Meeting Agenda

Meeting Title:	Cost Allocation Review Working Group (**CARWG**)
Meeting Number:	2022_11_29
Date:	Tuesday 22 November 2029
Time:	1:00pm to 2:30pm
Location:	Online, via TEAMS.

Item	Item	Responsibility	Type	Duration
1	Welcome and Agenda	Chair	Noting	2 min
2	Meeting Apologies/Attendance	Chair	Noting	2 min
3	**(a)** Minutes of Meeting 2022_09_27 and 2022_10_25	Chair	Decision	2 min
	(b) Minutes of Meeting 2022_09_27 and 2022_10_25	Chair	Decision	2 min
4	Action Items	Chair	Noting	2 min
5	Options for Allocating Frequency Regulation Costs	Marsden Jacob	Discussion	45 min
6	Contingency Reserve Lower – Runway Method	Marsden Jacob	Discussion	25 min
7	Next Steps	Chair	Noting	5 min
8	General Business	Chair	Discussion	5 min
	Next Meeting: TBD			

Please note this meeting will be recorded.

Competition and Consumer Law Obligations

Members of the Cost Allocation Review Working Group (**Members**) note their obligations under the *Competition and Consumer Act 2010* (**CCA**).

If a Member has a concern regarding the competition law implications of any issue being discussed at any meeting, please bring the matter to the immediate attention of the Chairperson.

Part IV of the CCA (titled "Restrictive Trade Practices") contains several prohibitions (rules) targeting anti-competitive conduct. These include:

(a) **cartel conduct**: cartel conduct is an arrangement or understanding between competitors to fix prices; restrict the supply or acquisition of goods or services by parties to the arrangement; allocate customers or territories; and or rig bids.

(b) **concerted practices**: a concerted practice can be conceived of as involving cooperation between competitors which has the purpose, effect or likely effect of substantially lessening competition, in particular, sharing Competitively Sensitive Information with competitors such as future pricing intentions and this end:

- a concerted practice, according to the ACCC, involves a lower threshold between parties than a contract arrangement or understanding; and accordingly; and
- a forum like the Cost Allocation Review Working Group is capable being a place where such cooperation could occur.

(c) **anti-competitive contracts, arrangements understandings**: any contract, arrangement or understanding which has the purpose, effect or likely effect of substantially lessening competition.

(d) **anti-competitive conduct (market power)**: any conduct by a company with market power which has the purpose, effect or likely effect of substantially lessening competition.

(e) **collective boycotts**: where a group of competitors agree not to acquire goods or services from, or not to supply goods or services to, a business with whom the group is negotiating, unless the business accepts the terms and conditions offered by the group.

A contravention of the CCA could result in a significant fine (up to $500,000 for individuals and more than $10 million for companies). Cartel conduct may also result in criminal sanctions, including gaol terms for individuals.

Sensitive Information means and includes:

(a) commercially sensitive information belonging to a Member's organisation or business (in this document such bodies are referred to as an Industry Stakeholder); and

(b) information which, if disclosed, would breach an Industry Stakeholder's obligations of confidence to third parties, be against laws or regulations (including competition laws), would waive legal professional privilege, or cause unreasonable prejudice to the Coordinator of Energy or the State of Western Australia).

Guiding Principle – what not to discuss

In any circumstance in which Industry Stakeholders are or are likely to be in competition with one another a Member must not discuss or exchange with any of the other Members information that is not otherwise in the public domain about commercially sensitive matters, including without limitation the following:

(a) the rates or prices (including any discounts or rebates) for the goods produced or the services produced by the Industry Stakeholders that are paid by or offered to third parties;

(b) the confidential details regarding a customer or supplier of an Industry Stakeholder;

(c) any strategies employed by an Industry Stakeholder to further any business that is or is likely to be in competition with a business of another Industry Stakeholder, (including, without limitation, any strategy related to an Industry Stakeholder's approach to bilateral contracting or bidding in the energy or ancillary/essential system services markets);

(d) the prices paid or offered to be paid (including any aspects of a transaction) by an Industry Stakeholder to acquire goods or services from third parties; and

(e) the confidential particulars of a third party supplier of goods or services to an Industry Stakeholder, including any circumstances in which an Industry Stakeholder has refused to or would refuse to acquire goods or services from a third party supplier or class of third party supplier.

Compliance Procedures for Meetings

If any of the matters listed above is raised for discussion, or information is sought to be exchanged in relation to the matter, the relevant Member must object to the matter being discussed. If, despite the objection, discussion of the relevant matter continues, then the relevant Member should advise the Chairperson and cease participation in the meeting/discussion and the relevant events must be recorded in the minutes for the meeting, including the time at which the relevant Member ceased to participate.

Government of Western Australia
Department of Mines, Industry Regulation and Safety
Energy Policy WA

Minutes

Meeting Title:	Cost Allocation Review Working Group (**CARWG**)
Date:	27 September 2022
Time:	1:00pm – 3:00pm
Location:	Microsoft TEAMS

Attendees	Company	Comment
Dora Guzeleva	Chair	
Oscar Carlberg	Alinta Energy	
Daniel Kurz	Summit Southern Cross Power	
Rebecca White	Collgar Wind Farm	
Noel Schubert	Small-Use Consumer Representative	
Mark McKinnon	Western Power	
Jason Froud	Synergy	
Genevieve Teo	Synergy	
Paul Arias	Shell Energy	
Edwin Ong	AEMO	
Cameron Parrotte	Woodside	
Grant Draper	Marsden Jacob Associates (**MJA**)	
Peter McKenzie	MJA	
Stephen Eliot	Energy Policy WA (**EPWA**)	
Shelley Worthington	EPWA	

Apologies	From	Comment
Tom Frood	Bright Energy	

Item	Subject	Action
1	**Welcome and Agenda** The Chair opened the meeting at 1:00pm.	
2	**Meeting Apologies/Attendance** The Chair noted the attendance as listed above.	

Item	Subject	Action
3	**Minutes of CARWG Meeting 2022_08_30** Draft minutes of the CARWG meeting held on 30 August 2022 were distributed in the meeting papers on 21 September 2022. The Chair noted Mr Froud was not listed as attending the 30 August 2022 meeting but attended the meeting until 2:00pm. The CARWG accepted the minutes as a true and accurate record of the meeting.	
	Action: CARWG Secretariat to publish the minutes of the 30 August 2022 CARWG meeting on the CARWG web page as final.	**CARWG Secretariat (28/09/2022)**
4	**Action Items** The action items were taken as read.	
5	**Assessment of Cost Recovery Options** Mr Draper restated the objectives and guiding principles for the review and the priority for the assessment of services, and provided a summary of the timeline for the review.	
	5(a) Allocation of Market Fees Mr Draper noted the CARWG had given the assessment of the allocation of Market Fees a high priority. Mr Draper noted that the following methods were reviewed (slide 6): • the current Wholesale Electricity Market (**WEM**) Method; • the current National Energy Market (**NEM**) Method; • a WEM Hybrid Method; and • Market Customers Only Method. Ms White asked how capacity was defined with regard to Market Participants selling WEM services. • Mr Draper replied that it was the maximum sent out capacity of the generators, as recorded in standing data. Ms White noted that, under the proposed WEM Hybrid Method, capacity for Market Generators is based on sent out standing data, which is substantially higher than the Capacity Credit allocation for intermittent generators, but is based on Individual Reserve Capacity Requirement (**IRCR**) for Market Customers, which has more to do with the peak. Ms White sought clarity on the rationale for the different approaches. • Mr Draper replied that the approach for Market Generators is based on the approach in the NEM, and is based on IRCR for Market Customers because there	

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is no alternative measure to use. There was no equivalent measure compared to total sent out from generation.

- Ms White sought to understand the drivers of AEMO's costs, and noted that she could see the logic for using IRCR and for AEMO having to take action to manage the system, but asked why Capacity Credits allocated to Market Generators was not considered as it is the equivalent of IRCR.
- Mr Draper noted that sent out capacity better reflects the effort required of AEMO for things like accreditation.
- Ms Guzeleva noted that Capacity Credit allocation, certification and compliance are only part of what AEMO does in terms of Market Generators – there is also daily dispatch, system reliability and security in real time, and Generator Performance Standard (**GPS**). Ms Guzeleva advised that AEMO has confirmed that, Market Generators currently cause the majority of AEMO's efforts, not Market Customers.
- Mr Schubert noted that the sent out capacity of intermittent generators causes a lot of AEMO's effort because their output can vary, so sent out capacity is a good indicator of AEMO's effort to manage the variability of intermittence.

Ms White asked how storage is to be treated, would it be levied twice, once under selling and once under buying.

- Ms Guzeleva noted that there will be no distinction between Market Generators and Market Customers in the future, so to allocate Market Fees, a definition would need to be determined for Market Participants that predominantly withdraw and that predominantly inject. Ms Guzeleva noted that the treatment of storage is a good question because storage will withdraw and inject in almost equal measure.
- Ms White agreed with Ms Guzeleva in terms of a hybrid Facility, that they are predominantly a generator and easier to deal with even if they withdraw from the network, whereas the case of a standalone battery was more difficult and she wanted to confirm how it would be treated.
- Mr Draper suggested that, to avoid double counting, a battery could be counted as a Market Participant selling energy.
- Ms White asked if it would be practical for AEMO to implement this in terms of how they sort the data and given the systems that they have.

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- Ms Guzeleva noted that the main question is how to properly define a 'Market Participant selling' versus a 'Market Participant buying', which could be on the basis of whether they predominantly inject or withdraw over a period of time.

Ms White asked if there is a way to charge intermittent rooftop distributed energy resource (**DER**) for their contribution to AEMO workload.

- Ms Guzeleva noted that allocation of Market Fees to withdrawals is proposed to be based on IRCR because rooftop PVs would not generally inject into the network when the IRCRs are measured, so the PV output would not offset consumption at this time, and these consumers will get their full cost allocation.
- Mr Draper added that IRCR for a residential customer with a rooftop PV is probably the same with or without the rooftop PV, so using IRCR would not allow customers with PV to avoid paying Market Fees.
- Ms White suggested that consideration needs to be given to the workload created for AEMO to manage low load in the middle of the day from DER and whether that is actually captured. Mr Kurz agreed with Ms White and sought to understand how the majority of AEMO's work is spent dealing with generators.
- Ms Guzeleva noted that AEMO has indicated that the majority of its effort is focused on generators, not loads. Ms Guzeleva asked CARWG members to provide any evidence about who are the causers of AEMO market services and who are the beneficiaries of these services. Ms Guzeleva suggested that an allocation different from 50/50 could be considered if evidence suggests that there is a different split of AEMO's effort.

