Economic Regulation Authority

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

Final determination

19 December 2024

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Executive summary

To meet consumer demand for electricity, adequate capacity must be installed and be available within the electricity system. The Reserve Capacity Mechanism ensures that there is sufficient capacity installed within the South West Interconnected System (SWIS). The Benchmark Reserve Capacity Prices (BRCPs) are a component of the Reserve Capacity Mechanism that provide pricing signals to encourage capacity to be installed in the SWIS. The Economic Regulation Authority annually determines the BRCP.[1]

The ERA's 2025 BRCPs determination is $360,700 per Megawatt (MW) per year for both the Peak and Flexible BRCPs.[2] The BRCPs will be used to calculate the Peak Reserve Capacity Price and the Flexible Reserve Capacity Price for the 2027/28 capacity year, which will be the price paid to capacity providers holding Peak or Flexible Capacity Credits, respectively.[3]

We determined the BRCPs by following the BRCP WEM Procedure, which requires a cost estimate of building and connecting a hypothetical 200 MW / 800 MWh Battery Energy Storage System to the SWIS and its fixed operational and maintenance costs over a 15-year life.[4] Since both the Peak BRCP and Flexible BRCP are based on the same technology specifications, the BRCPs are the same.[5]

The ERA's determination of $360,700 per MW per year is 57 per cent higher than the 2024 BRCP of $230,000 per MW per year.[6] This increase is mostly from the change in the reference technology requirements from a 160 MW open cycle gas turbine (OCGT) peaking generator 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 costs more to build, which has contributed to the BRCPs' increase.

The ERA's final determination of $360,700 per MW per year is 1.9 per cent higher than its draft determination ($354,000 per MW per year), published in November 2024. The increase is due to updated financial information that resulted in an increase in the weighted average cost of capital, partially offset by a decrease in forecast inflation. The ERA received four submissions on the draft determination from Alinta Energy, the WA Expert Consumer Panel, First Element Energy and Synergy.

The ERA used data and analysis from consultant GHD Advisory, Western Power and Landgate to make this determination and has published the supporting analysis.[7]

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1 The reserve capacity timeline is defined in the Wholesale Electricity Market Rules (WA), 20 November 2024, Rule 4.1, (online).

2 The Peak Reserve Capacity Price is paid to capacity providers for each MW of capacity that they make available to the Wholesale Electricity Market (WEM). All capacity credit holders receive capacity payments. Although generators are the largest capacity credit holders, storage systems and demand side programmes can be assigned capacity credits. Generators that do not participate in the Reserve Capacity Mechanism (or are ineligible) do not receive capacity payments.

The newly introduced Flexible Reserve Capacity Price is the price paid to those capacity providers with available capacity that is 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.

3 A capacity year starts at 8am on 1 October of the relevant year and ends at 8am on 1 October in the subsequent year.

4 WEM Procedure: Benchmark Reserve Capacity Prices, 1 August 2024, (online).

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

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

7 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.[8] In December 2023, the Coordinator determined the Benchmark Capacity Provider to be a 200 MW / 800 MWh Battery Energy Storage System (BESS) installed in the Pinjar or Kwinana regions. The ERA consequently updated the BRCPs WEM Procedure to reflect the Coordinator's determination and followed that WEM Procedure to determine the BRCPs for the 2027/28 capacity year.[9] From 2027/28 on, a new Reserve Capacity Credit, the Flexible Reserve Capacity Credit, will provide a pricing signal for capacity providers that have the capability to respond rapidly to large changes in demand.[10] The ERA is required to determine BRCPs for both Peak and Flexible Reserve Capacity.[11]

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).[12] 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.[13] The 2025 BRCPs are based on a bottom-up, annualised cost estimate for a BESS, with costs escalated to 2027.[14,15] These cost estimate components are detailed in chapter 3, chapter 5 and chapter 6 of this determination.

1.1 Changes from previous determinations

The main differences between previous BRCP determinations and the current determinations are:

- A change in the reference technology from a 160 MW OCGT that can run on diesel fuel to a 200 MW / 800 MWh BESS.

8 Energy Policy WA, 2023, *Coordinator of Energy Determination: Benchmark Capacity Providers – Peak Capacity Provider and Flexible Capacity Provider*, p. 5, (online).

9 Ibid.

10 Energy Policy WA, 2023, *BRCP Reference Technology Review – Consultation Paper*, p. 10, (online)

11 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.

12 The BESS specifications are detailed in section 2.1 of the *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, p.3, (online).

13 AEMO conducts the reserve capacity price determination process in accordance with the reserve capacity timeline defined under Wholesale Electricity Market Rules (WA), 20 November 2024, Rule 4.1, (online).

14 A capacity year commences on 1 October each year – Wholesale Electricity Market Rules (WA), 20 November 2024, Chapter 11, (online).

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

- The BESS must be installed and connected to the Western Power network in either the Pinjar or Kwinana regions.
- The ERA must determine both a Peak BRCP and a Flexible BRCP – however both are 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 regarding costs for consumers 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 changed materially from how they were calculated and determined in previous BRCP determinations.

