Economic Regulation Authority

2025 Benchmark Reserve Capacity Price for the 2027/28 capacity year

Draft determination

6 November 2024

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Invitation to make submissions

Submissions are due by 4:00 pm WST, Thursday, 21 November 2024

The ERA invites all interested parties to provide comment on the matters discussed in this paper and any other issues or concerns not already raised.

We would prefer to receive your comments via our online submission form https://www.erawa.com.au/consultation

You can also send comments through:

Email: publicsubmissions@erawa.com.au
Post: Level 4, Albert Facey House, 469 Wellington Street, Perth WA 6000

Please note that submissions provided electronically do not need to be provided separately in hard copy.

All submissions will be made available on our website unless arrangements are made in advance between the author and the ERA. This is because it is preferable that all submissions be publicly available to facilitate an informed and transparent consultative process. Parties wishing to submit confidential information are requested to contact us at info@erawa.com.au.

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Executive summary

The Benchmark Reserve Capacity Prices (BRCP) and the Reserve Capacity Prices are components of the Wholesale Electricity Market's Reserve Capacity Mechanism, which aims to ensure that there is enough capacity installed in the market to meet electricity demand.

Each year, the Economic Regulation Authority must determine the BRCPs to apply two years in the future. This is the ERA's draft determination of the 2025 BRCPs, which will apply for the 2027/28 capacity year.[1]

The ERA's draft determination of the 2025 BRCPs is $354,000 per Megawatt (MW) per year. The BRCPs will be used to determine the Peak Reserve Capacity Price and the Flexible Reserve Capacity Price for 2027/28. The Peak Reserve Capacity Price is the price paid to capacity providers for each MW of capacity that they make available to the Wholesale Electricity Market (WEM).[2] The Flexible Reserve Capacity Price is the price paid to those capacity providers with available capacity that meets the Flexible Capacity requirements – being able to respond to large and sudden changes in demand.

Flexible Reserve Capacity has been introduced to ensure that there is enough flexible capacity installed in the South West Interconnected System (SWIS) to meet its ramping requirements. The Reserve Capacity Mechanism provides price signals for capacity providers, like generators and batteries, to enter the WEM and offer their capacity. The revenue from making their capacity available adds to revenues from generating electricity and providing essential system services to generate an overall return for investors.

The BRCPs are a benchmark value of capacity, based on a cost estimate of building and connecting a hypothetical 200 MW / 800 MWh Battery Energy Storage System to the SWIS. Both the Peak BRCP and Flexible BRCP are based on the same specifications, as determined by the Coordinator of Energy, which makes their BRCP the same.[3]

The ERA's draft determination of $354,000 per MW per year is 54 per cent higher than the 2024 BRCP of $230,00 per MW per year.[4] This change is mostly from the change in the reference technology requirements, from a 160 MW open cycle gas turbine (OCGT) that ran on diesel fuel, to a 200 MW / 800 MWh battery. This large-scale battery has greater capacity than the previous OCGT, requires more land and also costs more to build, which contributes to the increase in the BRCPs.

The ERA has used data and analysis from consultant GHD Advisory, Western Power and Landgate, to inform this draft determination, and has published this analysis for review. The ERA seeks submissions from stakeholders on this draft determination.[5]

1 The reserve capacity timeline is defined in the Wholesale Electricity Market Rules (WA), 30 October 2024, Rule 4.1, (online).

2 All holders of capacity credits receive capacity payment. Although generators are the largest capacity credit holders, capacity credits can be provided to storage and demand side programmes. Generators that do not participate in the Reserve Capacity Mechanism (or are ineligible) do not receive capacity payments.

3 Energy Policy WA, 2023, *Coordinator of Energy Determination: Benchmark Capacity Providers – Peak Capacity Provider and Flexible Capacity Provider*, p. 7, (online).

4 Economic Regulation Authority, 2023, *2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year – Final determination*, p. ii, (online).

5 Economic Regulation Authority, 'Benchmark Reserve Capacity Price', (online) [accessed 21 October 2024].

1. Introduction

To ensure a reliable supply of electricity for consumers when they demand it, there needs to be adequate generation available within the SWIS. To achieve this, the WEM uses the Reserve Capacity Mechanism (RCM) to provide investment signals to install capacity in the SWIS when there is a forecast capacity deficit and to retire capacity when there is a significant capacity surplus.

The RCM's price signals are based on a cost estimate of constructing and installing the Benchmark Capacity Provider (determined by the Coordinator of Energy) into the SWIS at the specified locations.[6] In December 2023, the Coordinator determined the Benchmark Capacity Provider to be a 200 MW / 800 MWh Battery Energy Storage System (BESS) that is to be installed in the Pinjar or Kwinana regions. The ERA consequently updated the Benchmark Reserve Capacity Prices (BRCPs) WEM Procedure to reflect the Coordinator's determination and is following that WEM Procedure to determine the BRCPs for the 2027/28 capacity year.[7] For 2027/28 onwards, a new Reserve Capacity Credit, the Flexible Reserve Capacity Credit, will be introduced to provide a pricing signal for capacity providers that have the capability to respond rapidly to large changes in demand.[8] The ERA is required to determine BRCPs for both Peak and Flexible Reserve Capacity.[9]

The BRCPs are the forecast annualised cost estimate to build a new 200 MW / 800 MWh BESS that will provide capacity to the SWIS over a capacity year, stated in dollars per MW per year ($/MW/year).[10] Capacity providers are paid to make their facility's capacity available during the reserve capacity year. The capacity provider's payment is based on the number of capacity credits assigned to each facility and the applicable capacity credit price. The Australian Energy Market Operator (AEMO) determines the capacity credit price annually based on the BRCPs.[11] The 2025 BRCPs is based on a bottom-up, annualised cost estimate for the BESS, with costs escalated to 2027.[12,13] These cost estimate components are detailed in chapter 4, chapter 5 and chapter 6.

The ERA welcomes stakeholder submissions to this draft determination and will consider them when making the final determination, expected by early January 2025.