Mr Draper presented MJA's analysis of the impact of the four allocation methods on Market Participants (slides 7-11).

Mr Draper noted that allocating Market fees is not about market efficiency, it is more about fair and equitable cost recovery that reflects the effort AEMO puts into servicing different types of customers. The recommendation is to use the WEM Hybrid Method because:

- it better reflects the causer-pays methodology;
- it provides signals to retailers to pass costs to their customers based on IRCR; and
- it is more equitable in terms of cost reflective prices that are passed through the value chain and captures new technology that will enter the market, such as storage.

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	Mr Carlberg indicated that he understood the benefit of the proposed changes on the market customer side, but the benefits were not as clear on generator side. Mr Carlberg noted that he sees merit in the WEM Hybrid Method, but it may add costs and complexity for both market participants and AEMO, so he leans toward allocating costs on the basis of the current method. Mr Eliot asked CARWG members to provide any advice on what their costs would be to implement the WEM Hybrid Method. Mr Draper noted that the proportion proposed for the WEM Hybrid Method could change over time. Mr Draper asked Ms Gilchrist whether AEMO saw any major concerns with the WEM Hybrid Method, such as data availability or cost. o Ms Gilchrist replied that AEMO did not have any significant concerns, as long as it has the inputs, but noted that the devil is in the detail. Ms Guzeleva noted that the simplest and lowest cost option is to make no changes to how Market Fees are currently allocated because everybody can pass Market Fees to their customers through their contracts/PPAs. Ms Guzeleva noted that objective is to achieve an equitable and fair construct for allocating Market Fees. Mr Kurz noted that the whole reason to generate is to meet load, so the causer-pays and beneficiary-pays principles suggest the Customer Only Method, but the WEM Hybrid Method is the next best option because it reflects the changing nature of the system. • Ms Guzeleva questioned the view of some CARWG members that all benefits go to consumers and that generators are not beneficiaries given that they are in the market to make profits. Mr Draper noted that uncontracted peakers, such as Tesla and Merredin, would not be able to pass on costs to customers. Ms Guzeleva acknowledged that these facilities are not charged under the current arrangements and should be consulted on how any changes would affect them. Mr Schubert noted that Market Fees are a fairly small component of total charges and that the WEM Hybrid Method seems to be the best option. Mr Arias sought to clarify whether Market Fees would be included in reserve capacity pricing moving forward. Mr Draper indicated that this could be considered.	

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	Mr Arias indicated that he does not support the WEM Hybrid Method. Ms White suggested that it would be useful to understand what drives AEMO costs, by category, and what it would cost for AEMO to implement the WEM Hybrid Method. Ms Guzeleva questioned the effort to get a breakdown of the historic causes of AEMO's costs because these are likely to shift over time. Ms Guzeleva questioned the need to change the method to allocate Market Fees if specific benefits from the changes cannot be quantified. Mr Carlberg and Ms White agreed.	
	Action: CARWG Members are to provide evidence about who are the causers and beneficiaries of AEMO market services.	**CARWG Members (14/10/2022)**
	Action: AEMO is to consider what information can be provided to assist the CARWG in understanding the current breakdown of its expenses by market segment.	**CARWG Members (14/10/2022)**
	Action: CARWG Members are to provide estimates of the costs for Market Participants to implement the WEM Hybrid Method, including any contracting costs.	**CARWG Members (14/10/2022)**
	Action: AEMO is to provide a broad estimate of its costs to implement the WEM Hybrid Method.	**AEMO (14/10/2022)**
	5(b) Allocation of Frequency Regulation Costs Mr Draper noted that the MAC supported assessment of current NEM Causer-Pays Method and the Tolerance Method. Mr Draper presented MJA's analysis of the impact of these methods in the WEM (slides 15-17) and showed how these methods would provide incentives for participants to forecast more accurately and reduce their variability (e.g. for intermittent generators to install batteries) and that there was some efficiency benefits associated with the two approaches. Mr Draper noted the NEM Causer-Pays Method is highly complex, so there may be significant costs to implement this in the WEM. However, the AEMC has approved a rule change to simplify the NEM Causer-Pays Method and AEMO gave a presentation to MJA and EPWA on how this rule change will be implemented in the NEM. Mr Draper noted that: • under the New NEM Causer-Pays Method, payments will be provided to participants that make a positive contribution to frequency control; and • the new method is more straightforward than the current method.	

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Mr Draper indicated that MJA is modelling the impact of applying the New NEM Causer-Pays Method in the WEM to determine what incentives it provides, who the beneficiaries are and who is likely to be liable for the charges; and will provide that information to CARWG.

Mr Draper noted the recommendation was to adopt the New NEM Causer-Pays Method to allocate frequency regulation costs, subject to results of the MJA analysis.

- Ms Gilchrist advised that AEMO is in the final stages of determining how to implement the New NEM Causer-Pays Method in the NEM and noted that the exact same method did not need to be implemented in the WEM.
- Ms White asked what the driver was for the new method, noting that she understood that it is simpler, but that this comes as a trade-off against the incentives to change behaviour or to accurately levy costs on those causing the need for regulation.
    - Ms Gilchrist replied that there is a lot of information about this on AEMO's website and that the method would improve the responsiveness for Market Participants.
    - Mr Draper noted that the new method will apply at a-Facility level, which is consistent with where we are going in the WEM.
- Ms White agreed that a simpler method is better, as long as it achieves the objectives, but that she does not yet have enough information to support the New Causer-Pays Method. Mr Carlberg agreed that it seems like a good approach but that he needs more information.
    - Mr Draper indicated that MJA would arrange for an overview of the New Causers-Pays Method as well as provide results of its analysis of the impact of the method in the WEM.
- Following a question from Ms White, Ms Guzeleva clarified that the Current WEM Method, the NEM Causer-Pays Method, and the New NEM Causer-Pays Method all calculate allocations on a Facility basis and that there is no proposal to change this.
- Mr Schubert noted that a good feature of the New NEM Causer-Pays Method is that it rewards those who help avoid the need for frequency regulation.

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- Mr Carlberg asked for an example on how a generator would help avoid the frequency regulation costs and get paid under this new method.
  - Mr McKenzie indicated that the approach considers deviations above and below the frequency target – if you generate more than your target, then you are contributing to a higher frequency, and you would get a payment if you do this when frequency is low.
  - Mr Schubert noted that batteries or generators that have a lower droop setting will respond more quickly to frequency deviations and could automatically help flatten frequency deviations, and this proposal will provide a good incentive for this to happen.
- Ms Guzeleva asked CARWG members to propose alternatives if they find the proposed New NEM Causer-Pays Method to be unacceptable. One of the recommendations in AEMO's State of the System report was that a stronger signal is needed to incentivize behaviour that minimizes the cost of frequency regulation.
- Mr Parrotte noted that he expects more storage on the system in the future and that storage may be paired with renewable generators, so where a renewable generator decreases or increases frequency and the remote battery does the reverse, there is no net impact on the system, but the current method would sting them both.
  - Mr Draper noted that this is because the two Facilities are not treated as a single Facility.
  - Ms Guzeleva noted that scheduled Facilities are expected to operate within tolerance limits and it would be unacceptable for a storage Facility to unilaterally correct frequency deviations of an associated Facility – it would be a fundamental change to the concept of the WEM to allow Market Participants to self-manage frequency deviations within a portfolio. Mr Parrotte agreed, and indicated that this is not an issue to be addressed now, but may need to be considered later.
- Ms White asked if there was a risk that many generators respond and overshoot, causing more problems.
  - Mr Schubert replied yes, and that this has to be managed by appropriate control settings.

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	o Mr Parrotte noted that this is a risk, but if a generator does overshoot, then it would be penalised because it is no longer helping, which will encourage the right level of response. o Ms Guzeleva indicated that there should be a reward for setting market-friendly control settings, but a line needs to be drawn so that facilities do not deviate too far from their schedule, or they may find themselves in front of the regulator. o Mr Draper noted this may be self-correcting because a generator will be penalised if it does this too often and overshoots. • Ms White indicated that she understands the concept of generators responding without being dispatched for regulation, but wanted to understand how AEMO then knows that a generator did this and then quantifies the payment. Ms White asked for this to be covered when the further information is provided. Ms Guzeleva agreed with this concern. • Mr Schubert expressed the view that, as generation variability increases, there will be a need for more responses from generation, not just relying on a few generators and Automatic Generation Control (**AGC**) to manage frequency. • Ms Guzeleva and Mr Draper asked if the CARWG agreed to recommend consulting on adopting the proposed New NEM Causer-Pays Method, which is simpler and potentially more transparent, subject to the analysis being conducted on the efficiency benefits and impact of the method on Market Participants. Mr Schubert, Mr Froud and Mr Kurz supported the recommendation.	
	Action: EPWA and AEMO to arrange for further information to be provided to the CARWG on the New NEM Causer-Pays Method to allocate Frequency Regulation costs.	**EPWA and AEMO (25/10/2022)**
	Action: EPWA and MJA to provide the CARWG with the results of the analysis of the impact of implementing the New Causer-Pays Method to allocate Frequency Regulations costs in the WEM.	**EPWA and MJA (25/102022)**
	5(c) Allocation of Contingency Reserve Raise Costs Mr Draper noted that concerns have been raised that the runway method could attribute too much Contingency Reserve Raise costs to a Facility with multiple generators and multiple connection points because it is unlikely that the	

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whole Facility would be down at one time, rather it was more likely for an individual unit or connection to be down.

Mr Draper noted Collgar Wind Farm as an example – Collgar is not registered as an Aggregated Facility but it has two connections – and suggested that it may be more appropriate for each of Collgar's units to pay for Contingency Reserve Raise, not the aggregate of the Facility.

Mr Draper indicated that further analysis would be done to understand these examples so that application of the runway method does not over-recover costs for an extremely unlikely event, such as a whole power station tripping.