1.2 References throughout this determination

Throughout this determination:

- References to the WEM procedure refers to the BRCPs WEM Procedure unless otherwise specified.[17]
- 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 determination of $360,700 per MW per year for the 2027/28 capacity year, unless otherwise specified.[18]

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

17 WEM Procedure: Benchmark Reserve Capacity Prices, 1 August 2024, (online).

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

2. Scope of determination

The scope of the ERA's BRCPs determinations is detailed in the BRCPs WEM procedure which sets out how the BRCPs are to be determined and how the different components must be calculated. The 2025 BRCPs that will apply to 2027/28 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.
- The operational and maintenance costs, and costs of financing the BESS over the 15-year expected lifespan.

In detail, the BRCPs' major cost components consist of:

- The annualised total capital cost of building and connecting 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.

The BRCPs are determined using a Weighted Average Cost of Capital (WACC) approach across a 15-year expected economic life. The 15-year expected economic life is specified in the WEM Procedure and was arrived at based on the typical financing terms for large scale battery projects and the expected life of cycling lithium-ion battery cells given typical battery cycling degradation profiles.[19] This was covered in detail in the ERA's BRCP WEM Procedure review which had regard to advice from consultant GHD and stakeholder submissions.[20]

[19] *WEM Procedure: Benchmark Reserve Capacity Prices*, 1 August 2024, paragraph 2.2.3(a)(ii) (online), and Economic Regulation Authority, 2024, *Procedure Change Report: Benchmark Reserve Capacity Prices – [EEPC_2024_01]*, p. 28 (online).

[20] See Economic Regulation Authority, 2024, *Procedure Change Report: Benchmark Reserve Capacity Prices – [EEPC_2024_01]*, pp. 28-29 (online), and the accompanying GHD report: Economic Regulation Authority, 2024, *Benchmark lithium BESS costs, BRCP procedure update,* Report prepared by GHD, pp. 11-16 (online). When undertaking the review of the BRCP WEM Procedure, which the ERA must do at least once every five years (Wholesale Electricity Market Rules (WA), 20 November 2024, Rule 4.16.9), the WEM Procedure will account for the expected life of the Benchmark Capacity Provider. In the case of a lithium-ion battery, if the benchmark technology remained the same and the life increased, the ERA would update this accordingly as part of its review.

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.

2.1 Stakeholder feedback

Following the ERA's publication of the 2025 BRCPs draft determination, four submissions were received from stakeholders Alinta Energy, the Expert Consumer Panel, First Element Energy and Synergy.[21]

All stakeholder feedback has been considered by the ERA and has been referenced in this determination wherever possible. While some of the issues raised in the submissions are outside of the ERA's annual BRCP determination process, they may be considered in the ERA's next review of the BRCPs WEM Procedure. These issues include determining the BRCP based on a gross Cost of New Entry basis, battery duration requirements and network constraints.

A summary of all stakeholder feedback, and the ERA's response to the issues raised, is provided in Appendix 3.

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

3. Final determination

The ERA's determination of the 2025 BRCPs for both peak and flexible capacity is $360,700 per MW per year for the 2027/28 capacity year (see Table 1).[22]

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

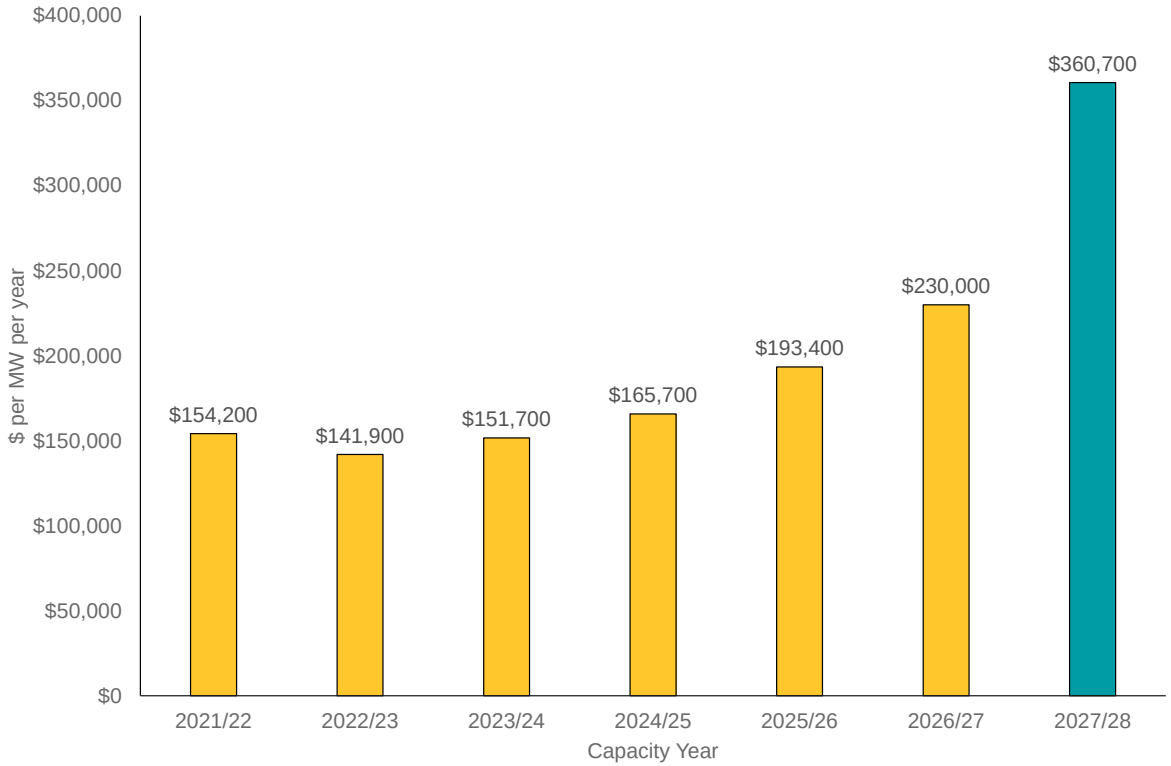
BRCP type	In $ per MW per year
Peak BRCP	360,700
Flexible BRCP	360,700

