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

Coordinator of Energy Determination: Benchmark Capacity Providers

Peak Capacity Provider and Flexible Capacity Provider

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1. This Determination

The Coordinator of Energy (Coordinator) has determined, under clause 4.16.11 of the Wholesale Electricity Market (WEM) Rules, the Benchmark Capacity Providers. In accordance with clause 4.16.12 of the WEM Rules, the Coordinator has determined:

(a) the appropriate reference technology to be used for each Benchmark Capacity Provider;

(b) the technical parameters to be used for each Benchmark Capacity Provider, including size and capabilities;

(c) the uncongested network location to be used for each Benchmark Capacity Provider, or if there is no uncongested network location, a network location with relatively low congestion; and

(d) whether the relevant Benchmark Reserve Capacity Price is to be assessed on the basis of:

  i. the gross capital cost of the relevant Benchmark Capacity Provider; or

  ii. the capital cost of the relevant Benchmark Capacity Provider less any expected contribution to capital costs from participation in the Real-Time Market.

The summary of the Coordinator's determination is provided in Section 5: Determination Summary.

2. Background to the Determination

Review Outcome 9 of the RCM Review[1] provided for the introduction of a provision in the Wholesale Electricity Market (WEM) Rules that requires the Coordinator to determine the Benchmark Flexible Capacity Provider and the Benchmark Peak Capacity Provider, together the Benchmark Capacity Providers. The Benchmark Capacity Providers are the reference facilities that are used to set the Benchmark Reserve Capacity Prices (BRCPs).

This determination is required by clause 4.16.11 of the WEM Rules (commenced on 13 December 2023), which requires the Coordinator to complete the first determination before 31 January 2024. Clause 4.16.12 of the WEM Rules details what the Coordinator must determine.

Once the Coordinator has made the determination, the Economic Regulation Authority (ERA) must review its BRCP Methodology within one year of the Coordinator's determination.

Following the initial determination, clause 4.16.11 of the WEM Rules requires the Coordinator to make another determination within three years of the previous determination of the Benchmark Capacity Providers, or within six months of a revised Electric Storage Resource (ESR) Duration Requirement being published in the Electricity Statement of Opportunities, if the ESR Duration Requirement determined by AEMO under clause 4.5.12(d) is different from the ESR Duration Requirement for the previous Reserve Capacity Cycle.

3. Consultation

Clause 4.16.13 of the WEM Rules requires the Coordinator to consult with Market Participants on the parameters determined under clause 4.16.12.

The Coordinator's proposals for the parameters determined under clause 4.16.12 have been discussed with the Market Advisory Committee and the RCM Review Working Group (a MAC-

[1] https://www.wa.gov.au/system/files/2023-08/reserve_capacity_mechanism_review_-_information_paper_stage_2.pdf

convened working group). A consultation paper on these proposals was also published for public consultation on 2 November 2023.

3.1 RCM Review Working Group

The Benchmark Capacity Providers review was discussed at two meetings of the RCM Review Working Group:

- On 21 September 2023, the group discussed the approach, the technology longlist and shortlist, the economic life and treatment of major overhauls (including the treatment of battery cell replacement as a variable cost), and indicative costs of the shortlisted technologies (clause 4.16.12 (a) to (c)).
- On 19 October 2023, the group discussed the proposed Benchmark Capacity Providers and analysis of using gross or net Cost of New Entry (CONE) (clause 4.16.12 (d).

Meeting papers and minutes are available on the RCM Review Working Group web page[2].

3.2 Market Advisory Committee

The Market Advisory Committee (MAC) discussed the review at its meeting on 12 October 2023. The MAC discussed:

- the approach to shortlisting technologies for each capacity product, and the resulting shortlist;
- the need to review the Benchmark Capacity Providers at regular intervals;
- the economic life and treatment of major overhauls, including the treatment of battery cell replacement as a variable cost;
- upfront capital costs and other fixed costs; and
- the results of the analysis indicating that the Benchmark Capacity Provider for both Peak Capacity and Flexible Capacity should be a 200MW/800MWh lithium battery energy storage system (BESS) connected at 330 kV.

3.3 Submissions received during public consultation

After discussing proposals with the MAC and the RCM Review Working Group, public submissions were requested in a consultation paper published on 2 November 2023[3]. Submissions were open from 2 November 2023 to 30 November 2023. The Coordinator received submissions from:

- The Australian Energy Market Operator (AEMO)
- Alinta Energy (Alinta)
- The Clean Energy Council (CEC)
- The Expert Consumer Panel (ECP)
- Shell Energy (Shell)
- Synergy
- One confidential submission

Copies of the non-confidential submissions are available in full on the Coordinator's website[4].