6 Energy Policy WA, 2023, *Coordinator of Energy Determination: Benchmark Capacity Providers – Peak Capacity Provider and Flexible Capacity Provider*, p. 7, (online).

7 Ibid.

8 Energy Policy WA, 2023, *BRCP Reference Technology Review – Consultation Paper*, p. 13, (online)

9 The Coordinator of Energy's determination is that both the Peak Benchmark Capacity Provider and the Flexible Benchmark Capacity Provider reference technology is to be the same – Energy Policy WA, 2023, *Coordinator of Energy Determination: Benchmark Capacity Providers – Peak Capacity Provider and Flexible Capacity Provider*, p. 7, (online). This means that both Flexible and Peak BRCPs will be the same however the Flexible Reserve Capacity Price and Peak Reserve Capacity Price will be determined by AEMO.

10 The BESS specifications are detailed in section 2.1 of the *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, (online).

11 AEMO conducts the reserve capacity price determination process in accordance with the reserve capacity timeline defined under Wholesale Electricity Market Rules (WA), 30 October 2024, Rule 4.1, (online).

12 A capacity year commences on 1 October each year – Wholesale Electricity Market Rules (WA), 30 October 2024, Chapter 11, (online).

13 Details of the power station requirements are defined in section 2.1 of the *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, (online).

1.1 References throughout this determination

Throughout this determination:

- References to the market procedure refers to the BRCPs WEM Procedure unless otherwise specified.[14]
- Cost and price estimates are in Australian dollars and exclude Goods and Services Tax unless otherwise specified.
- All references to the 2025 BRCPs refers to the ERA's BRCP draft determination of $354,000 per MW per year for the 2027/28 capacity year, unless otherwise specified.[15]

[14] *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, (online).

[15] This is not to be confused with the BRCP that applies to the 2025/26 capacity year.

2. Changes from previous BRCP process

The ERA's 2025 BRCP determinations follows the updated BRCPs WEM Procedure that accounts for the Coordinator for Energy's determination on the Benchmark Capacity Provider. The main differences between previous BRCP determinations and the current BRCP determinations are:

- A change in the reference technology from a 160 MW Open Cycle Gas Turbine that can run on diesel fuel to a 200 MW / 800 MWh BESS.
- The BESS must be installed in the Pinjar or Kwinana regions only.
- The ERA must determine both a Peak BRCP and a Flexible BRCP – however both are to be costed based on the same reference technology specifications.
- There is 'tilt factor' to account for rapidly changing BESS costs.
  - This has been set to a value of one, with reasons discussed in the ERA's BRCPs Procedure review.[16]

Other critical costing parameters, including transmission costs and the weighted average cost of capital, have not materially changed from how they were calculated and determined in previous years.

[16] Economic Regulation Authority, 2024, *Procedure Change Report: Benchmark Reserve Capacity Prices*, pp. 32-35, (online).

3. Scope of determination

The scope of this draft determination is set by the BRCPs WEM procedure which details how the BRCPs' components must be calculated.

The 2025 BRCPs must include all reasonable costs expected to be incurred when developing, constructing and installing a 200 MW / 800 MWh BESS, in the Pinjar or Kwinana regions, that are to commence operation from the start of the 2027/28 capacity year. Additionally, the operational and maintenance costs, and financing of the BESS over the 15-year expected lifespan must be accounted for.

The BRCP's major cost components consists of:

- The annualised total capital cost of the BESS, including:
  - Plant costs
  - Supply and installation costs
  - Transmission connection capital costs
  - Land costs
  - Owner's design and project management costs
  - Legal, financing and insurance costs
  - Environmental and development approval costs
  - Connection, registration and licencing costs.
- An annualised fixed operating and maintenance (O&M) component, which includes:
  - Fixed maintenance costs of the BESS including service, inspection and preventive maintenance
  - Corporate overheads
  - Transmission connection costs
  - Any other reasonable fixed operating and maintenance costs.

Both of the above cost components include financing using a Weighted Average Cost of Capital (WACC) approach across a 15-year expected economic life.

The BESS's total expected capacity credits is 200 MW (see section 4.1).

To determine the 2025 BRCPs, the ERA has used public information and advice from consultants, Western Power and Landgate. The ERA would like to highlight the contributions and input from both Western Power and Landgate, especially given the changes in the BRCPs WEM Procedure from previous determinations.

4. Draft determination

The ERA has determined the draft 2025 BRCP for both peak and flexible capacity to be $354,000 per MW per year for the 2027/28 capacity year (see Table 1).[17]