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, the BRCPs are the same. The BRCPs will differ if the specifications, characteristics or underlying technology for each BRCP differs. AEMO will use the appropriate BRCP to determine the Peak and Flexible Reserve Capacity Prices for 2027/28.

Figure 1 shows the Peak BRCPs since the 2021/22 capacity year. The large increase in 2027/28 is primarily due to the more expensive battery reference technology relative to the previous OCGT peaking generator technology.

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 was determined based on a 200 MW / 800 MWh BESS.

[22] Wholesale Electricity Market Rules (WA), 20 November 2024, Rule 4.16.1, (online).

3.1 The BRCP calculation

The BRCP is calculated using the following formula:[23]

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

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 6).

   ii. Annualised over a 15-year period using a nominal Weighted Average Cost of Capital (WACC) (see section 5.6 and Appendix 8).

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) (see section 3.2).

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

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

Component	2025 determination	2024 determination	Change from 2024
BRCP ($/MW/Year)	**360,700**	**230,000**	**130,700 57%**
Annualised capital costs ($/Year)	64,016,990	28,751,257	35,265,733 123%
Annualised fixed O&M costs ($/Year)	8,121,329	6,017,942 [24]	2,103,387 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 section 1.1). Most of the change is due to the change in reference

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

[24] 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).

technology as the BESS has significantly different characteristics and specifications to the previous OCGT reference technology.

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 5, Appendix 6 and Appendix 7. Differences between the 2025 BRCP draft determination and final determination are in chapter 4.

The ERA has published the BRCPs calculation spreadsheet on the ERA's website to provide transparency of the BRCP calculation.[25]

3.2 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 size accounts for degradation between construction, commissioning and the start of the 2027/28 capacity year, as well as a degree of oversizing to account for expected degradation over the 15-year life. This is detailed in GHD's report.[26]

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.[27] This is discussed in the ERA's BRCPs Procedure review.[28]

3.2.1 Stakeholder feedback on network availability

Alinta and Synergy commented on the availability within the network as an important issue that the ERA needs to account for when determining the BRCP. The ERA followed the BRCP WEM Procedure which, when it was updated, extensively consulted on different aspects of the BRCP determination process. The update to the BRCP WEM Procedure had to align with the decisions made by the Coordinator of Energy in their Benchmark Capacity Providers determination which specifically referenced that the BESS is to be installed into an unconstrained part of the network within the Pinjar and Kwinana regions.

When assessing the network around Pinjar and Kwinana, the ERA noted that the congestion around the Pinjar region would be relieved by Western Power's network expansion as part of stage one of meeting Energy Policy WA's SWIS demand assessment study.[29] However, the ERA did note that if the areas specified by the Coordinator of Energy become constrained parts of the network, the BRCP's amount of capacity credits expected to be awarded would need to be adjusted to account for the network congestion.[30] If the BRCP battery was assigned

25 Economic Regulation Authority, 'Benchmark Reserve Capacity Price', (online).

26 This is included in the uplift in the battery modules component of the BESS – see: Economic Regulation Authority, 2024, *Benchmark lithium BESS costs, PRCP procedure update,* Report prepared by GHD, p. 10 (online).

27 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.

28 Economic Regulation Authority, 2024, *Procedure Change Report: Benchmark Reserve Capacity Prices*, pp. 5-6, (online).

29 Energy Policy WA, 2023, *SWIS Demand Assessment 2023 to 2042 – A future ready grid*, pp. 10-11 (online) [accessed 30 November 2024].

30 Economic Regulation Authority, 2024, *Procedure Change Proposal: Benchmark Reserve Capacity Price – [EEPC_2024_01],* pp. 11-12 (online).

less capacity credits due to network congestion, then the BRCP would increase relative to the battery receiving all 200 MW of capacity credits due to the battery's total costs being recovered over a lesser amount of capacity credits. That is, the amount of revenue required per capacity credit would need to increase to compensate for the loss of capacity credits due to network congestion.

The ERA agrees that transparency of network availability would aid those capacity providers seeking to add new capacity to the SWIS as network congestion can have a significant impact on a project's finances.[31] The ERA must review the BRCP WEM Procedure whenever the Coordinator of Energy changes their Benchmark Capacity Provider determination from previous determinations, which includes any changes regarding network availability for the BRCP reference technology.

[31] The ERA references the example of Waroona Energy which was certified for 87 MW of capacity but received zero capacity credits for the 2026/27 capacity year after the capacity credit assignment process. See Parkinson G., 2 October 2024, 'Battery hopeful licks its wounds after missing out on capacity credits as grid shortfall erased', *Renew Economy*, (online) [accessed 30 November 2024]; Australian Energy Market Operator, 2024, *Summary of Certified Reserve Capacity Assigned by Facility for the 2024 Reserve Capacity Cycle*, (online); and Australian Energy Market Operator, 2024, *Capacity Credits since market start up to 2026-27*, (online).

