the ERA sampling method, which is based on the top 12 peak demand and peak LSG TIs, and has a sample of 168 TIs.
  - Dr Shahnazari indicated that the ERA selected these TIs as the basis for allocation because they are similar to the current method, and are representative of the average performance of the facilities into the future.
  - Dr Shahnazari indicated that if you decrease the sample, you might get a sample of the specific highest stress period in the system, but if you reduce the sample size, it does not have power to reliably forecast future performance. This will decrease the confidence interval of the mean of the sample, and the mean of that sample is the basis for allocating capacity values to generators.
- Dr Shahnazari indicated that, if you use the ERA's sampling method, wind farms like Warradarge and Yandin perform better on average than Collgar, but Collgar gets 65 MW under the Delta Method, whereas Warradarge and Yandin get substantially smaller values. Further, Badgingarra has a similar performance to Collgar but gets one third of what Collgar gets.
- Dr Shahnazari indicated that he does not agree with RCP Support's view that the ERA's sample is not representative of performance during stress periods. The TIs that determine First-In or Last-In ELCCs do not need to be used to forecast the future average performance of facilities. The First-In and Last-In ELCCs use a very small sample – only three independent samples, and imagine how uncertain that is.

[3] The ERA's presentation is available at https://www.erawa.com.au/cproot/21917/2/RC_2019_03----10-May-2021-MAC-Workshop----ERA-Presentation.pdf.

- Dr Shahnazari repeated the analysis in terms of average performance based on top 50 peak demand and to 50 peak LSG TIs, similar to what the Panel is proposing for small facilities.
    - Based on average performance over the top 50 peak demand and top 50 peak LSG TIs, Yandin has very similar performance to Collgar, but Yandin gets much smaller capacity values based on that sample that is produced. The results do not make sense over that sample of top 50 stress periods.
    - Dr Shahnazari indicated that he is not saying that the top 50 stress periods is a good sample – if you look at the top 50 stress periods, top demand happens during 13 distinct days and peak LSG happens during seven distinct days, so this is still a very small sample. The concerns with a small sample are not just about variability, the sample is supposed to provide a good indicator of future performance, and the average of a small sample is probably not a good indicator of the future average.
- Dr Shahnazari indicated that the Delta Method might be usefully applied to allocate the fleet capacity value to Facility Classes.
    - Facility Classes are big groups of facilities, and the variation of a Facility Class' First-In or Last-In ELCCs is not as variable as the First-In or Last-In ELCC of a small facility. That information can be used to better allocate the fleet interaction effect between different facilities.
- Dr Shahnazari indicated that the advantage of the ERA's proposed allocation method is that it is better aligned with capacity valuation principles, which is to base capacity valuation on average performance during system stress periods.
    - Dr Shahnazari indicated that, if the Panel has concerns about the representativeness of the sample that the ERA has proposed, they can look for ways to improve its representativeness and to also consider variability.
    - Dr Shahnazari suggested that the Delta Method ignores some important information – it is based on First-In and Last-In ELCC, which is based on average performance of Facilities during a very small set of TIs. Dr Shahnazari indicated that average performance is not a good indicator of future average performance in high stress periods.
    - Regarding capacity valuation principles, Ms Laidlaw indicated that RCP Support discussed in its presentation the principle of diminishing returns of the capacity value of an Intermittent Generator as the generator gets bigger, and if there is correlation between resources. Clearly the average performance of facilities during periods of system stress is important, but so is the correlation of output amongst facilities, and the ERA's approach

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ignores this important information. Ms Laidlaw asked Dr Shahnazari if he could think of an approach that would provide a bigger sample but would not lose sight of the diversity issue, which is very important given how the WEM is laid out?