Table 1: Draft BRCP determinations for the 2027/28 capacity year

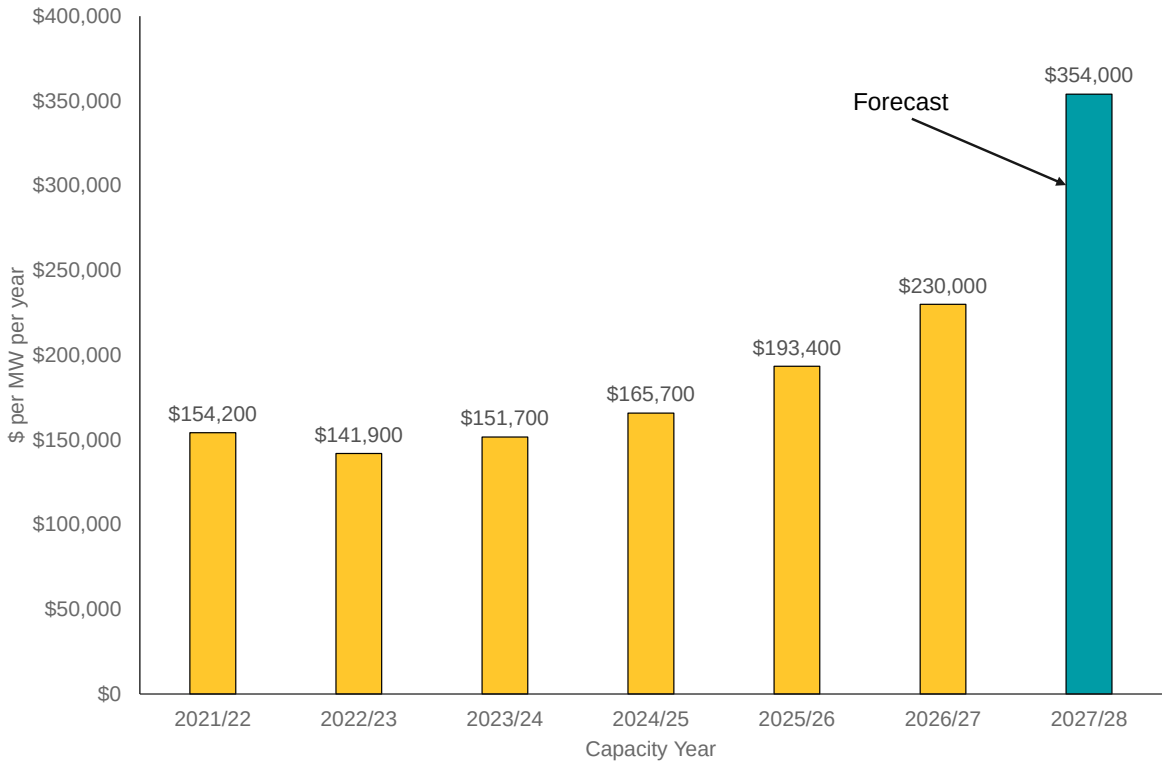
BRCP type	In $ per MW per year
Peak BRCP	354,000
Flexible BRCP	354,000

Source: ERA assessment of BRCP data, using the formula in the BRCPs WEM Procedure.

Since the Coordinator of Energy determined that both the Peak and Flexible BRCPs are to be based on the same Benchmark Capacity Provider (a 200 MW / 800 MWh Lithium-ion BESS), the BRCPs are the same. The associated Reserve Capacity Price will depend on the ERA's BRCPs final determinations and AEMO's assessments of the associated Peak and Flexible Reserve Capacity Prices.

Figure 1 shows the BRCPs since the 2021/22 capacity year.

Figure 1: BRCPs from the 2021/22 capacity year to 2027/28



Source: Australian Energy Market Operator, 'Benchmark Capacity Price archive', (online) and Economic Regulation Authority, 'Benchmark Reserve Capacity Price', (online).

Note: For the capacity years 2021/22 to 2026/27, the BRCP was based on a 160 MW Open Cycle Gas Turbine. The 2027/28 BRCP forecast is based on a 200 MW / 800 MWh BESS.

[17] Wholesale Electricity Market Rules (WA), 30 October 2024, Rule 4.16.1, (online).

The BRCPs are calculated using the following formula:[18]

$$BRCP = \frac{CAPITAL\ COST_{Annualised} + FIXED\ O\&M\ COST_{Annual}}{CAPACITY\ CREDITS}$$

Where:

a. $CAPITAL\ COST_{Annualised}$ is the BESS's annualised capital cost in Australian Dollars per year ($/Year) detailed in chapter 5, that is:

   i. Calculated using the formula in the WEM Procedure (see Appendix 5).

   ii. Annualised over a 15-year period using a nominal Weighted Average Cost of Capital (WACC) (see section 5.6 and Appendix 7).

b. $FIXED\ O\&M\ COST_{Annual}$ is a BESS's annual fixed operating and maintenance cost in Australian Dollars per year ($/Year) as detailed in chapter 6; and

c. $CAPACITY\ CREDITS$ are the BESS's Capacity Credits expected to be assigned by AEMO for Year 3 of the Reserve Capacity Cycle (in MWs).

Table 2 contains a comparison of the 2025 BRCPs draft determination against the 2024 BRCP final determination values, by component.

Table 2: Changes between the 2024 BRCP and the 2025 BRCPs by cost component

Component	2025 draft determination	2024 final determination	Change from 2024
BRCP ($/MW/Year)	**354,000**	**230,000**	**124,000 54%**
Annualised capital costs ($/Year)	62,652,303	28,751,257	33,901,046 118%
Annualised fixed O&M costs ($/Year)	8,132,636	6,017,942 [19]	2,114,694 35%
Expected Capacity Credits (MW)	200	151.17	48.83 32%

Source: ERA analysis of BRCP data and Economic Regulation Authority, 2023, 2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year – Final determination*, p. 6, (online).*

Direct comparisons between the 2024 BRCP and the 2025 BRCPs, and their associated cost components, need to be undertaken with caution because of the change to the BRCP determination process (see chapter 2). Most of the change is due to the change in reference technology, a 200 MW / 800 MWh BESS, which has significantly different cost and size characteristics to the previous open cycle gas turbine reference technology.

18 *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, section 2.2 (online).

19 This figure is obtained by multiplying the annualised fixed O&M amount of $39,809.10 per MW per year by the total number of capacity credits (151.17 MW) to arrive at a dollars per year amount. These figures were published in the Economic Regulation Authority, 2023, *2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year – Final determination*, p. 6, (online).

Chapter 5 provides details on the BESS's annualised capital costs and chapter 6 provides details on the fixed O&M costs for the 2025 BRCPs. For completeness, comparisons between the 2024 BRCP and the 2025 BRCPs by cost component are shown in Appendix 4, Appendix 5 and Appendix 6.

The ERA has published the BRCPs calculation spreadsheet to provide transparency of the BRCP calculation on the ERA's website.[20]

4.1 Expected capacity credits

The expected capacity credits for the 2025 BRCP BESS is 200 MW, based on the BRCPs WEM Procedure that requires the BESS to be able to inject 200 MW on day 1 of the 2027/28 capacity year. The BESS build accounts for degradation between construction, commissioning and the start of the 2027/28 capacity year.

The Network Access Quantity regime does not affect the number of expected capacity credits assigned to the BESS for this determination based on the assumption that it is installed in an unconstrained part of the network within the Pinjar and Kwinana regions.[21] This is discussed in the ERA's BRCPs Procedure review.[22]

[20] Economic Regulation Authority, 'Benchmark Reserve Capacity Price', (online).