4. Changes between the draft and final determinations

The final determination reflects the latest information available to the ERA when making the BRCPs determinations. The main changes to the cost components are shown in Table 3 and are driven by:

- A reduction in forecast inflation which reduced those BRCP cost components that have been escalated based on the Consumer Price Index (CPI).[32]
- An increase in the weighted average cost of capital (WACC) (detailed in chapter 7 and Appendix 8).

Although the decrease in inflation resulted in some cost components decreasing, this was more than offset by the increase in the WACC. This has resulted in a BRCP final determination of $360,700 per MW per year being 1.9 per cent higher than in the draft determination.

Table 3: Differences between the 2025 final and draft determination components

Cost component	2025 final determination	2025 draft determination	Change
BRCP ($/MW/year)	360,700	354,000	6,700 1.9%
WACC	10.46%	10.10%	36 basis points 3.6%
Annualised BESS capital costs ($/year)	64,016,990	62,652,303	1,364,687 2.2%
Annualised fixed O&M costs ($/year)	8,121,329	8,132,636	(11,308) (0.1%)
Total development and capital costs ($)	474,395,074	473,830,540	564,534 0.1%
Balance of plant ($)	30,725,852	30,856,922	(131,070) (0.4%)
Land costs ($)	9,905,563	9,947,818	(42,255) (0.4%)
Contingency costs ($)	58,875,020	58,901,019	(25,999) (0.0%)
BESS O&M ($)	5,041,739	5,046,096	(4,357) (0.1%)

[32] The forecast CPI for the ERA's BRCPs final determination is from the Reserve Bank of Australia, 2024, *Statement on Monetary Policy – November 2024*, p. 55 (online) which forecast 2.5 per cent in FY2025, and 3.1 per cent in FY 2026. This was lower than the forecast CPI at the time of the draft determination that is from the Reserve Bank of Australia, 2024, *Statement on Monetary Policy – August 2024*, p. 57 (online) which forecast CPI at 2.8 per cent in FY2025, and 3.2 per cent in FY 2026. These figures were used in the ERA's BRCP calculation spreadsheet available on the ERA's BRCPs webpage.

Cost component	2025 final determination	2025 draft determination	Change
Transmission O&M ($)	124,875	124,983	(108) (0.1%)
Transmission network service charges	1,362,173	1,368,150	(5,977) (0.4%)
Local government rates	197,258	198,124	(866) (0.4%)

Source: ERA analysis of BRCP data and ERA's 2025 BRCPs draft determination (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 $64 million). The BRCPs WEM Procedure sets out how to calculate these costs (see Appendix 6).[33]

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 4). 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 4 is discussed in the rest of this chapter. For completeness, a comparison of the 2025 BRCPs against the 2024 BRCP is provided in Appendix 5.

Table 4: BESS capital cost components

Cost component	2025 determination	Contribution to total capital cost (%)
Supply and Installation costs	236,125,852	50
Construction cost	77,237,106	16
Transmission connection capital costs	39,082,200	8
Land costs	9,905,563	2
Other indirect costs	30,149,414	6
Contingency costs	58,875,020	12
Weighted Average Cost of Capital[34]	23,019,918	5
Total BESS capital costs	**474,395,074**	N/A
Annualised capital cost ($/year)	**64,016,990**	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 BRCPs. The BESS supply and installation cost components are in Table 5.

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

[34] The weighted average cost of capital (WACC) is 10.46 per cent – see chapter 7. The 5 per cent amount shown in Table 4 represents the contribution of the WACC ($23 million) to the total BESS capital costs ($474 million).

Table 5: 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)	30,725,852	6
Total BESS supply and installation costs	**236,125,852**	**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.*

Note: Figures may not add up exactly due to rounding.

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.[35] This was estimated at around $178 million by GHD based on original equipment manufacturer information and is detailed in GHD's report which includes an uplift to account for degradation.[36]

5.1.2 Power conversion system

The power conversion system, estimated to cost around $28 million, comprises of inverters that converts the direct current from the battery cells to alternating current for feeding into the Western Power network.[37] This estimate is based on information from original equipment manufacturers, obtained by GHD.

5.1.3 Balance of plant (materials and equipment)

The balance of plant, estimated at around $31 million, covers the supply and delivery of cables, transformers and other materials relevant to a BESS facility.[38]

As required by the BRCPs WEM Procedure, these balance of plant costs have been escalated to costs as at 1 April 2027, based on CPI forecasts.[39] The escalation is to forecast these expected costs that will be incurred by the facility before the start of the 2027/28 capacity year.

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

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

37 Ibid.

38 Ibid.

39 Reserve Bank of Australia, 2024, *Statement on Monetary Policy – November 2024*, p. 55 (online).

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 on the ERA's website.[40]

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).[41] This is due to two main reasons (see Table 6):

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

Table 6: Comparison of the land cost between the 2024 and 2025 BRCP determinations

BRCP land component	2025 determination	2024 determination	Difference
Average land cost per hectare ($)	1,412,500	780,714	631,786 81%
Total hectares required	6.5	3	3.5
Total land cost[42] ($)	9,905,563	3,075,732	6,829,831 222%

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 are available in Landgate's report, which is available on the ERA website.[43] 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 CPI up to 1 April 2027 as required by the WEM Procedure.

