



Economic Regulation Authority

2024 Benchmark Reserve Capacity Price for the 2026/27 capacity year

Final determination

20 December 2023

Economic Regulation Authority

Level 4, Albert Facey House

469 Wellington Street, Perth WA 6000

Telephone 08 6557 7900

Email info@erawa.com.au

Website www.erawa.com.au

This document can also be made available in alternative formats on request.

National Relay Service TTY: 13 36 77

© 2023 Economic Regulation Authority. All rights reserved. This material may be reproduced in whole or in part provided the source is acknowledged

Contents

Executive summary	ii
1. Introduction	1
1.1 Changes between the draft and final determination.....	2
1.2 BRCP determination process	2
1.2.1 Stakeholder submissions.....	2
1.3 BRCP procedure review	3
1.4 Historical context of the BRCP	4
2. The BRCP calculation.....	5
2.1 Forecast cost escalation.....	7
2.1.1 Increase in CPI forecasts	8
2.1.2 Cost escalation factors developed by PwC.....	8
2.2 Expected capacity credits.....	9
3. Annualised capital cost of the power station	11
3.1 Power station costs	11
3.1.1 Power station generator model selection	12
3.2 Weighted Average Cost of Capital (WACC).....	12
3.2.2 Changes to the WACC between the draft and final determination	14
3.3 Other capital cost components.....	15
4. Annualised fixed O&M costs	16
4.1 Generation O&M cost.....	16
4.1.1 Changes to generation O&M costs between draft and final determinations	17
4.2 Asset insurance	17
4.2.1 Changes to asset insurance costs between draft and final determinations	17
4.3 Other operating and maintenance components.....	18

List of appendices

Appendix 1 List of Tables.....	19
Appendix 2 List of Figures	20
Appendix 3 Components of the 2024 BRCP final determination compared to 2023 BRCP	21
Appendix 4 Changes between the 2024 BRCP final and draft determinations	22
Appendix 5 Annualised capital costs	23
Appendix 6 Other operating and maintenance costs.....	26
Appendix 7 Weighted Average Cost of Capital.....	29

Executive summary

The Economic Regulation Authority has determined the 2024 Benchmark Reserve Capacity Price (BRCP) to be \$230,000 per megawatt per year. The Australian Energy Market Operator (AEMO) will use the BRCP to determine the Reserve Capacity Price for the 2025/26 capacity year.¹ The Reserve Capacity Price is the price paid to generators for each megawatt (MW) of capacity that they make available to Western Australia's Wholesale Electricity Market (WEM) in that year.²

The BRCP and Reserve Capacity Price are components of the WEM's Reserve Capacity Mechanism (RCM), which aims to ensure that there is enough capacity installed in the South West Interconnected System (SWIS) to meet electricity demand. The RCM provides price signals for capacity providers, like generators, to enter the market and make their capacity available. The revenue from making capacity available adds to revenues from generating electricity and providing essential system services to generate an overall return for investors.

The BRCP is a benchmark value of capacity, based on a cost estimate of building and connecting a hypothetical 160 MW open cycle gas turbine (OCGT) generator to the SWIS. The BRCP market procedure, which the ERA has followed in making this determination, defines the size and type of generator and the method for calculating the BRCP.³

The 2024 BRCP final determination of \$230,000 per MW per year is 18.9 per cent higher than the 2023 BRCP (\$193,400 per MW per year).⁴ This is the third highest BRCP on record, exceeded only in 2012/13 (\$238,500 per MW per year) and 2013/14 (\$240,600 per MW per year).^{5, 6} The significant increase in the BRCP comes from a combination of factors including increases in the cost of raw materials, increases in the weighted cost of capital (WACC) and a growth in global demand for generation, including OCGTs.⁷

The 2024 BRCP final determination is also higher than the 2024 draft determination (\$220,700 per MW per year). This is due to an increase in the WACC, updated consumer price index (CPI) and updated insurance costs. CPI is used to escalate a range of cost components, so incremental changes can result in several costs increasing. Similarly, increases to the WACC results in a higher overall cost as it effects the annualised capital cost of the BRCP generator. Stakeholder submissions to the draft determination were considered but did not impact the calculation of the final determination. The submissions will also be considered in the ERA's review of the BRCP procedure.⁸

¹ The reserve capacity timeline is defined in the Wholesale Electricity Market Rules (WA), 13 December 2023, 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 Economic Regulation Authority, 2020, *Market Procedure: Benchmark Reserve Capacity Price*, section 2.1, ([online](#)).