[21] The Network Access Quantity (NAQ) is a new element of the RCM that provides a cap on the amount of capacity credits a facility can receive based on the available network capacity at the relevant connection point. AEMO determines each facility's NAQ annually.

[22] Economic Regulation Authority, 2024, *Procedure Change Report: Benchmark Reserve Capacity Prices*, pp. 11-12, (online).

5. Annualised BESS capital costs

The ERA has estimated the total BESS development and capital costs to be around $474 million (or an annualised cost of around $63 million). The BRCPs WEM Procedure sets out how this is to be calculated (see Appendix 5).[23]

The largest capital cost contributor is the cost of supplying and installing the BESS, which is around 50 per cent of total capital costs (see Table 3). Construction costs and contingency are also a significant contributor at 16 per cent and 12 per cent of total capital costs respectively. Each component in Table 3 is discussed in the rest of this chapter. For completeness, a comparison of the 2025 BRCPs against the 2024 BRCP is provided in Appendix 4.

Table 3: BESS capital cost components

Cost component	2025 draft determination	Contribution to total capital cost (%)
Supply and Installation costs	236,256,922	50
Construction cost	77,237,106	16
Transmission connection capital costs	39,082,200	8
Land costs	9,947,818	2
Other indirect costs	30,149,414	6
Contingency costs	58,901,019	12
Weighted Average Cost of Capital	22,256,061	5
Total BESS capital costs	**473,830,540**	N/A
Annualised capital cost ($/year)	**62,652,303**	N/A

Source: ERA analysis of BRCP data.

Note: Other indirect costs and contingency costs make up the "M" margin – see section 5.5.

5.1 BESS supply and installation costs

The ERA engaged GHD to provide estimates of the BESS supply and installation costs (around $236 million) which is the largest contributor to the BRCP. The BESS supply and installation cost components are shown in Table 4.

[23] *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, section 3.1 (online).

Table 4: BESS supply and installation cost components and contribution to total BESS capital costs

Component	Cost ($)	Contribution to total BESS capital costs (%)
Lithium-ion battery modules	177,600,000	37
Power Conversion System	27,800,000	6
Balance of Plant (materials and equipment)	30,856,922	7
Total BESS supply and installation costs	**236,256,922**	**50**

Source: Economic Regulation Authority, 2024, Benchmark Reserve Capacity Price costs 2027/28 Capacity Year, *Report prepared by GHD Advisory, p. 10, (online) with cost escalation applied.*

5.1.1 Lithium-ion battery modules

The BRCPs WEM Procedure requires the BESS to be estimated using a lithium-ion battery module with a lithium iron phosphate sub-chemistry.[24] This was estimated at $178 million by GHD based on original equipment manufacturer information and is detailed in GHD's report.[25]

5.1.2 Power conversion system

The power conversion system, estimated to cost $28 million, comprises of inverters required to convert the direct current generated by the battery cells to alternating current for feeding into the Western Power network.[26] This estimate is based on information for original equipment manufacturers.

5.1.3 Balance of plant (materials and equipment)

The balance of plant covers the supply and delivery of cables, transformers and other materials relevant to a BESS facility.[27]

As required by the BRCPs WEM Procedure, these balance of plant costs were escalated to 1 April 2027, based on Consumer Price Index forecasts as these costs as expected to be incurred before the start of the 2027/28 capacity year (estimated to be around $31 million).

5.2 BESS construction costs

Construction costs for a new BESS are a significant contributor to the total BESS capital cost at around $77 million and includes both site preparation and main works construction contracts. Further details are available in GHD's report published with this draft determination on the ERA website.[28]

[24] *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, clause 2.1.6(a) (online).

[25] Economic Regulation Authority, 2024, *Benchmark Reserve Capacity Price costs 2027/28 Capacity Year,* Report prepared by GHD Advisory, p. 10, (online).

[26] Ibid.

[27] Ibid.

[28] Ibid, pp. 10-11.

5.3 Land costs

The total land cost is around $10 million which is significantly higher than in previous BRCP determinations ($3.1 million in the 2024 BRCP final determination).[29] This is due to two main reasons (see Table 5):

- The land size for the BESS is 6.5 hectares, more than double the size of the previous open cycle gas turbine site which was 3 hectares.
- The BESS must be situated in either the Pinjar or Kwinana regions only, whereas the previous BRCP was averaged over six regions in the SWIS. Pinjar and Kwinana are the most expensive of the six regions that were previously assessed.

Table 5: Comparison of the land cost between the 2024 and 2025 BRCP determinations

BRCP land component	2025 draft determination	2024 final determination	Difference
Average land cost per hectare ($)	1,412,500	780,714	631,786 81%
Total hectares required	6.5	3	3.5
Total land cost[30] ($)	9,947,818	3,075,732	6,872,086 223%

Source: Economic Regulation Authority, 2024, Land Values for the 2025 Benchmark Reserve Capacity Price*, Report prepared by Landgate, p. 4, (online); Economic Regulation Authority, 2023,* Land Values for the 2024 Benchmark Reserve Capacity Price*, Report prepared by Landgate, p. 6, (online) and* WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, section 3.5 (online).*

Details on the land costs is available in Landgate's report which is published on the ERA website alongside this draft determination.[31] Landgate does not provide cost-escalated amounts in their land value assessments. The ERA, consistent with land cost price escalations in previous determinations, has escalated the land valuation by the Consumer Price Index up to 1 April 2027 as required by the WEM Procedure.

5.4 Transmission connection capital costs

Western Power provided the ERA with cost estimates for connecting the BESS to the transmission network which includes building the required substation and transmission lines.[32] The transmission connection costs is around $39 million with details in Western Power's report, which is available on the ERA's website alongside this draft determination.

29 Economic Regulation Authority, 2023, *2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year – Final determination*, p. 11, (online).

30 The total land costs includes price escalation which calculated in the BRCP calculation spreadsheet on the ERA's website – Economic Regulation Authority, 'Benchmark Reserve Capacity Price', (online).