- Dr Shahnazari indicated that this was not the reasoning that the Panel presented in the Draft Rule Change Report to discount the ERA's proposed allocation method. Dr Shahnazari indicated that one of the reasons that the Panel discounted the ERA's allocation method was that facilities at different locations have different correlation to demand and to other facilities. Dr Shahnazari agreed with this, but suggested that physical factors such as technology, engineering factors and location are reflected in facilities' average performance during system stress periods.
- Ms Laidlaw indicated that the averaging of performance will pick up differences in performance of Facilities in different locations, but asked how will it address when one facility is located next to another, so they produce or fail to produce at the same time?
- Mr Shahnazari asked the same question of Ms Laidlaw – how does the Delta Method address this? Dr Shahnazari indicated that he does not think that Delta Method can explain what Ms Laidlaw is saying because both the ERA's proposed allocation method and the Delta Method are heuristic and are not scientifically proven.
- Ms Laidlaw pointed out that there are no scientifically proven methods.
- Ms Laidlaw indicated that:
  - the Delta Method accounts for both First-In ELCC (which is affected by each Facility's stand-alone performance against load) and Last-In ELCC (which is affected by the other facilities).
  - If a Facility has high correlation to others, its Last-In ELCC will be lower than its First-In ELCC. If a Facility fits in well with the other facilities, and the other Facilities fill in the gaps in the Facility's performance, then its Last-In ELCC will likely be higher than its First-In ELCC. The First-In and Last-In ELCC use different information.
  - RCP Support takes the point that there is a small sample size, but based on these points, Grasmere and Albany had extraordinarily high performance – their output was much higher than their average output. RCP Support agrees that these results might be volatile.

  - If you look at the performance of Collgar and the northern wind farms, they do not seem to be particularly unusual. Both did well in some periods and not so well others. They complemented each other very well.
  - The Last-In performance of the northern wind farms is much worse than their First-In, which is consistent with the effect of the correlation of those wind farms. When you look at the Last-In performance, they are affected by the other nearby facilities, which is reducing the benefit that they provide.
  - RCP Support takes the point that, with another year of data, where a different set of peaks is possible, the northern and the eastern wind farms could do poorly or very well. A bigger and more diversified fleet in future would be less vulnerable to this sort of variation.

- Mr Nunn indicated that you cannot tell whether there is a correlation between wind farms with three observations, this is not a correlation, it is just an observation.
  - Ms Laidlaw asked whether you would expect correlation between facilities that are located together, and less correlation between facilities that are further apart.
  - Mr Nunn agreed but indicated that this is not based on the data, just based on the known location of the Facilities.
- Mr Nunn indicated that RCP Support is drawing on a good point – the importance of temperature and wind speed, which tell us about how facilities generate. It would be interesting to see whether system stress could be thought of in terms of temperature, which might derive a better data set than just looking at high demand periods. This could include observations on weekends.
  - Ms Koziol indicated that RCP Support can investigate this, but drawing on AEMO's submission, suggested that there will likely still only be a small data set of high system stress intervals. Mr Nunn agreed but suggested it may move towards five or six observations.
- Ms Grace Liu asked how the average performance level can reflect the diminishing incremental capacity contribution of a facility, especially if there are many facilities with similar performance profiles in similar locations.
  - Ms Laidlaw indicated that this is the dilemma –a robust data set is preferred but there is also a need to reflect the diminishing incremental capacity contribution of facilities.
- Mr Carlberg suggested that the benefit of signaling correlation to investors is diminished when the results under the Delta Method are

going to be so volatile, and that this volatility will likely outweigh any correlation effects.

  - The Chair commented that the volatility is not necessarily just from the Delta Method.

- Ms Donohue asked whether the ELCC method considers whether a plant was under constraint?

  - Ms Koziol indicated that output values for facilities under a Consequential Outage would be replaced by an estimate from AEMO to reflect what it would have done if it was not constrained.

- Ms Erin Stone asked whether introducing locational signals in the RCM ahead of NAQs being set is consistent with the protection of Scheduled Generators' property rights for the next ten years.

  - The Chair indicated that the RCM does not provide property rights, so the Panel has not considered this, and that any questions on property rights should be addressed to EPWA.

- Ms Bedola suggested that it makes sense that the allocation intervals are aligned to the ELCC intervals, and the issue is the limited number of stress intervals. Ms Bedola asked whether the seven years should be considered individually and have seven ELCCs?

  - Ms Koziol indicated that the problem with this approach is that some years do not have any high system stress TIs from the perspective of the LOLP, so if you calculate the ELCC for a year that did not have high system stress, it will not represent an actual high system stress period, which is what the RCM is supposed to account for.