40 Economic Regulation Authority, 2024, *Benchmark Reserve Capacity Price costs 2027/28 Capacity Year,* Report prepared by GHD Advisory, pp. 10-11, (online).

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

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

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

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.[44] The transmission connection costs is around $39 million and is detailed in Western Power's report, which is available on the ERA's website.

Western Power, following the BRCPs WEM Procedure, provided a cost escalation of 7.5 per cent for the transmission works for the BRCP determination.[45]

5.5 "M" margin

The "M" margin is for other ancillary, indirect and contingency costs associated with constructing a BESS which also includes insurance. In previous BRCP determinations, the "M" margin was calculated as a percentage of BRCP reference technology's total installation and construction costs. To allow comparisons with previous BRCP determinations, when the same method is applied to the BESS's total installation and construction costs, the "M" margin came to around 28 per cent.[46] The "M" margin totalled around $89 million, with its components detailed below.

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).[47] 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's Wage Price Index, which is appropriate given most of these costs relate to labour costs.[48]

5.5.2 Contingency

GHD advised that a contingency of 15 per cent of the total capital cost is typical for large scale wholesale BESS projects, which amounts to around $59 million.[49]

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

45 Ibid, p. 7.

46 The 2025 BRCP "M" margin of 28.4 per cent was calculated by adding the other indirect costs ($30.1 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 ($30.7 million) and the total construction costs ($77.2 million). This is consistent with how the "M" Margin was derived in previous BRCP determinations.

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

48 Ibid, p. 24.

49 Ibid, p. 19.

5.6 Weighted Average Cost of Capital

The WACC is an estimate of the BESS's financing cost and investor's associated long-term required rate of return for determining the BRCP's annualised costs. The 2025 BRCPs WACC is 10.46 per cent (up from the 9.54 per cent WACC for the 2024 BRCP) and is discussed in chapter 7 and detailed in Appendix 8.

6. BESS fixed operating and maintenance costs

The BESS's fixed O&M costs accounts for around 11 per cent of the BRCP with an estimated annual cost of around $8 million. The ongoing fixed O&M costs 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 7 shows the breakdown of total cost across the various fixed O&M cost categories. GHD provided information that the ERA has used to calculate the BRCPs' fixed O&M cost component.[50] A comparison of the BRCP's fixed operating & maintenance costs with the 2024 BRCP is detailed in Appendix 5.

Table 7: Fixed O&M costs by component

Component	Determination ($/Year)
Annualised fixed O&M costs	**8,121,329**
BESS, BESS substation and balance of plant O&M	5,041,739
Connection assets fixed O&M	124,875
Transmission network service charges	1,362,173
Corporate overheads	1,214,511
Site security	180,773
Local government rates	197,258

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, 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.[51]

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

[51] Ibid, p. 20.

6.2 Connection assets fixed O&M

The connection asset fixed O&M mostly consists of costs for the ongoing maintenance of the connection switchyard and the overhead transmission line.

These costs are mostly labour and associated overhead and equipment costs amounting to $0.1 million a year.[52]

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 further information in GHD's report, available on the ERA's website.[53]

6.4 Corporate overheads

Corporate overheads and other related consulting services required for ongoing running of the BESS amounts to around $1.2 million a year and comprises of:[54]

- 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 and is in GHD's report.[55]

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 that contain the Kwinana and Pinjar regions. The average rate amounts to $0.2 million a year, with details in GHD's report.[56]

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

53 Ibid.

54 Ibid, p. 22.

55 Ibid, p. 23.

56 Ibid.

7. Weighted Average Cost of Capital

The WACC method is being applied to the BESS project costings, consistent with the BRCPs WEM procedure. The WACC is used to estimate the financing costs of the BESS project and represents the long-term required rate of return when determining the annualised cost of the BRCP reference technology.

For the 2025 BRCPs final determination, the nominal pre-tax WACC is 10.46 per cent (see Table 8). This is higher than the 9.54 per cent nominal pre-tax WACC for the 2024 BRCP.[57] The higher 2025 BRCP WACC reflects:

- The move to the BESS benchmark technology. As determined in the updated BRCP WEM procedure, a BESS project has a higher level of risk and requires a higher return when compared to the previous OCGT technology. This is partially offset by a moderation of financial conditions since October 2023.
- An increase in the nominal risk free rate, being the main driver of this change. This higher nominal risk free rate is partially offset by a lower debt risk premium for the 2025 BRCPs.

Table 8: WACC values for the 2025 BRCPs compared to the 2024 BRCP WACC values

Classification	Parameter	2025 BRCPs value	2024 BRCP value[58]
Cost of equity parameters	Nominal risk free rate (%)	4.34	4.69
	Equity beta	1.20	0.83
	Market risk premium (%)	5.80	5.90
	Pre-tax return on equity (%)	13.29	11.28
Cost of debt parameters	Nominal risk free rate (%)	4.34	4.69
	Debt risk premium (%)	1.710	2.153
	Debt issuance costs (%)	0.165	0.100
	Pre-tax return on debt (%)	6.22	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 (%)**	**10.46**	**9.54**

Source: ERA analysis of BRCP data.

57 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.