⁴ Economic Regulation Authority, 2023 *Benchmark Reserve Capacity Price for 2025/26 capacity year – Final determination*, ([online](#)).

⁵ These are nominal values.

⁶ Australian Energy Market Operator, *Benchmark Reserve Capacity Price*, ([online](#)) [accessed 28 November 2023].

⁷ Economic Regulation Authority, 31 August 2023, *Power station and associated costs*, Report prepared by GHD Advisory, section 2.3 ([online](#)).

⁸ The ERA must review the WEM Procedure and undertake a consultation process as part of that review at least every five years. Wholesale Electricity Market Rules (WA), 13 December 2023, Rule 4.16.9 ([online](#)).

The ERA's 2024 BRCP final determination used data and analysis from consultants (GHD Advisory and PricewaterhouseCoopers), Western Power and Landgate. These reports are available on the ERA's website.⁹

The current market procedure does not account for the Network Access Quantity nor penalties for high emissions technologies - both have potential implications for the BRCP reference technology. Energy Policy WA is undertaking reserve capacity mechanism and investment certainty reviews that cover these policies. The BRCP procedure review will commence following the completion of these reviews when the implications for the reference technology are understood.

⁹ Economic Regulation Authority, 'Benchmark Reserve Capacity Price', ([online](#)).

1. Introduction

To ensure reliable supply of electricity, generation needs to continuously meet consumer demand. To achieve this, Western Australia's Wholesale Electricity Market (WEM) uses the reserve capacity mechanism (RCM) to provide an investment signal to install capacity in the SWIS.

AEMO sets the reserve capacity requirement (RCR) two years ahead of a capacity year.¹⁰ Determining the BRCP two years ahead of the capacity year provides a level of certainty to capacity providers considering entering the WEM. The RCR supports AEMO to ensure the reliability standard for the SWIS is met and sufficient capacity will be available.¹¹ Facilities are allocated certified reserve capacity (expressed in MW) based on their expected contribution to system reliability.

Certified reserve capacity suppliers, which are mostly generators, are paid to make capacity available during the reserve capacity year regardless of whether they physically supply electricity.¹² The payment is based on the number of capacity credits they hold and the applicable price to each capacity credit which is the reserve capacity price.

AEMO determines the reserve capacity price, which varies year to year based on the BRCP and the level of excess reserve capacity in the WEM, relative to the planning criterion.^{13,14}

The BRCP, stated in dollars per megawatt per year, is a forecast annualised cost estimate to build a new 160 MW liquid fuelled open cycle gas turbine generator set (OCGT) to provide capacity to the SWIS over a capacity year, commencing two years into the future.¹⁵ The 2024 BRCP assessment applies to the 2026/27 capacity year. A capacity year commences on 1 October each year.¹⁶ The 2024 BRCP is based on a bottom-up, annualised cost estimate for the benchmark generator, escalated to 2026.¹⁷ This cost estimate includes:

- Fixed operating and maintenance costs for the power station, fuel handling, and transmission connection components.
- Land costs.
- Liquid fuel storage and handling facilities.

¹⁰ Wholesale Electricity Market Rules (WA) 13 December 2023, Rule 4.6.1, ([online](#)).

¹¹ The required amount of reserve capacity for a particular capacity year is based on the reliability standard which is part of the planning criterion in the Wholesale Electricity Market Rules (WA), 13 December 2023, Rule 4.5.9, ([online](#)). Excess reserve capacity is based on how much more reserve capacity is being offered into the SWIS relative to the amount required under the planning criterion.

¹² For convenience, the term 'generators' has been used to refer to suppliers of reserve capacity as they are the dominant group. All providers of capacity are remunerated through the reserve capacity mechanism, which includes demand side programmes and storage (i.e., batteries, hydro, etc).

¹³ AEMO conducts the reserve capacity price determination process in accordance with the reserve capacity timeline defined under Wholesale Electricity Market Rules (WA), 13 December 2023, Rule 4.1, ([online](#)).

¹⁴ The amount of capacity required in a capacity year is determined by the Long Term Projected Assessment of System Adequacy study which AEMO conducts. The results are published annually in AEMO's Electricity Statement of Opportunities. Australian Electricity Market Operator. *Wholesale Electricity Market Electricity Statement of Opportunities*, August 2023, pp76-77 ([online](#)).

¹⁵ The power station that the BRCP must be based on is defined as a 160 MW OCGT under section 2.1 of the *Market Procedure: Benchmark Reserve Capacity Price*, 9 November 2020, ([online](#)).

¹⁶ Wholesale Electricity Market Rules (WA), 13 December 2023, Rule 4.1.3, ([online](#)).