ERA Slides 9-11:

- Dr Shahnazari presented the following quote from the Draft Rule Change Report:

> *(2) if AEMO was to procure the exact amount of capacity credits set by the Reserve Capacity Target, with a proportion coming from intermittent generators, the resulting system reliability would not be acceptable, because the resulting system reliability would be lower than that implied under (1).*

  - Dr Shahnazari suggested that the Panel is arguing that, because the share of Intermittent Generators on the system was too small at the time of the last review of the Planning Criterion, the Panel assumes that the WEM should meet its Reserve Capacity Target with Scheduled Generators.

  - Dr Shahnazari considered that this is inconsistent with the WEM Rules because all generators are availability class one, including Intermittent Generators, and the WEM Rules require a minimum

amount of the Reserve Capacity Target to be covered by availability class one resources.

- Dr Shahnazari suggested that the adjusted COPT calculation is based on a LOLE that is lower than the target LOLE in the system, which means that the capacity value of Intermittent Generators may be undervalued.
- Dr Shahnazari indicated that the other problem with the Panel's adjustment of the COPT is that the scaled facilities in the COPT do not exist in the SWIS, so the calculated outage probability values are distorted. Dr Shahnazari cannot confirm the materiality of this effect.
- Dr Shahnazari noted that the ERA proposed a four hours in ten years LOLE based on recent EPWA publications and the capacity valuation methodology developed by EPWA. The ERA found that a four hours in ten years LOLE is consistent with EPWA's capacity valuation methodology and provides for Electric Storage Resources.
- Dr Shahnazari noted that, under the new WEM Rules, AEMO is going to develop short-term and medium-term PASA studies based on probabilistic assessments, so a solution could be for AEMO to determine the duration of loss of load events in the system, and based on that, AEMO can determine the LOLE targets suitable for the calculation of the RLM.
- Dr Shahnazari indicated that another solution would be for EPWA to introduce an explicit LOLE target.

Discussion

The Chair opened the workshop to questions and comments from attendees.

- Ms Donohue noted that the ELCC method seems to have source issues and asked whether there is still confidence in the method.
    - Ms Laidlaw indicated that there is little confidence in the current RLM method. The lack of data for ELCC is a concern, but there does not currently seem to be a better option.
    - Ms Koziol indicated that, ideally, the method would be expanded by including additional high system stress events. For example, AEMO could model possible high system stress events. However, this is not feasible for the next RCC.
    - Mr Carlberg indicated that there is potential for the ELCC to be driven by a few intervals, particularly for individual generators, but that the fleet might avoid this issue and be a bit more robust. The ERA acknowledged these risks and proposed measures to manage these risks, and to get a more robust forecast Fleet ELCC, such as using the median of annual results and the full period results, as a more robust proxy. Mr Carlberg suggested

that using the Delta Method to allocate the ELCC to individual generators does not acknowledge these risks.

- Mr Carlberg noted that PJM also indicated that these risks should be managed in applying the Delta Method, in terms of practicality and price signals. Applying the Delta Method to individual generators does not consider this.
    - The Chair indicated that it is RCP Support's understanding that PJM groups facilities mainly for calculation simplicity. PJM proposed transitional measures to deal with the risks that Mr Carlberg is referring to, but the FERC rejected these measures. Nevertheless, the Panel understands these risks and will consider them.
- Ms Bedola stated that she understands that proposed facilities are taken out and assessed based on the additional value that they contribute to the fleet. Ms Bedola agreed with this but asked how the capacity certification would change in year two. In the first year, a proposed facility in the north country might not get many Capacity Credits because it does not add much value, but if nothing else was to change in year two, would it take CRC away from the other facilities in north country?
    - Ms Koziol indicated that a proposed facility would be assessed in a second round. A proposed facility that is co-located with a lot of similar facilities would likely get a relatively low value while it is a proposed facility. Once it is a committed facility, it would be assessed with everyone else, so if it adds only a little value to the fleet and nothing else changes, the overall value of the group of similar facilities would be allocated between these facilities, so you could say it is taking away capacity value of existing facilities. The same could be said of a new facility that has a very similar profile to an existing facility – the ELCC of that existing facility would reduce.
    - Ms Bedola indicated that if a locational signal is needed, that signal will be muted if a new facility that does not add much value can take CRC away from other facilities.
        - Ms Koziol indicated that a new facility that is built in a saturated location would still get a lower CRC than a facility that is built in a more complementary location. If facilities are built in a complementary region, then there will be space again to build in the saturated area. It would be possible to protect existing facilities from this effect, but this not in scope of the Rule Change Proposal.
    - Ms Bedola suggested that this means that existing facilities are exposed to the risk that a new entrant does not account for co-location, and that she does not agree with this treatment.