58 Ibid, p.13.

7.1 Changes to the WACC between the draft and final determinations

Table 9 shows the difference in the WACC values used in the draft and final determination due to changes in the credit markets. The WACC figures for the 2025 BRCP draft determination were determined up to 30 September 2024 with the updated figures revised to 31 October 2024 for the 2025 BRCP final determination.

Table 9: Changes to the WACC and annual components between draft and final 2025 BRCP determinations

Parameter	2025 final determination	2025 draft determination	Change to draft
Nominal pre-tax WACC (%)	**10.46**	**10.10**	**Up 36 basis points**
Nominal risk free rate (%)	4.34	3.95	Up 39 basis points
Debt risk premium (%)	1.710	1.892	Down 18.2 basis points
Corporate tax rate (%)	30	30	-

Source: ERA analysis of BRCP data

The WACC is discussed in more detail in Appendix 8.

Appendix 1 List of Tables

Appendix 2 List of Figures

Appendix 3 Submissions received

The ERA received four submissions to the 2025 BRCPs draft determination from Alinta Energy, the Expert Consumer Panel, First Element Energy and Synergy. These submissions are available in full on the ERA's website and have been summarised in Table 10, along with the ERA's response to the issues raised.[59]

Table 10: Submissions to the 2025 BRCP draft determination

Issue	Submitter	ERA's response
BESS economic life The BESS's assumed life of 15 years may be shorter than a BESS's actual life span. This leads to higher costs for consumers. A BESS is likely to be able to continue to operate and receive capacity credit revenue beyond the 15 years period.	Expert consumer panel	The ERA is bound to follow the BRCP WEM Procedure that states the BESS is to have a 15 year life. The BESS' s 15 year life is based on information obtained during the ERA's review of the BRCP WEM Procedure.[60] The ERA's determination of the 15 year life was a balance between: • aligning with the financing terms for large scale BESS projects. • investors' expectations of battery cells given the likely cycling profile of the BESS. • the likely degradation of the cells given typical charging and discharging profiles. The ERA's determination weighed up having an economic life that is too long, which may not adequately compensate and thus not attract BESS investment if investors felt that they could not recover their investment, against too short a life, which would add significant costs to consumers. The ERA notes that Synergy's submission to that review raised concern that a 25-year life, which was the life used by the Coordinator of Energy in their determination, was unreasonable and that even a 15-year life could be too high depending on the BESS duty cycle.[61] The ERA notes that Alinta Energy's submission to the 2025 BRCP draft determination supported the 15-year

59 Economic Regulation Authority, 'Benchmark Reserve Capacity Price', (online).

60 Economic Regulation Authority, 2024, *Procedure Change Report: Benchmark Reserve Capacity Prices – [EEPC_2024_01]*, pp. 28-29 [online].

61 Synergy, 2024, Submission to *Procedure Change Proposal: Benchmark Reserve Capacity Prices – [EEPC_2024_01]*, p. 3 [online].

Issue	Submitter	ERA's response
		battery life as specified in the WEM Procedure.[62]
Annuity tilt Recommends that the ERA monitor the capital costs of BESSs and the implications for cost recovery, particularly around the annuity tilt for future determinations.	Alinta Energy	The ERA considered the issue of annuity tilt in the BRCP WEM Procedure review.[63] The ERA will monitor BESS costs and reevaluate the annuity tilt factor value at the next BRCP WEM Procedure review, noting that the value of 1 for the annuity tilt was, in part, to account for the costs to consumers.
Higher BRCP, higher costs A higher BRCP will result in higher costs for consumers with excessive costs being shouldered unfairly by consumers.	Synergy	The ERA is bound by the WEM Rules to follow the BRCP WEM Procedure when making the BRCP determination. Costs for consumers are an important consideration when reviewing the BRCP WEM Procedure which the ERA must do once every five years.[64] The ERA notes that balancing the cost for consumers was a driver in setting the annuity tilt factor to 1 in the updated WEM Procedure.[65]
Network constraints The Network Access Quantity (NAQ) regime is a revenue risk for investors and increased clarity on NAQ availability and network constraints is needed to provide greater investment certainty.	Synergy and Alinta	The ERA acknowledges that this is an issue facing new capacity providers as it can reduce the number of capacity credits that a facility can receive. The ERA references the recent example of Waroona Energy that was certified for 87 MW of capacity but was awarded 0 MW of capacity credits.[66] Although the BRCP Procedure requires the BRCP to be determined based on installing the BESS into an unconstrained area of the network, this issue is dependent on the Coordinator of Energy's Benchmark Capacity Providers review.
Other BESS revenues The ERA's Offer Construction Guideline needs to consider the	Expert consumer panel	Although this is primarily an issue for the ERA's Offer Construction Guideline review, the ERA must

62 Alinta Energy, 2024, Submission to *Procedure Change Proposal: Benchmark Reserve Capacity Prices – [EEPC_2024_01]*, p. 1 (online).

63 Economic Regulation Authority, 2024, *Procedure Change Report: Benchmark Reserve Capacity Prices – [EEPC_2024_01]*, pp. 32-35 (online).

64 Wholesale Electricity Market Rules (WA), 20 November 2024, Rule 4.16.9 (online).

65 Economic Regulation Authority, 2024, *Procedure Change Report: Benchmark Reserve Capacity Prices – [EEPC_2024_01]*, pp. 32-35 (online).

66 Parkinson G., 2 October 2024, 'Battery hopeful licks its wounds after missing out on capacity credits as grid shortfall erased', *Renew Economy*, (online) [accessed 30 November 2024].