- Ms White asked if the definition of 'generating unit/system' is appropriate.
- Ms Guzeleva noted that it is not consistent with the causer-pays principle to apply the runway method to the whole Facility if the facility is only partially affected if one of the connections fails.
- Ms Guzeleva noted that the issue is what is the risk to the system of a facility has more than one connection and how the site is configured. The current rules treat such a Facility as one unit under the runway method.
- Mr Schubert and Mr Draper suggested that the question is what is the Credible Contingency – the whole Facility or a particular unit. Ms Guzeleva noted that this depends on how that Facility is connected to the system.
- Mr Parrotte noted that Contingency Reserve Raise is there to address the loss of generation output and agreed with what was being discussed, but that there will be challenges in writing the WEM Rules to address the practical reality. Mr Parrotte noted that the intent is to set charges for the amount of generation that may be lost for a single contingency, which has nothing to do with dispatchability.
- Ms Guzeleva noted that the WEM Rules will need to be changed to make sure that the risk is properly measured by AEMO and not assume that each Facility has a single mode of failure.
- Mr Eliot asked whether the issue applies to Facilities that are not 'Aggregated Facilities' under the definition in the rules , noting that Collgar is not registered as an Aggregated Facility but can be operated as two separate plants. Mr Eliot noted that he did not believe

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resolving this could be tied to the definition of Aggregated Facilities.

  - Ms White noted that the issue is about Facility configuration and that Collgar is structured such that it can operate as two totally separate wind farms. Providing an incentive for Facilities to configure in this way will mitigate the need for Contingency Reserve Raise.
  - Mr Eliot agreed that this would provide the right signal but noted that this may make rule drafting challenging.

- Ms Guzeleva noted that, based on the causer-pays principle, we should not penalise Facilities just because they happen to be on the same site or are aggregated by AEMO, if their mode of failure does not mean that the whole Facility is out, as their connections can operate independently.
- Mr Draper asked Ms White whether Collgar had one or two connection points. Ms White confirmed that Collgar has two connection points.
  - Mr Draper noted that, in that case, Collgar would not have an aspect of a connection failure either, but would be hit for the whole Facility under the runway method rules that are coming into force on 1 October 2023.
- Mr Parrotte noted that the runway method should ideally be based on the generation output that would be lost for a single contingency. Whether that can be done in the rules effectively/efficiently is what needs to be determined.

5(d) Contingency Reserve Lower Costs

Mr Draper noted that:

- large battery electricity storage systems (**BESS**) may enter the market soon – batteries up to 250 MW are being considered – which would more than double the largest credible load rejection contingency;
- large batteries would only get a minor share of Contingency Reserve Lower costs under the current allocation methodology; and
- MJA is developing a runway method to address this issue, and provided an example (slide 26).

Mr Draper asked if the CARWG supported exploring allocating Contingency Reserve Lower costs using a runway approach, noting that:

- allocation could not go down to the smallest load because of the lack of interval metering, so it would likely only apply for Facilities 120 MW and up; and
- there will be challenges to managing issues around the thresholds for any tranches used in the runway method.

Mr Draper asked for feedback from the CARWG.

- Mr Carlberg noted that a runway method seems to make sense but asked whether big Non-Dispatchable Loads present the same risk of requiring load rejection service as smaller Loads.
- Ms Guzeleva noted that:
  - it is very unlikely that several Non-Dispatchable Loads will be simultaneously impacted by the same issue, it is more likely to be a network issue, in which case the Contingency Reserve Lower costs should be allocated to the network provider rather than the individual Loads; and
  - it is not consistent with the causer-pays principle to send a cost signal to the smaller Loads that have suffered an outage because of a network component.
- Mr Draper suggested using the existing allocation method for Loads up to 120 MW focusing the runway method on larger Loads.
- Ms White noted that the runway method for Contingency Reserve Raise includes networks, so it would be consistent to do the same for Contingency Reserve Lower.
  - Ms Guzeleva noted that networks are allocated Rate of Change of Frequency (**RoCoF**) services costs, not Contingency Reserve Raise.
  - Ms White agreed that the runway method for Contingency Reserve Raise allocates costs for network contingencies to the generators on that part of the network, but noted that it could be argued that networks should pay these costs.
- Ms White noted that the runway method was not previously implemented for Contingency Reserve Lower because of the complexity and cost associated with it, but she can see merit in the method if the tranche approach can achieve some of the benefits of the method without the complexity.

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	• Ms Guzeleva noted that it would be important to make sure that the cutoff is appropriately placed (e.g. the 120 MW) and that interval metering would be required for this to properly work. • Ms White asked whether small Loads are essentially netted off in the Notional Wholesale Meter, and noted that she believed there was previous consideration of Loads behind TNIs or substations but there was not appropriate metering. Ms Guzeleva asked if the CARWG supported exploring the application of the runway method. • Mr Parrotte noted that: o networks are subject to the technical rules, so it would be rare that they cause big contingencies; o the intent appears to be to pick a level below which you do not need to worry any more, and 120 MW seems reasonable; o bigger Loads and BESS will be operating in the future and should have SCADA; and o Woodside is conscious of this and is trying to design its plant not just from a reliability perspective, but also in consideration of the impact that it can have on the power system. Mr Parrotte noted a line had to be drawn somewhere and agreed with Mr Eliot, that bands above that line could drive perverse behaviour, and suggested that a reasonable compromise may be to require any Load or BESS above 120 MW to have SCADA – then you can do a full runway approach above that point.	
7	**Next Steps** A summary of the outcomes of this CARWG meeting will be provided at the MAC meeting on 11 October 2022, which will feed into the Consultation Paper to be published in December 2022. MJA's literature review will be published along with the Consultation Paper.	
8	**General Business** No general business was discussed. The next CARWG meeting is scheduled for 22 November 2022 (pending a meeting for AEMO and MJA to present to the CARWG on the New NEM Causer Pays Method for Frequency Regulation costs).	

The meeting closed at 3:00pm.

Government of Western Australia
Department of Mines, Industry Regulation and Safety
Energy Policy WA

Minutes

Meeting Title:	Cost Allocation Review Working Group (**CARWG**)
Date:	25 October 2022
Time:	1:00pm – 3:00pm
Location:	Microsoft TEAMS

Attendees	Company	Comment
Dora Guzeleva	Chair	
Sam Lei	Alinta Energy	Proxy for Oscar Carlberg
Daniel Kurz	Summit Southern Cross Power	
Rebecca White	Collgar Wind Farm	
Noel Schubert	Small-Use Consumer Representative	
Mark McKinnon	Western Power	
Justin Ashley	Synergy	Proxy for Jason Froud
Genevieve Teo	Synergy	
Paul Arias	Shell Energy	
Mena Gilchrist	AEMO	
Tom Frood	Bright Energy	
Cameron Parrotte	Woodside	
Grant Draper	Marsden Jacob Associates (**MJA**)	Presenter
Peter McKenzie	MJA	Presenter
Hugh Ridgway	AEMO	Presenter
David Scott	AEMO	Presenter
Lisa Laurie	AEMO	Observer
Stephen Eliot	Energy Policy WA (**EPWA**)	
Shelley Worthington	EPWA	

Apologies	From	Comment
Jason Froud	Synergy	
Oscar Carlsberg	Alinta	

Item	Subject	Action
1	**Welcome and Agenda** The Chair opened the meeting at 1:00pm.	
2	**Meeting Apologies/Attendance** The Chair noted the attendance as listed above.	
3	**Minutes of CARWG Meeting 2022_09_27** Draft minutes of the CARWG meeting held on 27 September 2022 were distributed in the meeting papers on 19 October 2022.	
4	**Action Items** The action items were taken as read.	
5	**New NEM Causer-Pays Allocation Method for Frequency Regulation** Ms Guzeleva welcomed the staff members from AEMO who were present to discuss the New National Energy Market (**NEM**) Causer-Pays Method to allocate Frequency Regulation costs.	

5(a) Explanation of the method

Mr Scott noted that the Australian Energy Market Commission (**AEMC**) had approved a change to the NEM Rules to introduce incentive arrangements to replace the existing NEM Causer-Pays Method that:

- institutes payments for parties that provide good frequency response (primary or secondary response); and
- allocates the cost of regulation Frequency Control Ancillary Services (**FCAS**).

Mr Scott noted that AEMO is developing a procedure to implement the New NEM Causer-Pays Method, which will be a data-driven project, requiring real-time calculation and publication as soon as possible.
Mr Scott provided an overview of the Existing Causer-Pays method, noting that it is a cost allocation mechanism for regulation FCAS, which is an Automatic Generation Controlled (**AGC**) enabled every 5 minutes to correct dispatch and forecast errors.

Mr Scott noted that nearly all the large units in the NEM were on AGC, particularly all of the coal and gas units, that some peaking units are not on AGC and are manual or operator controlled, and that there were some aggregated units that were semi ACG.

Mr Scott indicated that the Existing NEM Causer-Pays is based on four-second unit deviations from a straight-line dispatch trajectory compared to a central measurement.

Mr Scott indicated that a performance indicator is calculated and tells you whether your deviation is good or bad and also how good or bad. Any positives deviations are ignored and the negative deviations are summed by Participant. The total sum of each Participants' factor over the total sum of all Participants results in a percentage, which is multiplied by the requirement cost to equal the settlement amount for each Participant.

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- Ms Laurie asked whether this was based on SCADA values and if the SCADA values were replaced with any metered values later. Mr Scott answered that they do not use metered values, just one single set of data.
- Mr Lei asked, when measuring good and bad performance, whether that was based on luck and what the grid is doing rather than something that the facility can control. Mr Scott provided examples of how performance could be measured and Mr Ridgway added that the current method is based on AGC and it may be difficult for participants to work out, but the new system will be based on the actual frequency itself and participants will be able to calculate for themselves what performance should be in real-time, based on local frequency.
- Mr Schubert noted that there may be a number of units on AGC and asked if, in any particular interval, there may be only one or two contributing to the requirement. Mr Scott replied that this would be fairly unusual but noted there have been instances where response had concentrated in certain regions, and that the reserve services like FCAS will tend to migrate to the cheapest state where those reserves are available and they may be enabled more because they will be more competitive.