[2] https://www.wa.gov.au/government/document-collections/rcmrwg-meetings-held-between-january-2023-and-december-2023

[3] https://www.wa.gov.au/system/files/2023-11/epwa-brcp_reference_technology_review-v2.1.pdf

[4] https://www.wa.gov.au/government/document-collections/benchmark-reserve-capacity-price-reference-technology-review

A summary of common issues raised in the submissions is provided below, and a comprehensive response to the issues raised can be found in Appendix A.

3.3.1 Proposal A: The Benchmark Capacity Provider for the Peak and Flex Services

In the Consultation Paper, Energy Policy WA (EPWA) proposed that the Benchmark Capacity Provider for both Peak Capacity and Flexible Capacity be determined as a 200MW/800MWh Lithium BESS connected at 330kV. This facility represents the most efficient new entrant capacity provider for each capacity service.

CEC, ECP and Shell supported the proposed reference technology types and Synergy supported this at a high level. Alinta and AEMO indicated that they agree with the principles used to select the reference technology.

The confidential submission agreed with the proposed reference technology for the Flex product, but not for the Peak product. More detail is provided in Appendix A.

Alinta and Synergy raised concerns that a 4-hour ESR may not be sufficient to reach the Availability Duration Gap requirements in the future.

Synergy and AEMO consider that battery cell replacement would be better treated as fixed costs, rather than variable costs.

3.3.2 Proposal B: The Benchmark Capacity Provider review frequency

In the Consultation Paper, EPWA proposed that the Benchmark Capacity Providers should be reviewed every three years.

AEMO, the Expert Consumer Panel and Shell agreed that a review every three years would be appropriate.

Some stakeholders considered that reviews should occur after a defined event. Synergy considered that the Benchmark Capacity Providers should be reviewed when there is a change in the Availability Duration Gap or the emissions thresholds. AEMO considered that more frequent reviews could capture when ESR duration requirements change and if a more efficient storage or generation technology type commercialises in the interim. The CEC considered that reviews should be able to be triggered early based on a criterion established by the Coordinator and the MAC.

Some stakeholders were concerned that frequent reviews would cause volatility in the BRCPs and decrease investor certainty.

Alinta considered that the review should be undertaken every five years, or, in the event the Availability Duration Gap has increased.

3.3.3 Proposal C: Approach for Cost Of New Entry

In the Consultation Paper, EPWA proposed to retain a gross cost CONE approach to BRCP determination.

AEMO, Alinta, the CEC, Shell and Synergy agreed that the gross CONE approach to BRCP determination should be used.

The Expert Consumer Panel (ECP) noted that it understands the advantages and disadvantages of using gross CONE, but acknowledged that using Gross CONE would increase costs to consumers.

AEMO and the ECP both recommended that a switch from gross to net CONE in the future may be appropriate once the impact of the Benchmark Capacity Providers is observed in the market and the difference in cost between gross and net CONE can be quantified.

3.3.4 Other issues raised

The ECP considered that, if the economic value of providing network control services to Western Power were realised, the 15 MW ESR would be the most efficient new entrant and suggested that EPWA considers amending the WEM Rules, plus other measures, to achieve greater adoption of distributed ESR.

4. Coordinator's Assessment

In accordance with clause 4.16.11 of the WEM Rules, the Coordinator is required to determine and publish specific parameters for the Benchmark Capacity Provider. This section provides a summary of the Coordinator's assessment of these parameters.

4.1 The appropriate reference technology to be used for each Benchmark Capacity Provider

The WEM Rules define the Benchmark Capacity Provider for Peak Capacity or Flexible Capacity as a notional new entrant Facility based on the technology which is expected to be able to provide (Peak or Flexible) Capacity at the lowest annual capital cost.

The Coordinator has determined that the technology that is able to provide Peak Capacity at the lowest annual capital cost (including fixed operating costs) is a lithium battery electric storage system.

The Coordinator has determined that the technology that is able to provide Flexible Capacity at the lowest annual capital cost (including fixed operating costs) is a lithium battery electric storage system.

This is consistent with the proposals in the Consultation Paper. See chapter 2 of the Consultation paper for more information.

4.2 The technical parameters to be used for each Benchmark Capacity Provider, including size and capabilities

The Coordinator has determined that the parameters of the Benchmark Capacity Provider are:

- 200 MW injection capability
- 800 MWh of storage

This is consistent with the proposals in the Consultation Paper. See Chapter 2 of the Consultation Paper for more information, including the assumptions around service requirements for Peak Capacity and Flexible Capacity, economic life, and other factors that influence these parameters.