Issue	Submitter	ERA's response
appropriateness of including opportunity costs for BESS bidding given the assumption that the BRCP is determined based on a gross Cost Of New Entry (CONE) method, i.e. does not account for energy market or FCESS revenue. The BESS could be overcompensated via BRCP given its ability to recover revenue in other WEM markets.		determine the BRCP based on the BRCP WEM Procedure which explicitly requires the BESS to be assessed on a gross CONE basis, consistent with the Coordinator of Energy's Benchmark Capacity Provider determination.[67]
BESS and renewables A higher BRCP will incentivise BESS builds but not renewable and clean technologies causing a mismatch of generation and storage. The relevant level method means that the amount of capacity credits that a renewable plant receives based on its estimated contribution to system reliability is lower than what a BESS will receive based on its full four-hour discharge capacity.	First Element Energy	The assessment of how many capacity credits that different capacity technologies are assigned is detailed in the WEM Rules. The BRCP determination does not affect the amount of capacity credits a facility will receive but the BRCP does affect the value of each capacity credit. How many capacity credits a facility receives is outside the ERA's BRCP determination process.
Insufficient energy to charge BESS There will be insufficient renewable or clean power to charge the BESSs. Renewable droughts will cause blackouts if there is no charge and no firm capacity available.	First Element Energy	This issue is outside of the ERA's BRCP determination process. If fully charging BESSs in the SWIS becomes a sustained issue, this will ultimately affect the amount of capacity credits that the BESS will receive which will impact the BRCP calculation. The ERA is monitoring this issue, particularly as more BESSs enter the SWIS.
Long duration and short duration capacity Recommends differentiating the true firm capacity that has longer hours than a renewable drought. This needs to be defined by AEMO and set different Reserve Capacity Prices to long duration firm capacity and short duration capacity.	First Element Energy	This issue is outside of the ERA's BRCP determination process. The ERA will implement any changes to the BRCP WEM Procedure to align with any changes to the WEM Rules on BESS duration that aligns with the Coordinator of Energy's Benchmark Capacity Providers determination.
BESS duration Consider increasing the BESS duration to 6 hours or better	First Element Energy	This issue is outside of the ERA's BRCP determination process.

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

Issue	Submitter	ERA's response
balance the mismatch between BESS and renewable generation.		AEMO and Energy Policy WA have responsibility regarding the BESS duration requirements. Any changes to the duration requirement resulting from these changes will be implemented by the ERA accordingly.

Source: Submissions to the ERA's 2025 BRCP draft determinations (online).

Appendix 4 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 (see Table 11).

Table 11: Contribution to the BRCP by cost component

Component	Amount ($)	Contribution to the BRCP (%)
Capital Cost sub-total	**474,395,074**	**88.7**
Lithium-ion battery modules	177,600,000	33.2
Power Conversion System	27,800,000	5.2
Balance of Plant	30,725,852	5.7
Total construction costs	77,237,106	14.4
Land costs	9,905,563	1.9
Transmission connection capital costs	39,082,200	7.3
Other indirect costs	30,149,414	5.6
Contingency	58,875,020	11.0
WACC	23,019,918	4.3
Fixed O&M sub-total	**8,121,329**	**11.3**
BESS O&M	5,041,739	7.0
Transmission O&M	124,875	0.2
Transmission network service charges	1,362,173	1.9
Corporate overheads	1,214,511	1.7
Site security	180,773	0.3
Local Government rates	197,258	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 5 Comparison between the 2025 BRCPs determination and 2024 BRCP determination, by component

Table 12 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 12: Comparison between the 2025 BRCP determination and 2024 BRCP by component

Component	2025 determination	2024 determination	Change from 2024
Expected capacity credits (MW)	200	151.17	48.83
Weighted Average Cost of Capital	10.46%	9.54%	92 basis points
Power station cost ($/MW)	1,566,815	974,854	591,961
Margin for legal, financing, and other costs	28.4%	16.35%	12.05 percentage points
Transmission Costs ($/MW)	195,411	207,493	(12,082)
Fixed Fuel Costs ($)	N/A[68]	8,580,419	(8,580,419)
Land Costs ($)	9,905,563	3,075,732	6,829,831
Generation O&M cost ($/MW/year)	25,209	17,688	7,521
Switchyard and transmission line O&M costs ($/MW/year)[69]	624	691	(67)
Asset Insurance Costs ($/MW/year)	N/A[70]	8,392	See footnote 70.
Fixed Network Access and ongoing charges ($/MW/year)	6,811	13,037	(6,226)
Total Capital Costs ($)	**474,395,074**	**224,489,747**	**249,905,327**

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

69 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 determination and are quoted together.

70 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 determination	2024 determination	Change from 2024
Annualised capital costs ($/year)	**64,016,990**	**28,751,257**	**35,265,733**
Annualised fixed O&M ($/MW/year)	**40,607**	**39,809**	**798**
BRCP ($/MW/year)	**360,700**	**230,000**	**130,700**

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 6 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 13.