Mr Scott noted that in some circumstances there was high participation by some providers who can provide a lot of FCAS because they have high ramp rates (i.e. batteries). Coal and gas-fired generators would typically have a number of units on and would tend to mimic their bids, spreading them across all of their units, in effect distributing their ramping responsibilities across all of the units. Mr Scott noted that increased provision by some large batteries with extremely high ramp rates meant they can provide regulation FCAS very well, but in doing so will probably push down prices.

Mr Schubert indicated that he was trying to compare the NEM with the system in the Wholesale Energy Market (**WEM**) and that it was his understanding that there are only a few units participating in FCAS in the WEM. Mr Scott noted that, because FCAS is a co-optimized market service, there is not a lot of difference between treatment of regulation FCAS and energy. Mr Scott noted that the market in the NEM is quite a lot deeper than the WEM in terms of the provision of regulation.

Mr Scott explained how the deviations would be calculated in the New NEM Causer-Pays Method noting:

- it will be every four seconds;
- the trajectory is subtracted from the active power measurement; and
- there is a rule that all deviations will balance to allow allocations to the metered population.

Mr Scott noted the performance measure indicates a positive generating unit deviation when aligned with a positive performance measure and that a negative generating unit deviation when aligned with a negative

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performance measure is good. The good performance is when it is aligned with the yellow line, the dark area indicates the good deviations and the lighter area bad. The data is separated for Raise and Lower as those two markets tend to have fundamentally different cost characteristics at any one time, so it was determined to separate the cost allocation and payments associated with those. Mr Scott noted that was probably an improvement overall.

Ms Guzeleva noted that it appeared there would be an incentive for generators second guess what is happening and not match the target in the dispatch instruction and asked if this is a risk or if it is considered to be self-correcting.

Mr Scott noted that AEMO cannot do anything to control output, but most parties would want to operate in the regulation markets and are obligated to comply with their dispatch targets – AGC is the primary arrangement for this. The main reason for mandatory Primary Frequency Response (**PFR**) in the NEM was because generators were turning off their droop response within a certain hertz dead band, and only providing it beyond that, and AEMO were not controlling frequency within that band because the regulation system was too slow.

The rule change requires all generators to provide PFR at a very tight hertz dead band, so as soon as frequency starts moving outside that band, generators will tend to respond according to the PFR requirements which specify that there must be a certain amount of droop and a certain amount of response within 10 seconds (subject to certain agreed changes by exception). This means there are a lot of units on AGC, a lot of units aiming to provide regulation FCAS by making ramping available, and nearly all of the units are providing droop response, and the intent is that this will provide a stable level of primary and secondary response. If parties start trying to second guess what the requirement is, AEMO would expect that would start to correct itself over time.

- Ms Guzeleva noted that the analysis suggests that, while that is happening, bids in the FCASS will be lowered and asked why that was expected.
- Mr Scott replied that this was because, for units providing regulation FCAS, the AGC system is set up so that they respond reasonably fast and provide a lot of the required response, and they are paid for that response and, because the regulation market is reasonably competitive, we expect them to take account of that in their regulation offers.
- Mr Scott noted that overall the behaviours should be balancing.

Mr Scott noted the current arrangement for calculating contribution factors only allows recovery of FCAS costs, and the new method tries to capture all of the response in the system, including good PFR.

- Ms Guzeleva expressed concern that the existing method is quite complex but that the new method appears to be equally complex, and asked which of the two methods would be simpler to apply. Mr Scott

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replied that the new method is a vast improvement, and under no circumstances should the old method be applied as it was designed. Moving towards calculating more real time factors in each dispatch interval rather that over a 28-day period was an important feature of the new method.

- Ms White asked if it would be more costly to implement the existing or new method. Mr Ridgway indicated that was difficult to say because the new method has not been implemented and will not just deal with cost allocation, but will also create incentives for PFR, which is a value add for the new method.
- Ms Guzeleva asked if the main advantage was that it incentivises the right behavior.

Mr Scott indicated that the rule change is not really about incentivising PFR but about charging the parties that might cause PFR and paying the parties that are providing that PFR. Mr Scott noted the aim is also to try and improve the performance of the secondary response. Left unaddressed, plant which is inherently variable or have poor control would receive a cross subsidy because the units on PFR would be compensating for it.

- Ms White noted there are many facilities in the WEM that do not have AGC, rather they have Automatic Balancing Control (**ABC**), and asked if this would cause an implementation issue (other than those facilities presumably not being able to adjust their behaviour to minimise regulation demand).
- Mr Scott noted those units will probably be on PFR response and could provide primary droop response and can control their output, so they could be paid through this or be indifferent to it.
- Mr Lei asked if it was correct to assume facilities which have a tighter droop dead band would have a better performance factor and hence be paid for their performance.
    - Mr Ridgway responded that you would expect a tighter dead band to improve your performance, but noted there are other factors at play here. For example, how you determine the frequency measure and how accurately you follow that measure.
    - Mr Ridgway noted that another thing to remember is that your factors are not just determined by whether you are providing frequency response, but also how much stress the system is under and a performance metric will calculate your contribution factors. Mr Ridgway added that incentives are more heavily weighted towards periods where frequency may be more strongly deviated from the ideal, where you might have a wider dead band and, by doing more when the system is really under pressure, you would expect to get a much better contribution factor than someone who is just doing a little bit all the time.
    - Mr Scott added that the droop settings and the speed of response would also be important.

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- Mr Schubert noted that most generators in the NEM seem to be controlled on AGC and asked if that is for their normal scheduled MW output, noting that it was his understanding that AGC is only used in the SWIS for frequency control units.
    - Mr Parrotte noted that it was probably a bit of a mix and it was his understanding that everyone will go onto AGC in the new market.
    - Mr Schubert clarified that he was thinking more about real time dispatch and if there is a difference between the WEM and in the NEM, and if this was through AGC settings or through other signals.
    - Mr Scott indicated that he could not speak for the WEM but that the NEM is not dependent on all units being on AGC. If units in the NEM are not on AGC and are manually controlled, and they are not very good at following their targets, then this will cost them, which is a good thing.
    - Mr Schubert agreed, noting he was trying to understand where our methods in the WEM might not be as good.
- Ms White noted some facilities have a substantial SCADA lag and asked if this would cause equity issues in implementing this method (lag in signals to adjust behaviour compared to other facilities with little SCADA lag).
    - Mr Ridgeway noted they were looking at this in the implementation of this project and one partial solution is looking at using local frequency readings to determine a bespoke frequency measure for the unit. Mr Ridgeway noted that AEMO did not know if it will go down that path because it is still subject to consultation and adding a new SCADA channel is not trivial. AEMO will also consider setting an appropriate frequency measure, not just using a raw frequency deviation, that will be a moving average component over, say, 120 seconds so that it is slower and really only substantial frequency deviations that lead to strong factors will be generated.
    - Ms White noted that Collgar has about a 30 second SCADA lag, which is substantial, so even if it spends the money to get AGC, there is a risk that it will contribute to costs if it responds to an old signal.
    - Mr Scott suggested that the impact on financial settlements might not be large because everyone has a bit of a delay, but that was something to be proven through trials.

Mr Scott noted that there is a requirement in the NEM for corrective response, so the size of the frequency deviation does not dictate the cost. A relatively small frequency deviation could cause a large error on the system, which may be hidden because there was lots of droop response available, so ideally you would identify that they are all good performers and would pick this up in the calculation of the requirement for corrective response.

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Mr Schubert noted that encouraging good droop response seems to be a key ideal and asked whether most WEM generators are on 4% droop.

- Ms Guzeleva noted that generator performance standards (**GPS**) will apply in the WEM and that people were working with Western Power to negotiate their compliance. The GPS require certain droop response and that a key objective of the GPS is to incentivise the right behaviour so that customers do not need to buy more regulation through the market.

Ms Guzeleva noted the New NEM Cost-Reflective Method sounds better than the old method in that it will provide better response and asked if it will appropriately target financial incentives at those that can respond to that incentive to behave in a better way.

- Mr Ridgway suggested that it is appropriate for a facility that cannot respond to still wear costs because, if you are looking to invest and build a new facility, then you should be mindful that this is a real cost that this type of facility is going to impose on the system, or vice versa for a facility that responds well to this incentive.
- Ms Guzeleva noted that the New NEM Cost-Reflective Method appears to try to incentivise a positive behaviour from those that can provide it, but does not do much to change intermittent generators' behaviour through the cost allocation mechanism.
- Mr Scott suggested that it will change behaviour because the current arrangements only recover FCAS costs, and the new mechanism will also provide incentives for new investments, which is the other important aspect of this.

Mr Draper noted, with regard to the ability for renewables to provide regulation services, that a wind farm can back off a bit if the spot price is negative because of solar output and then provide regulation raise services when coal may not be operating. If batteries are charging, then wind will be the marginal plant and will need to provide this service, and should be compensated. Mr Draper noted the solar and the duck curve effect fundamentally changes the system and plant can benefit from these payment streams because of the changing nature of how and who is going to be providing these services going forward.

Mr Scott noted the separation between Raise and Lower are not in the current arrangements, and this is important because it provides opportunity to maximize performance against the prevailing dispatch conditions.

Ms Guzeleva queried how the New NEM Causer-Pays Method would sit with GPS, and whether it would mean starting to pay for something that is a compulsory provision under GPS.

- Mr Scott noted that there is not a full mandate to provide PFR in the NEM, it is a mandate to operate with your governor setting in a particular way. Mr Scott noted that it was not really about making a payment to those that are mandated, but about redressing the fact that parties that are currently providing PFR are forced to provide this

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response while others can be operating in a very random way, maximizing their output but causing all sorts of dispatch errors, and those PFR units have to compensate for this.

Ms Guzeleva noted that in the WEM there are dispatch tolerances and that we currently have PFR that is not paid for because it is part of the minimum standard on the system, but people take this into account and would incur penalties if they go outside dispatch tolerance limits.

Mr Scott noted that there was nothing like tolerance limits in the NEM, rather a requirement to comply with dispatch instructions and asked what the value was of a tolerance limit.

- Ms Guzeleva replied that a Participant who repeatedly steps outside these would face the regulator.
- Mr Scott noted that was more of a regulatory solution rather than pricing the deviations at any one time.