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- The Chair asked whether Ms Bedola was suggesting that the market should protect existing plant from new entrants?
- Ms Bedola suggested that this is what the NAQ scheme is doing. Ms Bedola asked why someone should be impacted if another person ignores the locational signal?
- Ms Donohue agreed that the NAQ locks in value.
- The Chair indicated that the NAQ arrangement provides protection for pre-existing property rights in contracts under the Access Arrangement, and that providing protection to intermittent facilities from new entrants is well outside the scope of this Rule Change Proposal, and that this would need to be taken up with EPWA.
- Ms Liz Aitkin asked whether sovereign risk had been considered.
- Ms Laidlaw indicated that, if someone puts an Intermittent Generator near your Intermittent Generator, there is a chance that they are going to effectively reduce your capacity. If the two facilities had the same average output, their combined capacity value is unlikely to be double the current facility's capacity value. When you are talking about investor risk and sovereign risk, if someone else builds an intermittent facility that is very similar to yours, then your capacity value will be at risk, whether directly through something like the Delta Method, or less directly through the fleet value going down, all other things being equal. On the other hand, if another intermittent facility is built that is complementary to yours, then the collective capacity value can go up, and you will benefit from this.
- Ms Aitkin indicated that this is the risk she was referring to, but there is also a risk from making rule changes ex-post investment, which will discourage investment. It represents a reasonably significant risk. Ms Aitkin asked whether the Panel had considered this in the drafting of amendments away from the ERA's proposal.
- The Chair indicated that this had been considered, and that most of the risks that Ms Aitkin is referring to are inherent in the ELCC method rather than the allocation method.
- Ms Laidlaw indicated that two things were being considered – the investment signals and sovereign risks, and power system reliability. Averaging up is a concern because a very reliable 'you-can-count-on' capacity value for an Intermittent Generator is potentially quite low.
- Dr Shahnazari stated that:
  - The issue of uncertainty in forecasting the capacity value of resources applies to all resources and the WEM Rules are

deficient in this regard. This risk is to be managed outside of the RLM. The ERA explained in its Rule Change Proposal how other jurisdictions manage this risk – see Appendix 3 of its proposal.

- The capacity value of many Intermittent Generators depends on the mix of other generators on the system. AEMO needs a reliable estimate of the contribution of resources to the system to ensure system adequacy. The issue relating to the financial risk to other facilities from changes in the mix is to be addressed outside of the RLM because AEMO would always look at distorted measures of system adequacy.

- Mr Nunn indicated that it is important to think about how someone would look at an investment signal. If you thought that the signal was robust, then you would build your wind farm where historical capacity factors are good during high stress periods, so you would build right on top of Grasmere and Albany and you would say, 'now I'm entitled to an 80% capacity factor'. But you could not advise someone to do this because they could lose that value next year. If the investment signal is not durable, then the question is whether it provides any meaningful signal, or is it just noise?
  - Ms Laidlaw suggested that, while there will be year-to-year volatility, a large part of the signal will be reasonably consistent and will reflect diversity. In making an investment decision, you would be conscious of the year-to-year volatility in output, and therefore, performance. If you are co-located with other facilities, this will generally reduce your capacity value, and this signal will tend to be more robust and longer lasting, despite variances across different peak events.
  - Mr Nunn indicated that economists may believe in the value of expected values, but financiers will want to see stable returns, and will not accept wild swings in cash flows from one year to the next. Also, the capacity of these sorts of assets should be relatively stable – it might change as new plants enter the market and as dynamic efficiencies change over time, but it should not change from year-to-year because of a single high demand day in the year. It is a bad outcome to use something unstable to reflect something that is stable, so a way to reduce the volatility is needed to make the results closer to what is expected over time, on average.
- Mr Carlberg commented that system managers will also want consistent capacity values, as the control room might have trouble relying on Albany and Grasmere for an 80% capacity factor because this was predicted based on three observations.
  - Ms Laidlaw indicated that the Albany and Grasmere results impacted the fleet value because they did extremely well in the

high stress TIs, so based on Mr Carlberg's comments, this would suggest that from System Management's point of view, the Fleet ELCC is suspiciously high.