4.3 The uncongested network location to be used for each Benchmark Capacity Provider

The Coordinator has determined that the Benchmark Capacity Provider is to be assumed to connect to the 330 kV network near either Kwinana or Pinjar.

This is consistent with the proposals in the Consultation Paper. See Chapter 2 of the Consultation Paper for more information.

4.4 Whether the BRCP is to be assessed on the basis of gross CONE or net CONE

The Coordinator assessed whether the BRCP is to be determined based on gross capital cost (gross CONE) or capital cost less the expected contribution to capital costs from participation in the Real-Time Market (net CONE). The Coordinator has determined that the Benchmark Reserve Capacity Price is to be calculated on a gross CONE basis.

This is consistent with the proposals in the Consultation Paper. See chapter 3 of the Consultation Paper for more information.

4.5 Other matters raised in submissions

4.5.1 The Benchmark Capacity Provider and the Availability Duration Gap

Consultation respondents raised concerns about a potential mismatch between the capabilities of the Benchmark Capacity Provider and the Availability Duration Gap. The Coordinator agrees that if a Benchmark Capacity Provider is an energy limited facility, the Availability Duration Gap is an important input to the determination of the Benchmark Capacity Provider.

Clause 4.16.11(b) (introduced as part of the WEM Amending Rules implementing the outcomes of the RCM Review) includes a trigger to review the Benchmark Capacity Providers within six months if the Availability Duration Gap changes. Clause 4.16.9 requires the ERA to review (and update if necessary) its BRCP procedure within 1 year of a review of the Benchmark Capacity Providers.

The definition of Long Term PASA was also amended to include a forecast of the Availability Duration Gap for each year of the Long Term PASA Study Horizon, and the Coordinator expects that AEMO will publish this forecast for the first time alongside its 2024 ESOO.

4.5.2 Low renewable generation output periods

Several submissions raised questions about whether the SWIS reliability could be managed through a prolonged period of low renewable generation using 4-hour storage. Modelling in the RCM Review did not identify any unserved energy in the 10% POE peak demand scenario based on 2022 ESOO load forecasts, as long as sufficient capacity was commissioned to meet the reserve capacity target.

Additional modelling carried out for the Benchmark Capacity Provider review updated this assessment assuming:

- retirement of all coal-fired generation by 2030
- confirmed new capacity build plus a 500 MW / 2,000 MWh battery electric storage system at Collie, to a total of around 950 MW of 4-hour storage
- no new generic capacity added to meet the Reserve Capacity Target
- hourly wind generation based on 2022-23 Capacity Year actuals
- demand floored at zero rather than having batteries consuming negative demand during the middle of the day.

The modelling results were assessed against the new 0.0002% Expected Unserved Energy limit in the second limb of Planning Criterion.

This scenario saw no unserved energy over the period to 2033, with the storage and firming facilities within the fleet adequately handling the load when there is low wind output. While this confirmed that 4-hour storage is adequate over the next decade, this needs to be monitored as developments in demand growth, new build, and plant retirements may vary over time relative to the scenario modelled. This underscores the importance of regular reviews of the Benchmark Capacity Providers.

5. Determination Summary

The Coordinator has determined that:

1. The Benchmark Peak Capacity Provider will be a lithium battery energy storage system with:
   - 200 MW injection;
   - 800 MWh energy storage;
   - a 330 kV connection near Kwinana or Pinjar
2. The Benchmark Flexible Capacity Provider will be a lithium battery energy storage system:
   - 200 MW injection;
   - 800 MWh energy storage;
   - a 330 kV connection near Kwinana or Pinjar
3. Benchmark Reserve Capacity Prices will be determined on a gross CONE basis.

Appendix A. Responses to submissions received in the consultation period

Issue	Submitter	Comment/Issue Raised	Coordinator's Response
Proposal A: Benchmark Capacity Providers (reference technologies) for Peak Capacity and Flexible Capacity			
1	Alinta	Considers that the reference technology should meet the Availability Duration Gap determined by AEMO.	If a Benchmark Capacity Provider is an energy limited facility (such as an ESR), the Availability Duration Gap is an important input to its determination. Clause 4.16.11(b) (introduced as part of the WEM Amending Rules implementing the outcomes of the RCM Review) includes a trigger to review the Benchmark Capacity Providers within six months if the Availability Duration Gap changes. Clause 4.16.9 requires the ERA to review (and update if necessary) its BRCP procedure within 1 year of a review of the Benchmark Capacity Providers. The definition of Long Term PASA was also amended to include a forecast of the Availability Duration Gap for each year of the Long Term PASA Study Horizon, and the Coordinator expects that AEMO will publish this forecast for the first time alongside its 2024 ESOO.
	Synergy	Synergy considers that WEM Rule amendments are required to remove the potential mismatch between the availability requirements of the BRCP Reference technology and the ESR Duration Requirements.	
2	Alinta	Alinta has doubts that a 4-hour battery is suitable to meet the Availability Duration Gap. Alinta considers that a longer duration technology or flexible gas may be more appropriate.	Analysis indicates that a 4-hour battery is sufficient to meet the ESR Duration Requirement under modelled assumptions for the next ten years, indicating that it should be sufficient at least until the next three yearly review. A review will be triggered if the requirement changes. As mentioned above, the definition of Long Term PASA was amended to require AEMO to forecast the Availability Duration Gap for each year of the Long Term PASA Study Horizon, commencing in the 2024 Reserve Capacity Cycle.