Ms Guzeleva noted that it would have been preferable for the New NEM Causer-Pays Method to have already been implemented so that we can find out what behaviour it incentivises, and queried the practicalities of implementation, noting that AEMO would implement this by 2025 while the WEM was moving to a new market in 2023.

Mr Ridgway added that the system is designed to be very flexible, and the frequency measure can be changed if it is not accurately describing which direction you want people to move in.

Mr Scott agreed with Ms Guzeleva and noted that the NEM has a regulated requirement to provide mandatory PFR and found that PFR is not really suitable for the new FCAS market. Therefore, it was determined that it is best to use secondary response bidding arrangements to create a market and that the Causer-Pays arrangements can be extended to compensate for both primary and secondary response. Mr Scott noted there was no intent to replace the mandatory requirement, rather the design was intended to work with that requirement while the AMEC was very keen to remove the requirement.

Ms Guzeleva asked if unmetered generation pick up a proportion of the charges and Mr Scott replied that they did.

Ms Guzeleva thanked Mr Scott and Mr Ridgway for their presentation.

5(b) Modelling Results – Application of the Method in WA

Mr McKenzie indicated that MJA modelled the New NEM Causer-Pays Method based on four-second SCADA data, recreating a sample WEM day for a small sample of plant covering most of the plant types, focussing on the Causer-Pays factors and how these were assigned. Mr McKenzie indicated that there was a slight difference between the actual and modelled generation depending on what plant was generating at the time.

- Mr Lei asked how the performance of wind farms was calculated as they do not receive dispatch target.
    - Mr McKenzie noted dispatch targets were made up for the WEM and provided slide 5 as an example, where for Meriden Solar

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they looked at the generation during the time period and took an average value.

- Ms Guzeleva asked, in the absence of dispatch targets in the WEM dispatch process, did they intend to use forecasts.
  - Mr Ridgway noted they used forecasts in the NEM.
  - Mr McKenzie replied yes that they would be using forecasts and Mr Draper noted that, in that instance, they were likely under forecasting the liability for solar and wind.
- Ms Guzeleva noted that, if this method were to be implemented in the WEM, it would have to use forecast quantities and asked if there is a way to model this to use realistic forecasts to see what the deviation would be, noting that it would be important to get an understanding of the real impact.
- Mr Draper noted that they could develop a forecasting methodology to determine the scale of the liability for intermittent plants, noting that MJA used the average in its modelling due to time constraints.
- Mr McKenzie noted, for the Causer-Pays factor per MW of capacity (after scaling), that the amount of deviation per MW of capacity was similar for solar and wind, which had higher contribution factors. Mr Draper noted that, because no one was below the line, they were all liable but that wind and solar were the greatest payers per MW for the sample day, and then coal and gas plant.

Mr McKenzie noted that, based on the small sample set, the New NEM Causer-Pays Method assigned more costs to demand compared to other methods and that slide 15 showed a breakdown of the percentages by generator type, with wind the biggest contributor for the sample day. Mr Draper noted demand was getting more than 50% of the contribution factors.

Mr McKenzie noted that the assumptions made with the mean contribution factor resulted in more skewing towards demand than other methods and that this could change as the method is finalized. The process was repeated for five days and Mr McKenzie noted that there was some variation between days.

Mr Draper noted that the greatest variation was for solar, with demand varying substantially as well. Mr McKenzie agreed that solar had the biggest variation, with coal and gas fairly steady, and noted that Open Cycle Gas Turbines (**OCGT**) could change depending on how much is dispatched on an individual day.

Ms White asked how the payments for these facilities would change under the new NEM Causer-Pays Method compared to the Current NEM Causer Pays Method and the current WEM method.

- Mr Draper replied that MJA's comparison across the different methodologies was depicted on slide 17 and Mr McKenzie added that the results were aligned across the methods.

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- Mr Lei noted that the new NEM method shifts the costs to generators from loads currently paying 90% to generators paying ~50% and asked whether this was proportional to the issue they are causing.
- Mr Draper noted that loads are getting more costs because there is not much solar plant on the system, and wind and solar will probably end up being about 50/50 by 2030 as more wind and solar plant enters the system.
- Mr Draper indicated that he believed that there will be similar percentages by about 2030.
- Ms Guzeleva asked, if that was the case, then the key question is – are we actually reducing the overall costs.
- Mr Draper suggested that they needed to determine whether causer-pays pricing results in reduced deviations and reduced regulation requirements (both up and down) leading to a lower overall cost for the system.
- Ms Guzeleva agreed, noting that the cost of implementing a new but more complex method in the WEM had to lead to an overall system benefit that far outweighs that cost.

Mr Draper noted that the WEM requirement for regulation will increase from 110 MW at peak to around 300 MW with the amount of renewables and solar coming onto the system over the next decade.

Ms Guzeleva noted that the costs to move to the New NEM Causer-Pays Method and the impacts of that method on growth in services between now and 2030 needs to be better understood, and that we would be in a better position to understand the overall cost and impact on the system if the NEM had implemented it five years ago.

Mr Draper noted that as part of this exercise, they would have to attempt to determine what the tangible benefits will be in implementing Causer-Pays and that MJA would look at the NEM to try to work out what that would look like without the Causer-Pays methodology and how it would have been different.

- Ms White asked if the NEM method planned to also include the residential loads.
- Mr Ridgway replied that everyone who participates in the market will be impacted by this, as it is aggregated together and treated as a pool. If you are a residential load without four-second metering, then you fall into the residual and you receive a portion of the cost along with everyone else who is not metered. Mr Scott added that was the residual deviation.
- Ms White asked if that was captured in the light blue slot on slide 17.
- Mr Draper replied that demand was captured on slide 15 and that includes all the notional meter customers. On slide 17 demand was removed to focus on generation.
- Ms White asked whether the notional meter still had the netting off affect or is it able to do the sum of the residual for each load.

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	• Mr Draper noted that they were just doing an aggregate demand trace, not individual values and Mr McKenzie added that it was just one residual value. • Ms Guzeleva clarified that this was not splitting photovoltaic supply from demand that it looks at the notional meter as a whole. • Mr Schubert noted that the costs and benefits need to be worked out, but that if incentivised, fast acting wind and solar with inverters could help with frequency regulation and, in the future, that would be a cheap source of regulation capacity if they were incentivised to help by operating below their potential output. • Ms Guzeleva noted that in the new market they will be able to provide regulation and that it was a question of how to provide that incentive, by either: o encourage them strongly via pricing or otherwise to participate in the actual market for services; or o reward them for something that they would do naturally.	
7	**Next Steps** Next steps were not discussed due to time constrains.	
8	**General Business** No general business was discussed. The next CARWG meeting is scheduled for 22 November 2022	

The meeting closed at 3:00pm.

Government of Western Australia
Department of Mines, Industry Regulation and Safety
Energy Policy WA

Agenda Item 4: CARWG Action Items

Cost Allocation Review Working Group (**CARWG**) Meeting 2022_11_29

Shaded	Shaded action items are actions that have been completed since the last MAC meeting.
Unshaded	Unshaded action items are still being progressed.
Missing	Action items missing in sequence have been completed from previous meetings and subsequently removed from log.

Item	Action	Responsibility	Meeting Arising	Status
8	AEMO is to consider what information can be provided to assist the CARWG in understanding the current breakdown of its expenses by market segment.	AEMO	2022_09_27	**Open** AEMO has advised that it is still considering what information it can provide on this action item.
10	AEMO is to provide a broad estimate of its costs to implement the WEM Hybrid Method.	AEMO	2022_09_27	**Open** AEMO has advised that it will provide a cost estimate at the same time that it provides estimates to implement the other changes proposed under the Cost Allocation Review, once details of the proposals become clearer.

Government of **Western Australia**
Energy Policy WA

Cost Allocation Review – Frequency Regulation and Contingency Reserve Lower

Presentation to Cost Allocation Review Working Group (CARWG)

29 November 2022

Grant Draper / Peter McKenzie
Marsden Jacob Associates

Working together for a **brighter** energy future.

Agenda

Timeline and purpose

5. Options for allocating Frequency Regulation costs
    - Tolerance Method (revisited)
    - WEM Deviation Method (simplified Causer Pays – new)
    - Next Steps
6. Contingency Reserve Lower
    - Runway Method
    - Next Steps
7. Questions
8. General Business

Timeline and Purpose

Steps/Tasks	Duration/Timing
Step 1 – Policy Assessments	
(a) Literature review of the methodologies to allocate Market Fees and ESS costs in other jurisdictions	Mid-April to Mid-May 2022
(b) In consultation with the MAC Working Group, assess whether, and to what extent, the current allocation method for the Market Fees and for the costs for each of the ESS are aligned with the causer-pays principle and, if not, whether they should be	Mid-May to Mid-June 2022
Step 2 – Practicability Assessments	
In consultation with the MAC Working Group, for the fees and costs that are not aligned, or not fully aligned, with causer-pays principle: • Identify the options that can be practically and efficiently applied in the WEM to allocate the Market Fees and each ESS cost • Assess each option against the guiding principles • Model the impact of each of the options on Market Participants • Recommend a preferred option for the allocation of the Market Fees and each ESS cost	July-September 2022
Step 3 – Methodology Development	
Develop the details of the cost allocation methodologies in consultation with the MAC Working Group	September-October 2022
Develop and publish a consultation paper on the design for the allocation methodologies and seek stakeholder comments	November-January 2023
Develop publish an information paper on the detailed design for the allocation methodologies	March 2023
Step 4 – Formal Rule Change	
Develop one or more Rule Change Proposals for consideration by MAC, and approval by the Coordinator and Minister	April 2023

5. Options for Allocating Frequency Regulation Costs

Options for Allocating Frequency Regulation Costs

- We have provided assessments of the following methods to allocate Frequency Regulation costs in the WEM:
  - Current NEM Causer-Pays
  - New NEM Causer-Pays
  - Tolerance Method (referred to as the **Forecast Range** Method in these slides)
  - Existing WEM cost allocation (i.e. based on metered generation of interim generators and metered consumption of loads)
- At its meeting on 15 November 2022, the MAC endorsed further assessment of:
  - AEMO's proposed Forecast Range Method as a interim method to be implemented in 2025 (after new market commencement)
  - the New NEM Causer-Pays Method in 2027/28 with a potential implementation of this method in the WEM in 2028/29