31 Economic Regulation Authority, 2024, *Land Values for the 2025 Benchmark Reserve Capacity Price*, Report prepared by Landgate, (online).

32 Economic Regulation Authority, 2024, *Total Transmission Cost Estimate for the Benchmark Reserve Capacity Price for 2027/28*, Report prepared by Western Power, (online).

Western Power, following the BRCPs WEM Procedure, provided a cost escalation of 7.5 per cent for the transmission works.[33]

5.5 "M" margin

The "M" margin is for other ancillary, indirect and contingency costs associated with constructing a BESS which also includes insurance. This is estimated at 28.4 per cent of the BESS's total capital costs and totals around $89 million.

5.5.1 Other indirect costs

GHD provided an estimate of other indirect costs for constructing and installing the BESS of around $30 million (escalated to 1 April 2027).[34] These include:

- Connection agreements, dangerous goods licensing and market registration
- Environmental and developmental approvals
- Legal costs, insurance, water supply and commissioning costs
- Owner's engineering and construction management and support.

These costs were escalated using a forecast of Western Australia Wage Price Index as most of these costs are related to labour rates.[35]

5.5.2 Contingency

GHD advised that a contingency of 15 per cent of the total capital cost is typical for this kind of BESS build project, which amounts to around $59 million.[36]

5.6 Weighted Average Cost of Capital

The WACC is used to estimate the BESS's financing cost and the long-term required rate of return when determining the BRCPs' annualised costs. The 2025 BRCPs WACC is 10.10 per cent (up from the 9.54 per cent WACC for the 2024 BRCP) and is discussed in chapter 7 and detailed in Appendix 6.

[33] Economic Regulation Authority, 2024, *Total Transmission Cost Estimate for the Benchmark Reserve Capacity Price for 2027/28*, Report prepared by Western Power, p. 7. (online).

[34] Economic Regulation Authority, 2024, *Benchmark Reserve Capacity Price costs 2027/28 Capacity Year,* Report prepared by GHD Advisory, pp. 12-18, (online).

[35] Ibid, p. 24.

[36] Ibid, p. 19.

6. BESS fixed operating and maintenance costs

The BESS's fixed O&M costs accounts for 11 per cent of the BRCP with an estimated annual cost of around $8 million. This component covers the ongoing fixed O&M costs and includes:

- BESS O&M, BESS substation O&M and Balance of Plant O&M
- Connection assets fixed O&M costs
- Transmission network service charges
- Corporate overheads
- Site security services
- Local government rates.

Table 6 shows the breakdown of total cost across the various cost categories. GHD provided information that the ERA used to calculate the BRCPs' fixed O&M cost component.[37] A comparison of the BRCP's fixed operating & maintenance costs with the 2024 BRCP is detailed in Appendix 5.

Table 6: Fixed O&M costs by component

Component	Draft determination ($/Year)
Annualised fixed O&M costs	**8,132,636**
BESS, BESS substation and Balance of Plant O&M	5,046,096
Connection assets fixed O&M	124,983
Transmission network service charges	1,368,150
Corporate overheads	1,214,511
Site security	180,773
Local government rates	198,124

Source: ERA analysis of BRCP data using Economic Regulation Authority, 2024, Benchmark Reserve Capacity Price costs 2027/28 Capacity Year, *Report prepared by GHD Advisory, pp. 20-23, (online).*

6.1 BESS, BESS substation and Balance of Plant O&M

The BESS, substation and Balance of Plant O&M costs include:

- Electrical testing of the BESS substation
- Inspections and servicing of the battery modules and inverter stations
- Preventative maintenance on breakers, cables and other equipment.

This amounts to around $5 million a year, with details in GHD's report.[38]

[37] Economic Regulation Authority, 2024, *Benchmark Reserve Capacity Price costs 2027/28 Capacity Year,* Report prepared by GHD Advisory, p. 20-23, (online).

[38] Ibid, p. 20.

6.2 Connection assets fixed O&M

The connection asset fixed O&M is mostly for ongoing maintenance of:

- The connection switchyard
- The overhead transmission line.

These costs are mostly made up of labour and associated overhead costs and equipment, amounting to $0.1 million a year.[39]

6.3 Transmission network service charges

The BESS will incur Western Power transmission network service charges for using the electricity network. These charges are estimated at $1.4 million a year, based on the tariffs published by Western Power. This includes use of system charges and metering charges, with detailed information in GHD's report.[40]

6.4 Corporate overheads

These corporate overheads and other related consulting services amounts to around $1.2 million a year and comprises of:[41]

- Corporate overheads to cover office costs, employee insurance, office leases
- Insurance costs not associated with BESS plant warranties
- Legal and regulatory costs
- Subcontractors for maintenance, testing, checks and inspections
- Engineering support for the general operation and troubleshooting issues within the BESS.

6.5 Site security

BESS site security costs, including emergency response and regular inspections is estimated at $0.2 million a year.[42]

6.6 Local government rates

The local government rates are based on the BESS's 6.5 hectare gross rental value averaged across the local council areas containing Kwinana and Pinjar. The average rate amounts to $0.2 million a year, with details in GHD's report.[43]

39 Economic Regulation Authority, 2024, *Benchmark Reserve Capacity Price costs 2027/28 Capacity Year,* Report prepared by GHD Advisory, p. 21, (online).

40 Ibid.

41 Ibid, p. 22.

42 Ibid, p. 23.

43 Ibid.

7. Weighted Average Cost of Capital

Consistent with the BRCP market procedure change, the WACC method is appropriate for BESS projects.

The WACC is used to estimate the financing costs of BESS projects and represents the long-term required rate of return when determining the annualised cost of the BRCP reference technology.

For the 2025 BRCPs draft determination, the indicative nominal pre-tax WACC is 10.10 per cent. This is higher than the 9.54 per cent for the 2024 BRCP WACC. The higher 2025 BRCPs' WACC reflects the move to the BESS benchmark technology.