Issue	Submitter	Comment/Issue Raised	Coordinator's Response
3	Confidential	It is important to note that the proposed battery technologies, while capable of shifting energy across different times, require charging and fail to provide any capacity after four hours duration.	These dynamics were accounted for in EPWA's analysis. (see section 3 and section 2.6.3 of the Consultation Paper)
	Confidential	It is critical to consider the change in generation fleet composition with the anticipated decommissioning of significant amounts of coal generation within the next six years, in any proposed design of a BRCP Reference Technology for the peak product.	
4	Synergy	The choice of technology should also be mindful of system security and reliability requirements and the additional value that higher availability provides to the WEM in terms of system security and reliability. Synergy considers that although a 4-hour ESR can meet the obligations for Peak Capacity, other technology types, with 14-hour availability obligations, may provide additional value to the WEM due to the longer availability obligations, and this addition value to customers should be considered in the choice of the reference technology.	The Benchmark Capacity Provider needs to be the lowest capital and fixed operating cost facility that meets the relevant limbs of the Planning Criterion. Analysis indicates that a 4-hour battery is the lowest cost new entrant to meet Peak Capacity needs for the next few years. Determining a different Peak Benchmark Capacity Provider at this stage would prematurely increase the cost to consumers. If system needs change the lowest cost new entrant may change, and the Benchmark Capacity Provider will change accordingly. (see response above regarding the triggers for review)
	Confidential	The reference technology for the Peak Capacity Product should be a firm source of long term energy generation, rather than an ESR. If an ESR becomes the dominant market technology, it could potentially exclude other diverse technologies needed in the WEM.	
	Alinta	Alinta considers that selecting a 4-hour battery as the reference technology risks undermining investment	

Issue	Submitter	Comment/Issue Raised	Coordinator's Response
		signals for other types of capacity which is identified as needed in the future by the SWISDA. Alinta noted that SWISDA indicates that longer duration storage or flexible storage will soon be the clearing price of the hypothetical auction for capacity.	
	Confidential	The BRCP framework should be designed to foster the development of renewable facilities, which provide green electrons, rather than technologies which shift electrons from one time period to another.	
5	ECP	ECP considers that if the economic value of providing network control services to Western Power were realised, the 15 MW ESR would be the most efficient new entrant.	At present, the pricing for these network control services is not available in a way that could be incorporated into the analysis. When this information becomes available, it can be included in a future review.
6	ECP	ECP suggests that EPWA consider amending the WEM Rules, plus other measures, to achieve greater adoption of distributed ESR.	While this is not in scope of this review, Distributed Energy Resources (DER) integration in the WEM is being progressed by EPWA under the DER Roadmap. EPWA is happy to discuss this, and how it could be achieved, with ECP.
7	Synergy	Synergy considers that the assumed economic life of 25 years is optimistic for an ESR and suggests the economic life used in the BRCP methodology should align with Market Participants expectations of the economic life of ESRs.	While the cost of cell replacements is significant, so is the cost of refurbishing fossil-fuelled technologies as it also involves replacing significant plant components. If the assumption was amended for batteries, for consistency it would also need to be amended for other technologies. Treating refurbishment costs as variable rather than fixed is consistent with the ERA's offer construction guideline.
	CEC	Does not expected lithium BESS to have a lifetime of 25 years.	