Tolerance Method Revisited (1)

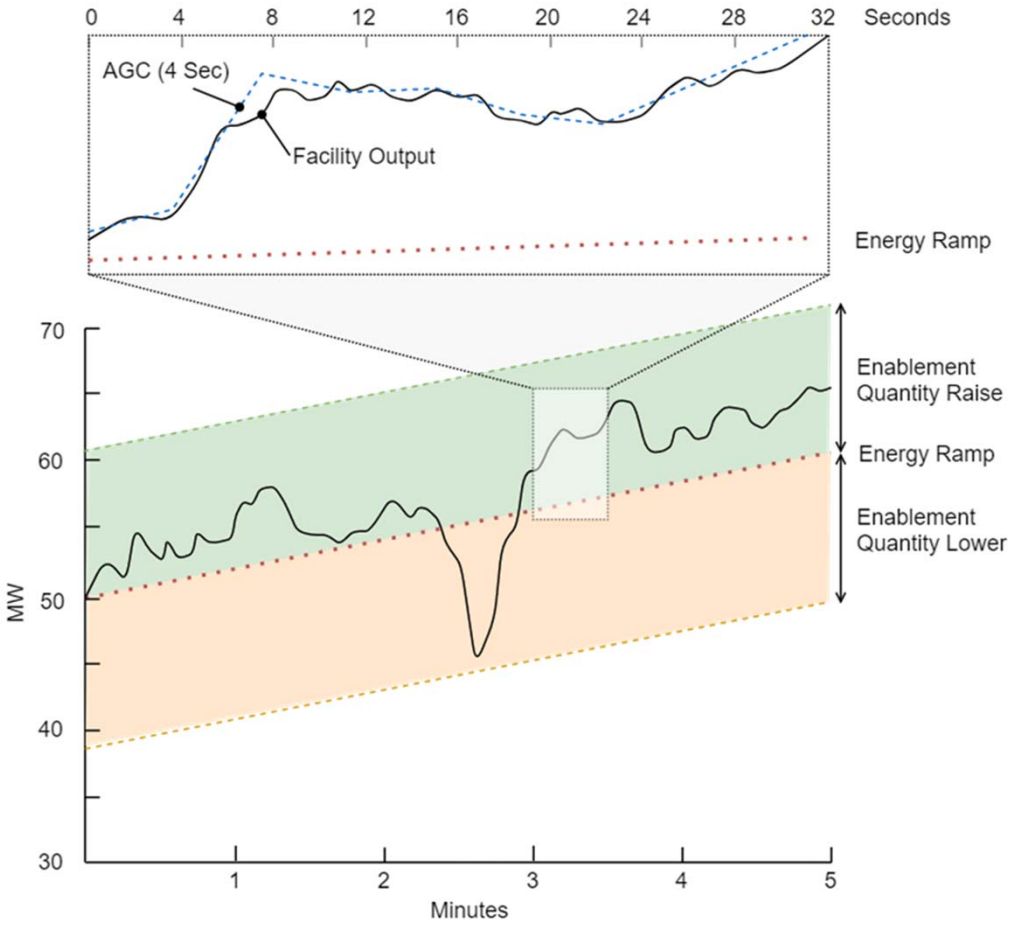
AEMO has previously raised the concept of using an ex-ante **Forecast Ranges** from each Facility to set Regulation quantities and for allocation of regulation costs

1. Provides additional input to AEMO for establishing the Regulation quantity that needs to be procured in a trading interval
    - Aligns Regulation quantities with forecasted uncertainty, which is when AEMO commits to quantities of Regulation to procure
2. Provides input to a Causer-Pays methodology for recovering regulation costs
    - Causers would set the requirement ex-ante based on their projected Forecast Range (rather than ex-post by actual performance)
    - Payment would be as a proportion of total ranges
        - Provides incentives for participants to reduce Forecast Range (i.e., better forecasting), which would reduce regulation requirements and regulation costs

Tolerance Method Revisited (2)

3. Helps identify the “firm” capability of Intermittent Facilities to calculate reserves available for FCESS
    - The lower bound of the range may be used as the upper limit for any FCESS reserves made available by curtailing beneath that lower Forecast Range value
    - If the WEM includes a ramping/reserve market in the future, participants providing Forecast Ranges of generation can help identify the potential ramping availability of their generator
        - E.g., if a wind generator is constrained down to provide FCESS, it has potential to ramp up quickly to meet future ramping or reserve requirements

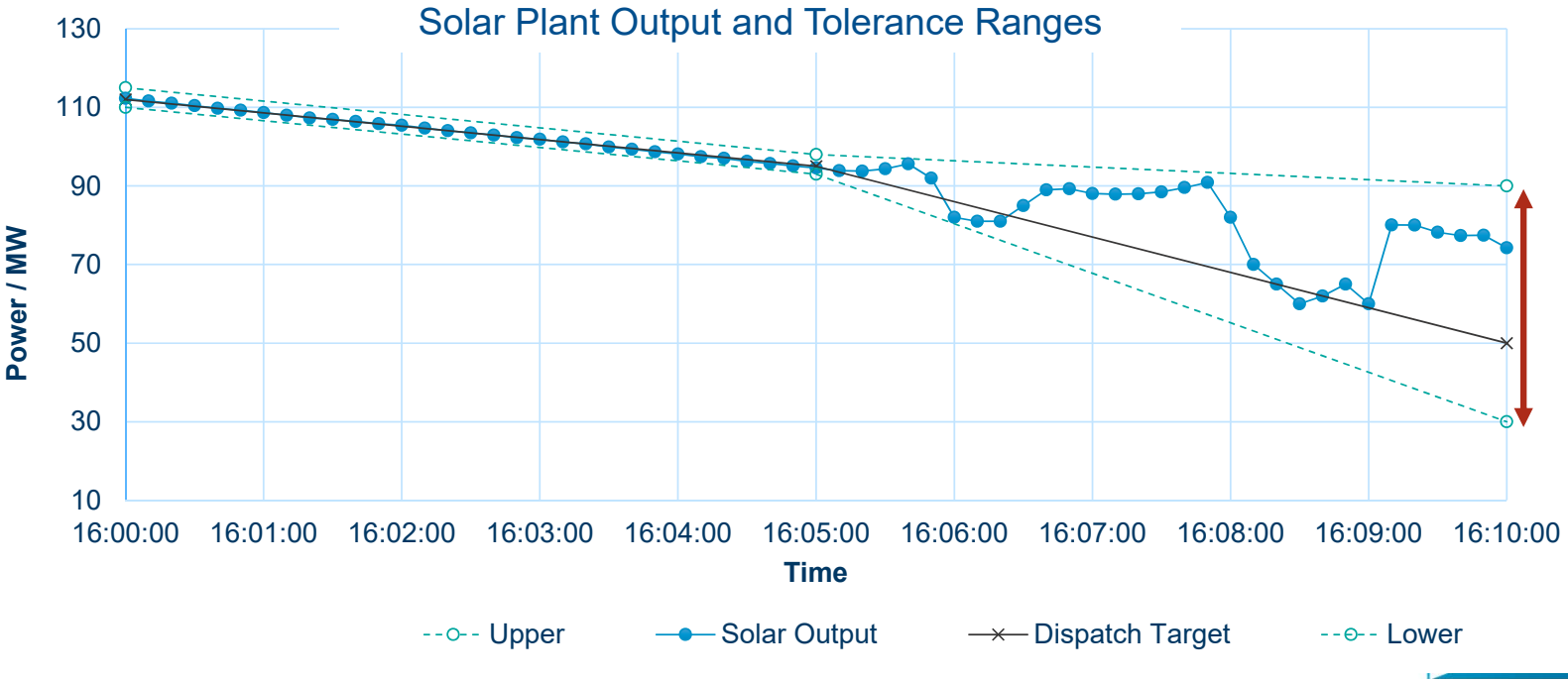
AEMO's Problem Statement – Better Volatility Forecasts



- AEMO procures Regulation Raise and Regulation Lower to manage overs and unders in the supply demand balance
- Regulation Raise and Lower quantities in the Reformed WEM will be dynamic, rather than static quantities procured today in the LFAS market
- Critically, AEMO procures an ex-ante quantity of Regulation, based on a forecast level of volatility to be managed by the service (Rule 3.10)
- Regardless of whether that Regulation quantity is utilised in that Dispatch Interval, those Facilities enabled for the service are paid, and the costs are recovered
- It may be considered that Regulation quantities should also be established as an ex-ante forecast of volatility from expected behaviour

Forecast Range

- Setting a Forecast Range per Dispatch Interval would provide AEMO with valuable information about the expected likelihood of generation outcomes
- By linking the tolerance to both Dispatch Compliance and to Regulation Causer Pays, Market Participants may be incentivised to
  - o forecast more accurately
  - o reduce volatility where it is cost efficient to do so