¹⁷ Details of the power station requirements are defined in section 2.1 of the *Market Procedure: Benchmark Reserve Capacity Price*, 9 November 2020, ([online](#)). The power station must be able to operate on distillate fuel. All OCGT references in this determination refer to an OCGT that must be able to run on distillate fuel.

- Transmission connection costs.
- Other ancillary and infrastructure costs that are normally incurred when developing a power station.
- Allowances for legal, insurance, financial, and environmental approval costs including a contingency margin (margin 'M').

1.1 Changes between the draft and final determination

Economic conditions have changed since the draft determination was published. Since the draft determination, the following updates were made to determine the final 2024 BRCP:

- Increase in the weighted cost of capital (WACC) mostly due to an increase in the nominal risk free rate. Details are in section 3.2.
- Increase in the consumer price index (CPI) forecasts. This is detailed in section 2.1.1 below.
- Revised asset insurance costs from higher asset replacement and business interruption insurance. This is detailed in section 4.2.

The effect of these changes is a 4.2 per cent increase to \$230,000 per MW per year from the draft determination of \$220,700 per MW per year. A consolidated table showing the change in values between the draft and final determinations is at Appendix 4.

1.2 BRCP determination process

The ERA commenced the 2024 BRCP determination process in July 2023 and published its draft determination on 4 October 2022.¹⁸ Submissions closed on 8 November 2023.

This report details how the ERA made its final determination. Throughout this determination:

- References to the market procedure refer to the BRCP market procedure unless otherwise specified.¹⁹
- Cost and price estimates are in Australian dollars excluding goods and services tax, unless otherwise specified.
- All references to the 2024 BRCP refer to the ERA's BRCP determination of \$230,000 per MW per year applicable to the 2026/27 capacity year, unless otherwise specified.

1.2.1 Stakeholder submissions

The ERA received two submissions which are available on the ERA website.²⁰ Synergy's submission was broadly supportive of the draft determination.

The second submission requested to remain confidential. The ERA accepted this request on the basis a redacted version of the submission was provided to publish on the ERA website. This submission raised two concerns. The first is that escalation factors do not reflect likely market dynamics and prices for an OCGT. Specifically, that the overall cost escalation applied

¹⁸ Economic Regulation Authority, 'Benchmark Reserve Capacity Price', ([online](#)).

¹⁹ Economic Regulation Authority, 9 November 2020, *Market Procedure: Benchmark Reserve Capacity Price*, ([online](#)).

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

over the three years to 2026/27 is insufficient. The submission suggests that the escalation factors for bulk commodities do not account for the specific dynamics of the gas turbine market and that fabricated equipment costs vary significantly. It also considers the increase in demand for turbines worldwide makes the use of steel and copper inputs too simplistic.

The second concern related to the forecast foreign exchange rates. The submission indicated that the difference in the exchange rates used in the BRCP calculation and the rates at the time of an investment decision could result in a significant variance between actual capital costs and those used to develop the BRCP. The submission suggests that the exchange rates used in the BRCP calculation be updated in July each year to align with applications for certified reserve capacity.

The ERA considered these points, but they have not impacted the calculation of the 2024 BRCP final determination.

In addition to considering steel and copper inputs, the ERA includes other escalation factors such as the wage price index for construction, and exchange rates.²¹ The ERA considers that the issue raised relates more to investment decisions, as opposed to the calculation of the BRCP itself.

The ERA also considered that the submitter's second point does not account for the lead time for an OCGT build being typically two years.²² The BRCP determination is completed around two years and nine months in advance of the capacity year coming into effect with the expectation that any contracts entered into to deliver an investment in that time window, will normally reflect the expectation of future cost escalation including foreign exchange rates and will generally include hedging arrangements to manage variations. While it is correct that OCGT costs may vary substantially between a determination and when it comes into effect, the intent is to estimate the future expectations of cost with the best information available at the time of the determination.

1.3 BRCP procedure review

The ERA calculates the BRCP in line with the current Market Procedure, as required by the WEM Rules. Separate to the annual determination the ERA must also complete a review of the Procedure, including engaging in a consultative process, every five years.²³ Matters raised in submissions received during this BRCP determination will be considered in the procedure review.

Energy Policy WA (EPWA) is currently reviewing the RCM, including the BRCP reference technology. It is also separately undertaking a review of investment certainty in the WEM that will also consider how to apply emissions penalties through the RCM. The outcomes of these reviews may require changes to the market procedure.²⁴

²¹ Economic Regulation Authority, 31 August 2023, *Power station and associated costs*, Report prepared by GHD Advisory, section 2.3 ([online](#)).