- As determined in the updated BRCPs WEM procedure, a BESS project has a higher level of risk, and requires a higher return, compared to the previous open cycle gas turbine technology.
- However, this is partially offset by a moderation of financial conditions since October 2023.

The WACC is discussed in detail in Appendix 7.

Appendix 1 List of Tables

Appendix 2 List of Figures

Appendix 3 2025 BRCPs by cost component

Given the changes to the reference technology, this Appendix provides a consolidated breakdown of the different components and their contribution to the overall BRCP (Table 7).

Table 7: Contribution to the BRCP by cost component

Component	Amount ($)	Contribution to the BRCP (%)
Capital Cost sub-total	**473,830,540**	**88.5**
Lithium-ion battery modules	177,600,000	33.2
Power Conversion System	27,800,000	5.2
Balance of Plant	30,856,922	5.8
Total construction costs	77,237,106	14.4
Land costs	9,947,818	1.9
Transmission connection capital costs	39,082,200	7.3
Other indirect costs	30,149,414	5.6
Contingency	58,901,019	11.0
WACC	22,256,061	4.2
Fixed O&M sub-total	**8,132,636**	**11.5**
BESS O&M	5,046,096	7.1
Transmission O&M	124,983	0.2
Transmission network service charges	1,368,150	1.9
Corporate overheads	1,214,511	1.7
Site security	180,773	0.3
Local Government rates	198,124	0.3
Capacity Credits	**200 MW**	**N/A**

Sources: ERA analysis of BRCP data.

Economic Regulation Authority, 2024, Benchmark Reserve Capacity Price costs 2027/28 Capacity Year, *Report prepared by GHD Advisory, (online).*

Economic Regulation Authority, 2024, Land Values for the 2025 Benchmark Reserve Capacity Price*, Report prepared by Landgate, (online).*

Economic Regulation Authority, 2024, Total Transmission Cost Estimate for the Benchmark Reserve Capacity Price for 2027/28*, Report prepared by Western Power, (online).*

Appendix 4 Comparison between the 2025 BRCPs draft determination and 2024 determination, by component

Table 8 details the differences between 2025 and 2024 BRCPs by cost component. As noted within this determination, caution is needed when comparing the BRCP values due to the changes in the BRCP WEM Procedure following the Coordinator of Energy's determination of the Benchmark Capacity Provider being a 200 MW / 800 MWh Lithium-ion BESS.

Table 8: Comparison between the 2025 BRCP draft determination and 2024 BRCP by component

Component	2025 draft determination	2024 final determination	Change from 2024
Expected capacity credits (MW)	200	151.17	48.83
Weighted Average Cost of Capital	10.10%	9.54%	56 basis points
Power station cost ($/MW)	1,567,470	974,854	592,616
Margin for legal, financing, and other costs	28.4%	16.35%	12.05 percentage points
Transmission Costs ($/MW)	195,411	207,493	(12,082)
Fixed Fuel Costs ($)	N/A[44]	8,580,419	(8,580,419)
Land Costs ($)	9,947,818	3,075,732	6,872,086
Generation O&M cost ($/MW/year)	25,230	17,688	7,542
Switchyard and transmission line O&M costs ($/MW/year)[45]	625	691	(66)
Asset Insurance Costs ($/MW/year)	N/A[46]	8,392	See footnote 46.
Fixed Network Access and ongoing charges ($/MW/year)	6,841	13,037	(6,196)
Total Capital Costs ($)	**473,830,540**	**224,489,747**	**249,340,793**
Annualised capital costs ($/year)	**62,652,303**	**28,751,257**	**33,901,046**

[44] A BESS does not have any fixed fuel costs whereas the previous OCGT required 14 hours of diesel fuel.

[45] This is the combined transmission and switchyard O&M costs which were shown separately in previous BRCP determinations. These costs were not separated in the 2025 BRCP draft determination and are quoted together.

[46] Asset insurance costs are now part of the corporate overheads cost component within the fixed O&M costs and is no longer a separate line item.

Component	2025 draft determination	2024 final determination	Change from 2024
Annualised fixed O&M ($/MW/year)	**40,663**	**39,809**	**854**
BRCP ($/MW/year)	**354,000**	**230,000**	**124,000**

Source: ERA analysis of BRCP data and Economic Regulation Authority, 2023, 2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year – Final determination*, p. 21, (online).*

Appendix 5 Annualised capital costs

The formula for calculating the BRCP capital costs is:

$$CAPITAL\ COST\ = [PC\ \times (1 + M) + TC + LC] \times (1 + WACC)\text{^}0.5$$

The values for each input in the capital cost formula is provided in Table 9.

Table 9: Comparison of the 2025 BRCP draft determination and 2024 BRCP capital costs

Component	2025 draft determination	2024 final determination	Change
Power station cost (PC) ($/MW)	1,567,470	974,854	592,616
Weighted Average Cost of Capital (WACC)	10.10%	9.54%	56 basis points
Expected capacity credits (MW)	200	151.17	48.83
Margin for legal, financing, and other costs (M) (%)	28.4 [47]	16.35	12.05 percentage points
Transmission Costs (TC) ($/MW)	195,411	207,493	(12,082)
Fixed Fuel Costs (FFC) ($)	N/A	8,580,419	(8,580,419)
Land Costs (LC) ($)	9,947,818	3,075,732	6,872,086
Total Capital Costs ($)	**473,830,540**	**224,489,747**	**249,340,793**
Annualised capital costs ($/Year)	**62,652,303**	**28,751,257**	**33,901,046**

Source: ERA analysis of BRCP data and Economic Regulation Authority, 2023, 2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year – Final determination*, p. 23, (online).*

[47] The 2025 BRCP "M" margin of 28.4 per cent was calculated by adding the other indirect costs ($30.2 million) and contingency ($58.9 million) and dividing that by the power station's costs, comprising of the lithium-ion battery modules ($177.6 million), the power conversion system ($27.8 million), the electrical and control balance of plant costs ($30.9 million) and the total construction costs ($77.2 million).