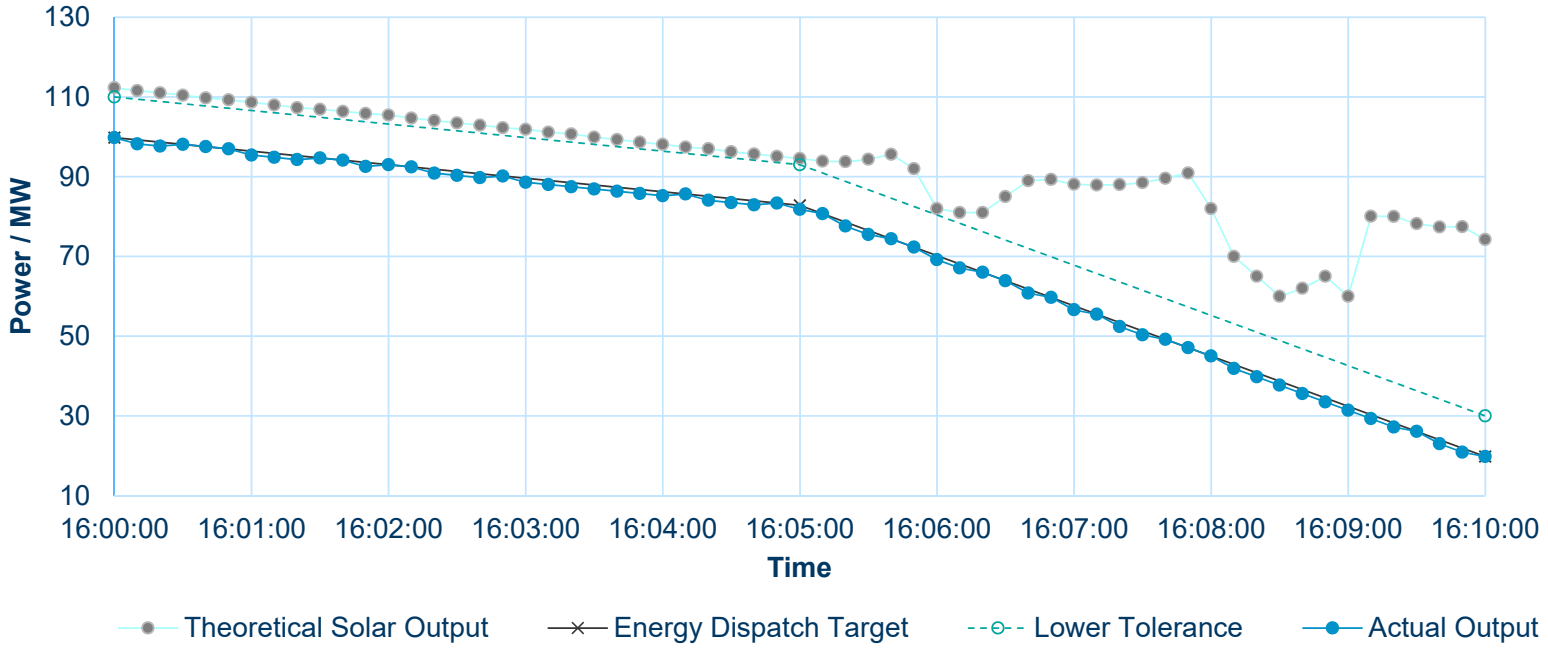


The wider the Forecast Range, the larger the cost attribution of Frequency Regulation costs

Potential “Good” Behaviour in Response to Forecast Range Concept – Solar Plant

The solar plant offers a Raise FCESS service, which is enabled across the two intervals, requiring the Facility to reduce output to maintain sufficient headroom to the lower bound of its forecast

Solar Plant Output Operating at Lower Tolerance Limit and providing Raise FCESS



Forecast Ranges Cost Recovery (1)

Marsden Jacob's approach to Frequency Regulation cost recovery using Forecast Ranges in the WEM is:

1. Determine the Forecast Ranges for each generator type based on ensuring that all plant deviations in a period (1 month) are contained within the Forecast Range
   - Forecast Ranges are fixed for a 7-day cycle (4 cycles per month)
2. For the 4-week period, set Regulation Raise and Lower requirements
   - Example, for 2021/22 the requirements are:

     LFAS Upwards and Downwards:*

     (a) Up to 110 MW between 5:30am and 8:30pm; and

     (b) 65 MW between 8:30pm and 5:30am

* Will be set dynamically in the future

Forecast Ranges Cost Recovery (2)

3. Based on the total Forecast Ranges

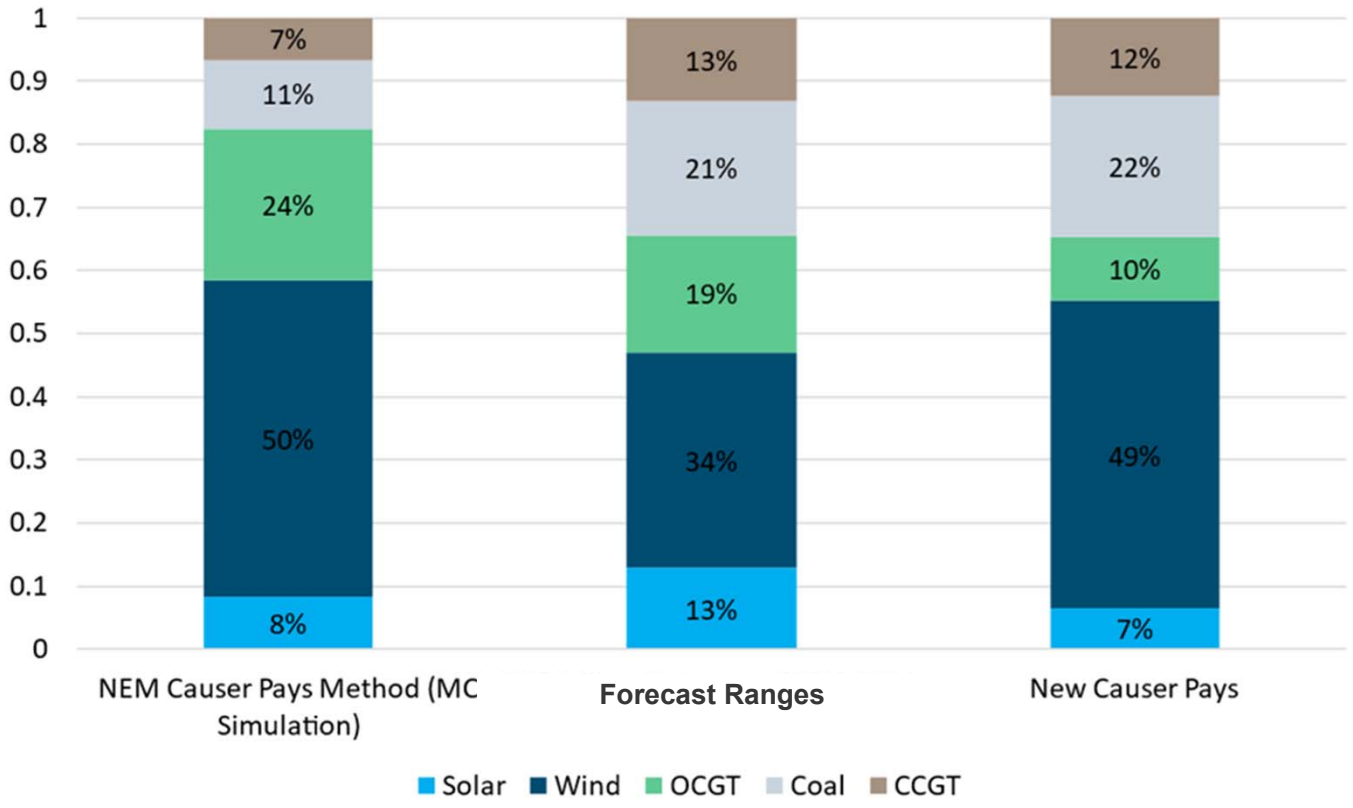
   - Forecast Range per generator type multiplied by the number of that type – e.g., 30 generators with Forecast Ranges up and down of 6MW on average – 180MW Up / 180MW down

   Pro-rata the Forecast Ranges to the LFAS requirement

   - Example, if a solar generator has a Forecast Range of 6MW up and 6MW down for a 7-day period, then it will get 6/180MW of the costs of LFAS for that 7-day period (average of 110MW and 65MW is around 100 MW taking account of hours per period) i.e., 6/180 * 100MW
   - In effect, this is the weekly contribution factor for the solar generator for the 7-day period.

Forecast Bands Cost Recovery – Contribution Factors

Frequency Regulation Cost Recovery Factors (%) for WEM – NEM Causer Pays (Existing and New) and Forecast Ranges



Relative to Causer Pays Methods, more costs are allocated to Solar Plant under the Forecast Ranges method

Potential Issue with Forecast Ranges Method (1)

- Market Participants would be incentivised to under-forecast ranges to minimise allocation of Frequency Regulation costs
  - This will require implementing penalties if actual output exceeds the Forecast Range
- If penalty payments are high, then Market Participants will be incentivised to over-forecast ranges
  - This has the potential to increase Regulation Requirements and level of enablement payments (higher costs borne by the market)
  - To avoid this occurrence, AEMO would set Regulation Requirements based on a variety of inputs (which includes Forecast Ranges) and, if Forecast Ranges are being over-estimated, would take this into account when setting the Regulation Requirement
- If penalty payments are low, then Market Participants will be incentivised to under-forecast ranges
  - Reduces Regulation Requirements and level of enablement payments
  - AEMO is required to dispatch additional plant to manage frequency excursions that eventuate because deviations in actual output are likely to be higher than forecast
  - Once again, to avoid this occurring, AEMO would have to consider the under-estimation of Forecast Ranges when setting Regulation Requirements

Potential Issue with Forecast Ranges Method (2)

- Potential for gaming by Market Participants to influence market outcomes in their favour
  - Implies that AEMO may not get reliable Forecast Ranges from participants and will most likely have to rely on its own forecasts when establishing Regulation Requirements
  - EPWA is of the view that AEMO's forecasting capabilities, especially for intermittent plant, will improve in the future (i.e. investment in better forecasting systems and methods) and help decrease Regulation Requirements
- Market Participants should be incentivised to provide accurate forecasts of load and generation, but in EPWAs view, utilisation of the Forecast Range method may not result in better market outcomes
- The Forecast Ranges method may not result in accurate attribution of Frequency Regulation costs if Forecast Ranges are under- or over-estimated by Market Participants

Frequency Regulation Cost Recovery Problem Statement (1)

- Many of the Frequency Regulation cost-recovery options have multiple objectives in addition to allocation of Frequency Regulation costs:
  - New NEM Causer Pays – provides financial compensation for providing primary frequency response and incentives for the dispatch of plant or loads that help correct frequency deviations
  - Forecast Ranges – provides incentives for better forecasting by Market Participants to minimise Regulation Requirements and for intermittent plant to provide FCESS Raise Service
- However, there are existing WEM market mechanisms to ensure the provision of primary frequency response (Generator Performance Standards) and to correct frequency deviations (ESS Frequency Regulation, ESS Contingency Reserve and RoCoF)
  - Adding incentives to improve performance adds complexity, which may not be warranted in a cost allocation method

Frequency Regulation Cost Recovery Problem Statement (2)