- Mr Carlberg suggested that the volatility of the Fleet ELCC and of individual generators needs to be explored. Regardless, Alinta prefers the ERA's allocation approach, which acknowledges that the Fleet ELCC is going to change from year to year and implements measures to get a more robust forecast for the Fleet ELCC. If the Fleet ELCC is also driven by those three intervals, then system managers are going to have concerns that:
  - the forecast is based on three observations, and
  - the Fleet ELCC is going to be too high.
- Ms Laidlaw asked whether Alinta still supports the ELCC method; and Mr Carlberg indicated that different iterations of ELCC should be explored and if the ELCC method prevails, as it can under the ERA's approach, it needs to have measures to improve its robustness.
- The Chair asked Mr Carlberg what he means by robustness and Ms Laidlaw suggested that he means, for example, using the median of the seven years. Mr Carlberg indicated that is correct, using this as a proxy.
- Ms Koziol indicated that the concern is that the ERA's proposed allocation methodology is not a good proxy because it accounts for performance in irrelevant TIs. Periods of system stress and facility output are both driven by weather, so RCP Support does not see how using intervals of low system stress to approximate the output of facilities during periods of high system stress would make the allocation method more robust.
- Ms Koziol indicated that the RCP Support does not discount the points that Mr Carlberg and Mr Nunn are making – it shares concerns about the Fleet ELCC and the individual ELCCs being driven by a few events, and are looking for options to address this, but do not consider using low system stress TIs to be a good alternative.

- Dr Shahnazari commented that there is no theory to explain that a Facility that has a larger delta between its First-In and Last-In ELCC should have a greater contribution system reliability. This is a heuristic that the Delta Method assumes.
  - Ms Laidlaw indicated that this is not what the Delta Method is saying.
- Ms Donohue indicated that moving to security constrained economic dispatch (**SCED**) is likely to change facilities' capability to contribute to high stress periods and asked if RCP Support had considered the

impact of SCED in any of the modelling? Badgingarra is frequently constrained, so as a constrained market is implemented and other generators are constrained, these Facilities may not be able to contribute during times of system stress through no fault of their own, so would this impact the results?

- Ms Koziol indicated that the ELCC method in the draft decision and the model both account for any reduced output due to constraints. The reduced value is replaced with an estimated value of what would have happened if there had not been a constraint. The NAQ process then accounts for network constraints, so RCP Support has not considered any impact of system constraints or SCED in its model.
- Ms Donohue indicated that the concern is more that moving to SCED could substantially change how plants operate, and that APA Group has experienced this with Badgingarra, so moving to SCED could substantially change some plant's operations.
- Ms Laidlaw suggested that the NAQ and RLM processes may be redesigned to better integrate the processes in the future, but that this is not going to happen for the 2021 RCC. Ms Laidlaw agreed that there are interactions between these processes – the RLM assumes an unconstrained capacity value that is then fed into the NAQ process. This is how the RCM was designed.
- Ms Koziol indicated that the Panel considered in the Draft Rule Change Report that the assumed input fleet for the RLM may be different from the actual fleet, including that that some facilities are assumed to be unconstrained but are subsequently constrained by the NAQ process. Changes to some facilities can affect the CRC of other facilities, negatively or positively. RCP Support's analysis indicates that the Delta Method reduces this risk but does not remove it. The Panel thinks that this is an acceptable risk if the differences are relatively small, but that this is something that needs to be further considered in the future.

- Mr Carlberg commented that he sees that output during low system stress periods should not influence results, but he thinks that there may be some periods of low system stress that could be used to approximate conditions of higher system stress. This is probably what the ERA was considering in using peak demand and peak LSG intervals. To address the data issue, approximations should be used as a proxy for the conditions in peak TIs.
  - Ms Koziol indicated that RCP Support it is taking this on board and will investigate any proxies that it can identify. Ms Koziol asked stakeholders to advise if they have any other suggestions for a proxy, in addition to looking at high temperature days.

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	The Chair did not receive any further questions or comments and therefore thanked attendees for their contribution and closed the workshop.	

The workshop ended at 12:05 PM