Appendix 6 Other operating and maintenance costs

This appendix covers the other components that contributed to the increase in the fixed operating and maintenance costs discussed in Chapter 6 and detailed in Table 10 below.

Table 10: Comparison of 2025 BRCP annualised fixed O&M costs draft determination values to 2024 BRCP values

Component	2025 draft determination	2024 final determination	Change
Annualised fixed O&M costs ($/MW/year)	**40,663**	**39,809**	**854**
Generation O&M costs ($/MW/year)	25,230	17,688	7,542
Fixed network access and ongoing charges ($/MW/year)	6,841	13,037	(6,196)
Asset insurance costs ($/MW/year)	N/A[48]	8,392	N/A
Switchyard and transmission line O&M costs ($/MW/year)[49]	625	691	(66)

Source: ERA analysis of BRCP data and Economic Regulation Authority, 2023, 2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year – Final determination*, p. 26, (online).*

[48] The asset insurance costs are now part of the corporate overheads cost component within the fixed O&M costs and is no longer a separate line item (see section 6.4).

[49] This is the combined transmission and switchyard O&M costs which were shown separately in previous BRCP determinations. These costs were not separated in the 2025 BRCP draft determination and are quoted together.

Appendix 7 Weighted Average Cost of Capital

The weighted average cost of capital (WACC) is a calculation of a firm's cost of capital in which each component of capital, debt and equity, is proportionately weighted.

For the determination of the BRCP, the WACC:

1. Represents a long-term required rate of return.
2. Is used in an annuity calculation to calculate an annual compensation amount to investors for capital costs over the life of the asset.
3. Is updated annually to reflect efficient financing costs at a point in time.

Calculation of the WACC in the market procedure

Section 4.2 of the WEM procedure directs the ERA on how the WACC for the BRCP is to be calculated.[50]

Specifically, clauses 4.2.5 and 4.2.6 of the WEM procedure detail the high-level framework to be used:

4.2.5 The ERA must compute the WACC on the following basis:

(a) The WACC must use the Capital Asset Pricing Model (**CAPM**) as the basis for calculating the return to equity.

(b) The WACC must be computed on a pre-tax basis.

(c) The WACC must use the standard Officer WACC method as the basis of calculation.

4.2.6 The pre-tax Officer WACC must be calculated using the following formulae:

$$WACC_{\ nominal} = \frac{1}{(1 - t(1 - \gamma))} R_e \frac{E}{V} + R_d \frac{D}{V}$$

Where:

(a) R_e is the nominal return on equity (estimated using CAPM) and is calculated as:

$$R_e = R_f + \beta_e \times MRP$$

Where:

(i) R_f is the nominal risk free rate;

(ii) β_e is the equity beta; and

(iii) MRP is the market risk premium.

(b) R_d is the nominal return on debt and is calculated as:

[50] *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, section 4.2 (online).

$$R_d = R_f + DM$$

Where:

(i) R_f is the nominal risk free rate for the Capacity Year;

(ii) DM is the debt margin, which is calculated as the sum of the debt risk premium (DRP) and debt issuance cost (d).

(c) t is the benchmark rate of corporate income taxation, established at either an estimated effective rate or a value of the statutory taxation rate;

(d) γ is the value of franking credits;

(e) $\frac{E}{V}$ is market value of equity as a proportion of the market value of total assets;

(f) $\frac{D}{V}$ is market value of debt as a proportion of the market value of total assets;

(g) The nominal risk-free rate is based on the annualised yield on Commonwealth Government bonds with a maturity of 10 years:

- using the indicative mid rates published by the Reserve Bank of Australia; and
- averaged over a 20-trading day period;

(h) The debt risk premium, DRP, is a margin above the risk free rate reflecting the risk in provision of debt finance. This will be estimated by the ERA as the margin between the annualised yields of Australian corporate bonds which have a BBB (or equivalent) credit rating from Standard and Poor's and the nominal risk free rate;[51]

(i) If there are no Commonwealth Government bonds with a maturity of 10 years on any day in the period referred to in Clause 4.2.6(g) of this WEM Procedure, the ERA may estimate the nominal risk free rate by interpolating on a straight line basis from the two bonds closest to the 10 year term and which also straddle the 10 year expiry date; and

(j) If the methods used in step Clause 4.2.6(i) of this WEM Procedure cannot be applied due to suitable bond terms being unavailable, the ERA may estimate the nominal risk free rate by means of an appropriate approximation.

Since the ERA is responsible for calculating the 2025 BRCP, the ERA must estimate the WACC following the WEM Procedure process. The ERA's annual BRCP determination involves two sets of components listed in clause 4.2.7:

- Annual components, which require review each year and comprises of the risk free rate, debt risk premium and corporate tax rate.
- Structural components, which are fixed in the WEM Procedure until the ERA's next BRCP review. These components include the market risk premium, equity beta, debt issuance costs, franking credit value and gearing ratio.

[51] The ERA applies the revised bond yield approach to estimate the debt risk premium. The revised bond yield approach is detailed in the 2022 final gas rate of return instrument. Economic Regulation Authority, 2023, *2022 final gas rate of return instrument*, Amended 12 September 2023, (online).

Clause 4.2.7 of the WEM Procedure details the parameters that the WACC must use as variables each year (see Table 11):

Table 11: WACC parameters for the BRCP calculation

CAPM parameter	Notation/Determination	Component	Value
The following variables are to be determined			
Nominal risk free rate of return	R_f	Annual	
Debt risk premium	DRP	Annual	
Corporate tax rate	t	Annual	
The following variables are specified in the WEM Procedure			
Market risk premium (%)	MRP	Fixed	5.80
Equity beta	β_e	Fixed	1.2
Debt issuance costs (%)	d	Fixed	0.165
Franking credit value	γ	Fixed	0.50
Debt to total assets ratio (%)	$\frac{D}{V}$	Fixed	40
Equity to total assets ratio (%)	$\frac{E}{V}$	Fixed	60

Source: WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, clause 4.2.7 (online).*

Updated annual WACC

The ERA has reviewed and calculated the annual components listed in the WEM Procedure, which are the nominal risk free rate, the debt risk premium, and the corporate tax rate.