- A cost allocation mechanism for Frequency Response in the WEM only requires to:
  - Provide incentives for participants to minimise generation (or load) deviations within the Tolerance Bands that have already been established in the WEM
    - Note, that this is problematic for intermittent generators given variations in generation caused by weather and that only expensive options are typically available for intermittent generators to decrease ‘natural variations’ in output (curtailing generation and foregoing energy and LGC revenue, or installing BESS)
  - Ensure that Market Participants that deviate from generation (or load) targets and add to the requirement for regulation services make an adequate contribution to Frequency Regulation costs – does not have to be ‘real time’ cost recovery

New Option: WEM Deviation Method (Simplified Causer Pays)

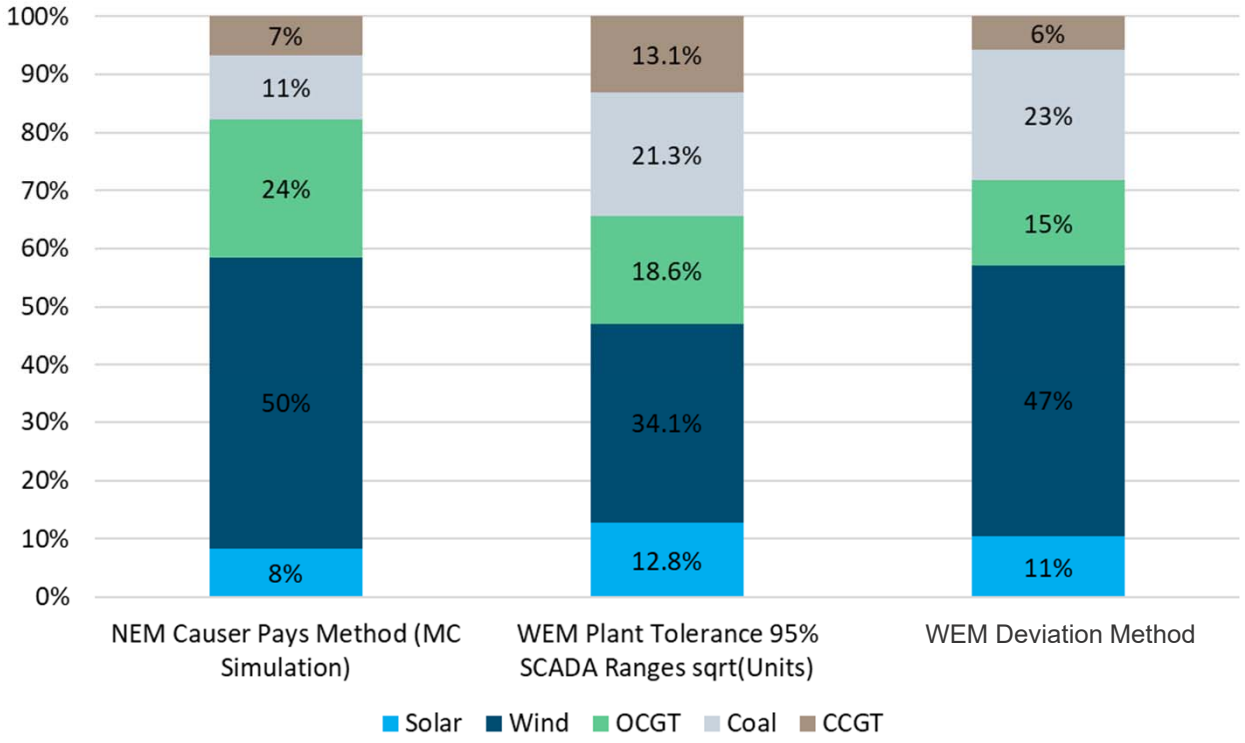
- A simplified method for recovery of Frequency Regulation costs is to base recovery on deviations from average generation (or load) over a 5-minute dispatch interval in the WEM
- This wold be based on 4-second SCADA data where we measure actual deviations from a linear dispatch target
- This would involve:
  - Estimating a linear average generation (or load) based on 4 second SCADA data for a 5-minute dispatch interval
  - Estimating a standard deviation from average generation (or load) across a 30-minute trading interval (over 6 dispatch intervals)
  - Calculating and aggregating coefficients of variation (i.e. standard deviation divided by average) for plant and loads and calculate the contribution factor (normalised) for each 30-minute trading period (must add up to 100%)
  - Calculating the average contribution factor for a trading interval (currently 30 minutes) and apportion the frequency regulation costs to the generator/load
  - Note: use of a linear dispatch target takes into account different generation levels at the commencement of each dispatch period

WEM Deviation Method Pros and Cons

Pros	Cons
• Provides incentives for Market Participants to minimise generation (and load) deviations, acknowledging that loads and intermittent generators will not be able to correct deviations in many instances	• Generation and load deviations may not always result in frequency excursions and costs being incurred to manage/correct frequency deviations.
• Loads and intermittent generators are likely to pay the most under this method • However, this has also been the result of the application of all other methods based on the 'causer pays' principle	• Intermittent generators and loads response to price signals provided by WEM Deviation Method could be limited (i.e. cost of better controlling load or intermittent generation is expensive), which implies that the efficiency benefits may be modest, even if cost attribution is more consistent with 'causer-pays' principles
• Relatively simple to implement and administer	
• Provides little incentives for 'gaming' by Market Participants to avoid charges. • Avoids Market Participants nominating forecasting ranges or expected generation or load levels over a dispatch interval	
• Is consistent with existing WEM frameworks (i.e. Tolerance Bands, Generator Performance Standards, requirement for PFR, etc.)	

WEM Deviation Method Contribution Factors – by Technology

Frequency Regulation Cost Recovery Factors (%) – WEM Deviation Method



- Simplified method shows a similar trend to the NEM Causer-Pays and Tolerance Methods, with wind being the largest contributor
- The split between loads and generation would be very similar to the NEM Causer-Pays method as both use aggregation of errors
- Can be adjusted easily for other sampling methods instead of Standard Deviation, such as 95% Confidence interval or Min/Max

Frequency Regulation Cost Recovery – Next Steps

- Develop preferred approach for allocating Frequency Regulation costs in the WEM:
  - Assess the method to apply until the New NEM Causer Pays Method can be assessed and, potentially, implemented – options include:
    - WEM Deviation Method (following the start of new WEM arrangements, ~2025)
    - Current method
  - Longer term – reassess adoption of the New NEM Causer-Pays Method once it is finalised and after successful introduction in the NEM in 2025 and some reasonable period in operation
    - Assess in ~2027 for implementation in ~2028/29
  - Incorporate above approach into Consultation Paper

6. Contingency Reserve Lower – Runway Method

Contingency Reserve Lower Requirement

- Contingency Reserve Lower is required to cover the risk of a material increase in system frequency due to a loss of single large load, or multiple loads on a single network element
- The largest credible load rejection event is 120 MW, based on the loss of the Eastern Goldfields region or the Boddington Gold Mine
- The Contingency Reserve Lower service for 2021-22 remains up to a maximum of 90 MW, which is 120 MW (largest continency event) minus 30 MW for Load Relief (loads draw more power when system frequency is high)
- The potential introduction of a large-scale BESS into the SWIS (i.e., 250 MW) would more than double the largest credible load rejection contingency – this could increase the Contingency Reserve Lower service to 220 MW (i.e., 250 MW – 30 MW Load Relief)
- The CARWG agreed that consideration should be given to applying the runway method to facilities above 120 MW for Contingency Reserve Lower services (27 September 2022)

Runway Method for Contingency Reserve Lower

- When BESS (charging) or dispatchable load (e.g., hydrogen plant) exceeds 120 MW, apply Runway Method for allocation of Contingency Reserve Lower costs in a trading interval
- Runway method is the same as that used for Contingency Reserve Raise (no tranches used for cost allocation)
- If BESS and dispatchable loads are less than 120 MW, Contingency Reserve Lower costs are allocated on basis of metered consumption (current method)
- Next slide considers cost allocation with one large single BESS Facility (250 MW)
- Unit cost of Contingency Reserve Lower is $3.61 per MW per Interval
  Interval cost is 220 MW * $3.61 per MW = $794.91
  (i.e., Contingency Reserve Lower requirement = 250 MW minus 30 MW Load Relief)

Cost Reflective Approach to Contingency Reserve Lower – 250 MW BESS

Cost Recovery in a Trading Interval under a Runway Method

Load	Load Size (MW)	A only	A, B, C	Capacity (MW)	Cost Share
Load A	250	130	120	250	
Load B	120	0	120	120	
Load C	Small Loads	0	1,800	1,800	
Capacity (MW)		130	2,040	2,170	
Cost Share Interval		**52%**	**48%**	**100.0%**	
Load A	250	$413.4	$22.4	$435.8	54.8%
Load B	120	$0.0	$22.4	$22.4	2.8%
Load C	1,800	$0.0	$336.7	$336.7	42.4%
Total		$413.4	$381.6	$794.9	100%

Notes:

- Small Load is effectively equal to the notional wholesale meter
- Assuming large Load (120 MW) is a Non-Dispatchable Load equipped with an interval meter

A. Under this revised method, BESS (Load A) bears 54.8% of costs in the trading interval when recharging, Small loads (42.4%) and the Non-Dispatchable Load (120 MW) only 2.8%

B. 52% cost share for BESS (Load A) exceeding 120 MW = Load increment above 120 MW / Max Capacity of Largest Load (MW) = 130 MW / 250 MW

C. 48% cost share pro-rated to each load (A, B, C) based on MW below 120 MW for single largest load, i.e. X(i) MW / 2040 MW

D. This method is more consistent with the causer-pays principle whereby the party that gives rise to additional Contingency Reserve Lower service (the BESS) pays most of the cost

E. Need to adjust methodology to cater for future network contingencies that may also exceed 120 MW (but less likely)

Contingency Reserve Lower – Next Steps

- The requirement for the Contingency Reserve Lower service is a function of the size of the potential load that may be lost
  - This is analogous to how the largest generator is the main causer of the requirement for Contingency Reserve Raise service
- A causer-pays approach consistent with the method used for Contingency Reserve Raise suggests that a modified ‘runway method’ could be applied to allocate Contingency Reserve Lower costs to the largest loads operating in a trading interval
- Recommend that the Runway Approach outlined in this presentation be adopted for the allocation of Contingency Reserve Lower costs (incorporated into Public Consultation document)

Questions?