Table 13: Comparison of the 2025 BRCP determination and 2024 BRCP capital costs

Component	2025 determination	2024 determination	Change
Power station cost (PC) ($/MW)	1,566,815	974,854	591,961
Weighted Average Cost of Capital (WACC)	10.46%	9.54%	92 basis points
Expected capacity credits (MW)	200	151.17	48.83
Margin for legal, financing, and other costs (M) (%)	28.4 [71]	16.35	12.05 percentage points
Transmission Costs (TC) ($/MW)	195,411	207,493	(12,082)
Fixed Fuel Costs (FFC) ($)	N/A	8,580,419	(8,580,419)
Land Costs (LC) ($)	9,905,563	3,075,732	6,829,831
Total Capital Costs ($)	**474,395,074**	**224,489,747**	**249,905,327**
Annualised capital costs ($/Year)	**64,016,990**	**28,751,257**	**35,265,733**

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).*

[71] The 2025 BRCP "M" margin of 28.4 per cent was calculated by adding the other indirect costs ($30.1 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 ($30.7 million) and the total construction costs ($77.2 million).

Appendix 7 Comparison of operating and maintenance costs

This appendix shows the differences between the 2025 and 2024 BRCPs by fixed O&M cost component. Details on the fixed O&M components are discussed in Chapter 6 and shown in Table 14.

Table 14: Comparison of 2025 BRCP annualised fixed O&M costs determination values to 2024 BRCP values

Component	2025 determination	2024 determination	Change
Annualised fixed O&M costs ($/MW/year)	**40,607**	**39,809**	**798**
Generation O&M costs ($/MW/year)	25,209	17,688	7,521
Fixed network access and ongoing charges ($/MW/year)	6,811	13,037	(6,226)
Asset insurance costs ($/MW/year)	N/A[72]	8,392	N/A
Switchyard and transmission line O&M costs ($/MW/year)[73]	624	691	(67)

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).*

[72] 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).

[73] 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 determination and are quoted together.

Appendix 8 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:

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

Calculation of the WACC in the BRCP WEM procedure

Section 4.2 of the WEM procedure directs the ERA on how to calculate the WACC for the BRCP.[74]

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:
>
> $$R_d = R_f + DM$$

[74] Economic Regulation Authority, 2024, *WEM Procedure: Benchmark Reserve Capacity Prices*, Section 4.2, (online).

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;[75]

(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.

The ERA must estimate the WACC following the WEM Procedure. The ERA's annual BRCP determination involves two sets of components listed in clause 4.2.7 of the WEM Procedure:

- Annual components, which require review each year and comprise 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 BRCPs review. These components include the market risk premium, equity beta, debt issuance costs, franking credit value and gearing ratio.

Clause 4.2.7 of the WEM Procedure details the parameters that the WACC must use as variables each year (see Table 15):

[75] 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).

Table 15: 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 for 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.

For the 2025 BRCPs WACC, the ERA determined a nominal risk free rate of 4.34 per cent.[76] This is lower than the 4.69 per cent nominal risk free rate for the 2024 BRCP.[77]

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 of the issuer, and therefore the risk present in that entity's bonds. The BRCPs WEM procedure requires the use of a BBB (or equivalent) credit rating from Standard and Poor's.[78]

The ERA uses a "revised bond yield approach" to determine the debt risk premium at a point in time by:[79]

- Step 1: Determining the benchmark sample – identifying a sample of relevant domestic and international corporate bonds that reflect the BBB credit rating.[80]
- 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 the yield curves – estimating yield curves on the bond data by applying the Gaussian Kernel, Nelson-Siegel and Nelson-Siegel-Svensson techniques.[81]
- 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.
- Step 6: Calculating the debt risk premium by subtracting the 10-year risk free rate from the 10-year cost of debt.

For the 2025 BRCPs WACC, the ERA determined a debt risk premium of 1.710 per cent.[82] This is lower than the 2.153 per cent debt risk premium for the 2024 BRCP.[83]

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76 The nominal risk free rate of 4.34 per cent is based on a 20-trading day averaging period up to 31 October 2024.

77 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.

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

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

80 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.

81 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.

82 The debt risk premium of 1.710 per cent is based on a 20-trading day averaging period up to 31 October 2024.

83 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.

Corporate tax rate

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

Updated BRCP WACC

This appendix provides a WACC for the BRCP based on the approach detailed in the BRCP WEM procedure and the 20-trading day averaging period ending 31 October 2024.

For the 2025 BRCP, the nominal pre-tax WACC is 10.46 per cent (see Table 16). This is higher than the 9.54 per cent nominal pre-tax WACC for the 2024 BRCP.[84]

The higher 2025 BRCP WACC reflects the move to the BESS benchmark technology. As determined in the updated BRCP WEM 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.

Table 16: WACC for the 2025 BRCP compared to the 2024 BRCP WACC values

Parameter	2025 BRCP value	2024 BRCP value[85]
Estimation date	31 October 2024	31 October 2023
Cost of equity parameters		
Nominal risk free rate (%)	4.34	4.69
Equity beta	1.20	0.83
Market risk premium (%)	5.80	5.90
Pre-tax return on equity (%)	13.29	11.28
Cost of debt parameters		
Nominal risk free rate (%)	4.34	4.69
Debt risk premium (%)	1.710	2.153
Debt issuance costs (%)	0.165	0.100
Pre-tax return on debt (%)	6.22	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 (%)	**10.46**	**9.54**

84 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.

85 Ibid, p.13.

Source: ERA analysis

The difference between the WACC used in the 2025 draft and final determinations is detailed in section 7.1 of this determination.