Nominal risk free rate

The risk free rate is the return an investor would expect when investing in an asset with no risk. This is the rate of return an investor receives from holding an asset with a guaranteed payment stream. Since there is no likelihood of default, the return on risk free assets compensates investors for the time value of money.

For the BRCP calculation, the WEM procedure uses Commonwealth Government bonds as the proxy for risk free assets in Australia when estimating the risk free rate of return. To estimate the risk free rate, the WEM procedure uses indicative mid-rates published by the Reserve Bank of Australia (RBA). Where there are no Commonwealth Government bonds with a maturity of exactly 10 years, the ERA interpolates the risk free rate on a straight line basis.

The use of a 10-year term for the risk free rate is consistent with the purpose of BRCP WACC calculations, which is to reflect a long-term rate of return for the annuitisation of capital costs over the life of the BESS project.

The BRCP process uses a nominal risk free rate, which includes a component for the market expectations of inflation.

As an indicative figure for the draft 2025 BRCP determination, the ERA estimates a nominal risk free rate of 3.95 per cent.[52] This is lower than the 4.69 per cent nominal risk free rate for the 2024 BRCP.[53]

Debt risk premium

The debt risk premium is the rate of return above the risk free rate that lenders require to compensate them for lending funds to a firm. The debt risk premium compensates debt holders for the possibility of default by the issuer.

The debt risk premium is closely aligned with the risk of the business. When issuing debt in the form of bonds, a credit rating can be assigned that reflects the probability of default by the issuer, and therefore the risk present in that entity's bonds. The market procedure requires the use of a BBB (or equivalent) credit rating from Standard and Poor's.[54]

The ERA uses a "revised bond yield approach" to determine the debt risk premium at a point in time by:[55]

Step 1: Determining the benchmark sample – Identifying a sample of relevant domestic and international corporate bonds that reflect the BBB credit rating.[56]

Step 2: Collecting data and converting the bond yields to Australian dollar equivalents.

Step 3: Averaging yields over the averaging period - Calculating an average Australian dollar equivalent bond yield for each bond across the averaging period.

Step 4: Estimating curves – Estimating yield curves on the bond data by applying the Gaussian Kernel, Nelson-Siegel and Nelson-Siegel-Svensson techniques.[57]

Step 5 - Estimating the return on debt – Calculating the simple average of the three yield curves' 10-year costs of debt to arrive at a market estimate of the 10-year cost of debt.

52 The nominal risk free rate of 3.95 per cent is based on a 20-trading day averaging period up to 30 September 2024.

53 Economic Regulation Authority, 2023, *2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year: Final determination*, p.13, (online). Based on a 20-trading day averaging period up to 31 October 2023.

54 *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, clause 4.2.6(h) (online).

55 Economic Regulation Authority, 2023, *2022 final gas rate of return instrument,* Amended 12 September 2023, p.12, (online).

56 The WEM Procedure Change Report for the BRCP details that the new reference technology for the purposes of BRCP having a credit rating of BBB.

57 The Gaussian Kernel method recognises that the observed spreads on bonds with residual maturities close to the target tenor (or maturity) contains more relevant information for estimation. The Nelson-Siegel model captures many of the typical observed shapes that the yield curve assumes over time. As an extension of the Nelson-Siegel model, the Nelson-Siegel-Svensson method incorporates additional flexibility to more precisely capture the movement of the yield curve in a more volatile market.

Step 6 – Calculating the debt risk premium by subtracting the 10-year risk free rate from the 10-year cost of debt.

As an indicative figure for the draft 2025 BRCP determination, the ERA estimates a debt risk premium of 1.892 per cent.[58] This is lower than the 2.153 per cent debt risk premium for the 2024 BRCP.[59]

The debt risk premium will be updated in the ERA's final determination for the BRCP to account for changes to debt markets.

Corporate tax rate

The ERA has reviewed the corporate tax rate which has not changed from the 30 per cent rate.

Updated BRCP WACC

This appendix provides an illustrative rate of return for the BRCP based on the approach detailed in the WEM Procedure and the 20-trading day averaging period ending 30 September 2024.

For the draft 2025 BRCPs, the indicative nominal pre-tax WACC is 10.10 per cent (see Table 12). This is higher than the 9.54 per cent nominal pre-tax WACC for the 2024 BRCP.[60]

The higher 2025 BRCP WACC reflects:

- The move to the BESS benchmark technology.
  - As determined in the updated BRCP market procedure, a BESS project has a higher level of risk, and requires a higher return, compared to the previous gas turbine technology.
  - This is partially offset by a moderation of financial conditions since October 2023.

58 The debt risk premium of 1.892 per cent is based on a 20-trading day averaging period up to 30 September 2024.

59 Economic Regulation Authority, 2023, *2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year: Final determination*, p.13, (online). Based on a 20-trading day averaging period up to 31 October 2023.

60 Ibid.

Table 12: Indicative WACC for the 2025 BRCPs draft determination with the 2024 WACC values

Parameter	2025 draft determination value	2024 value[61]
Estimation date	30 September 2024	31 October 2023
Cost of equity parameters		
Nominal risk free rate (%)	3.95	4.69
Equity beta	1.20	0.83
Market risk premium (%)	5.80	5.90
Pre-tax return on equity (%)	12.84	11.28
Cost of debt parameters		
Nominal risk free rate (%)	3.95	4.69
Debt risk premium (%)	1.892	2.153
Debt issuance costs (%)	0.165	0.100
Pre-tax return on debt (%)	6.01	6.94
Other parameters		
Debt proportion (gearing) (%)	40	40
Franking credits (gamma) (%)	50	50
Corporate tax rate (%)	30	30
Weighted Average Cost of Capital		
Nominal pre-tax WACC (%)	**10.10**	**9.54**

Source: ERA analysis.

[61] Economic Regulation Authority, 2023, *2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year: Final determination*, p.13, (online).