Issue	Submitter	Comment/Issue Raised	Coordinator's Response
	AEMO	AEMO recommends further consideration of the treatment of battery cell replacement as a variable operating cost, which may under-represent the significant costs of cell replacements and associated balance of plant costs when assessing the BRCP.	The assumptions around economic life were included in this review for comparison purposes only. The ERA is preparing to review its BRCP determination method based on the new Benchmark Capacity Providers. This includes considering the economic life over which the costs can reasonably be spread.
	Synergy	Synergy considers that the costs associated with cell replacement should be considered as fixed costs for the BRCP determination and that by considering these costs as variable costs reduces the investment signal. Synergy's preferred approach is for the reduced economic life and increase in costs to be included in the BRCP.	
	Confidential	The usage profile may not align with a 25-year economic life, even with extensive maintenance.	
	Confidential	To achieve the 25-year projected lifespan of an ESR, active cooling is likely to be necessary, which should also be considered in the BRCP assessment.	
8	Confidential	If these maintenance costs are included in the Average Variable Cost, there may be challenges for the Economic Regulation Authority to effectively monitoring RCM offers.	It is for the ERA to consider amendments to its offer construction guideline or market surveillance activities, if it considers this to be necessary.
	Synergy	Synergy recommends the ERA's offer construction guideline be updated with specific examples for ESRs providing the two services.	

Issue	Submitter	Comment/Issue Raised	Coordinator's Response
9	Alinta	Alinta disagrees with some of the input assumptions in determining the 4-hour battery cost.	The assumptions considered CSIRO information as well as known costs for actual projects in Western Australia. The methodology and assumptions to be used in setting the BRCP will be considered and consulted on through the ERA's upcoming review.
	Shell	Considers that some of the assumptions included in the analysis provided in the Consultation Paper is premature.	
10	Confidential	It important to have clarity on how the capacity market and BRCP will align with the Federal Minister's CIS-style scheme is now also urgently required, as the two appear to perform essentially the same functions.	The federal CIS design for the SWIS is being progressed with the Commonwealth, and is intended to complement the existing market mechanisms rather than duplicate them. Further, final CIS design for the SWIS will also be factored into the Coordinator's WEM Investment Certainty Review.
Proposal B: Reference Technology reviewed every three years			
11	AEMO	Supports the three-year review obligation and supports more frequent reviews to capture changes in the duration requirement or if new storage or generation technology commercialises in the interim.	Refer to response above regarding the trigger for reviews. Further, under the new clause 4.16.11 the Coordinator must review the Benchmark Capacity Providers within three years of the previous determination and, therefore, the Coordinator has the option to review them at any time in the three year period if technology costs change materially. Emissions thresholds for receiving Certified Reserve Capacity are being considered in the WEM Investment Certainty Review, and the need for a similar trigger should be considered as part of that work.
	Synergy	Supports the three-year review obligation, however, suggests that the BRCP should be reviewed when the Duration Gap and the emissions thresholds are changed.	
	Synergy	Considers that the choice of Reference Technology, or alternatively, the methodology for determining the BRCP, needs to be easily amended to ensure	

Issue	Submitter	Comment/Issue Raised	Coordinator's Response
		continued alignment with the availability obligations in the WEM rules.	
	Alinta	Alinta considers that there should be appropriate flexibility in the rules to allow for the technology to change when a need for longer duration/generating capacity becomes evident within a review period.	
	CEC	The CEC suggests that the MAC and the Coordinator consider establishing a set of criteria that could trigger an early review of the reference technology in the event that other technologies provide superior performance and value. The CEC suggests this criterion should be used in conjunction with ongoing monitoring which could reduce the administrative cost and burden from completing regular reviews.	
12	Alinta	Alinta considers that the current review period of 5 years is appropriate with the rules providing flexibility for the reference technology to be updated sooner should the need arise.	The method for setting the capacity price seeks to balance stability with accuracy. There will already be a lag between a change in the Availability Duration Gap and the implementation of a BRCP based on a new technology. Given the pace of change in both power system needs and technology development, it is prudent to revisit the selection of Benchmark Capacity Providers before five

Issue	Submitter	Comment/Issue Raised	Coordinator's Response
	Confidential	Any capacity regime where the rules can change on a yearly, or three yearly basis, will increase costs to consumers due to the inability to access low cost finance. Reviews should be undertaken less frequently than three years to prevent volatility of the BRCP. A stable and predictable BRCP is essential for maintaining investor confidence and ensuring the feasibility of new forms of capacity.	years has elapsed, even if the Availability Duration Gap does not change.
Proposal C: use gross CONE approach			
13	AEMO	Noted that a switch to net CONE may make sense in future years, once the impact of the peak and flex capacity pricing have been seen in the market.	Noted. The regular reviews allow for a change in approach if market outcomes warrant this.
	ECP	Understands the advantages and disadvantages of using gross CONE, however, acknowledges the increased costs to consumers.	
14	ECP	Recommends annual monitoring distinct from 3-year technology review to understand the key differences between gross and net CONE approach.	This type of ongoing monitoring can and should be done without the implementation of additional specific rules.

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