²² U.S. Energy Information Administration, March 2022, *Cost and Performance Characteristics of New Generating Technologies*, *Annual Energy Outlook 2022*, p2 ([online](#)).

²³ Wholesale Electricity Market Rules (WA), 13 December 2023, Rule 4.16.9 ([online](#)).

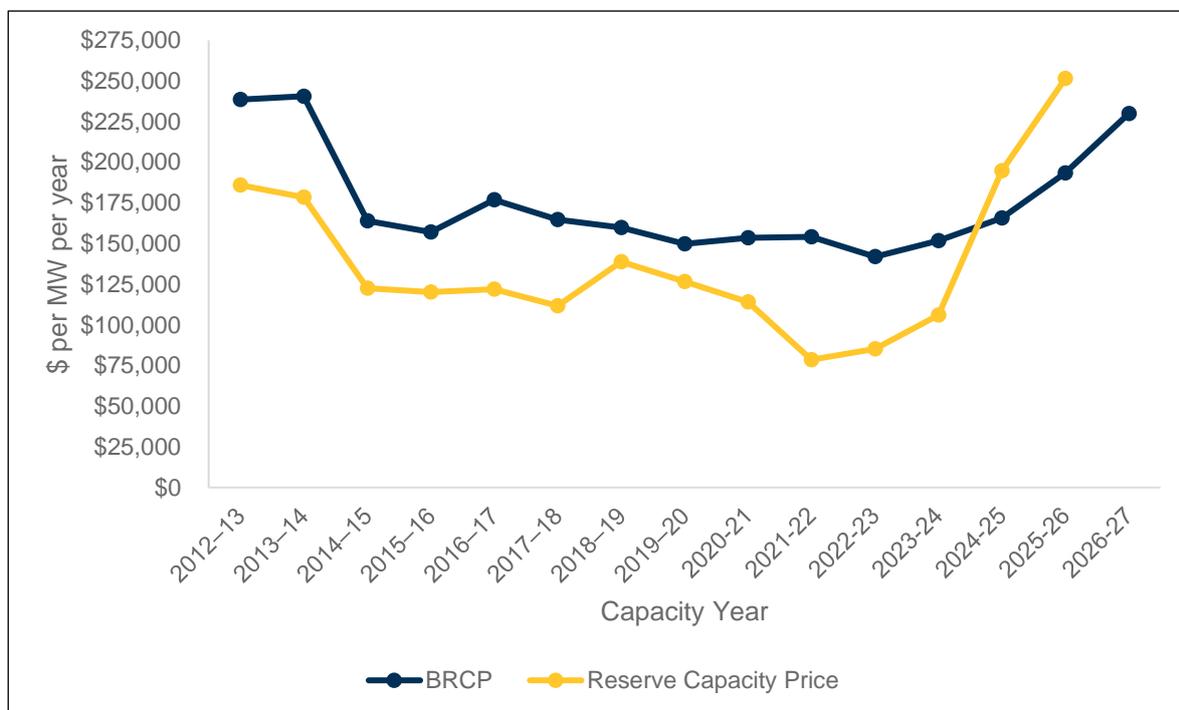
²⁴ The update of the market procedure will include changes to reflect the transfer of responsibility from AEMO to the ERA.

1.4 Historical context of the BRCP

Figure 1 shows the historical prices of the BRCP in relation to Reserve Capacity Price (RCP). The time series shows that after a peak in 2012, the BRCP decreased to 2014/15 then remained relatively flat until 2023/24, when it began to increase again. The RCP follows a similar trajectory, but lower than the corresponding BRCP, which reflects the assessed level of excess capacity in the market at the time. The greater the level of excess capacity, the lower the RCP relative to the BRCP.

However, in the 2024/25 capacity year the RCP begins to track above the BRCP. This is a result of tighter capacity in the system and a forecast capacity deficit (i.e., capacity is less than the RCR for that capacity year). In the 2025/26 capacity year, AEMO forecasts additional capacity will be required relative to the RCR which leads to the RCP being 1.3 times the BRCP to provide a strong signal for capacity to enter the market.²⁵

Figure 1: Comparison of historical BRCP and Reserve Capacity Prices



Source: AEMO, Benchmark Reserve Capacity Price, ([online](#)) [accessed 28 November 2023].

The current expected demand scenario as outlined in the 2023 WEM Electricity Statement of Opportunities for the 2026/27 capacity year suggests the multiplier will be applied to the 2024 BRCP.²⁶

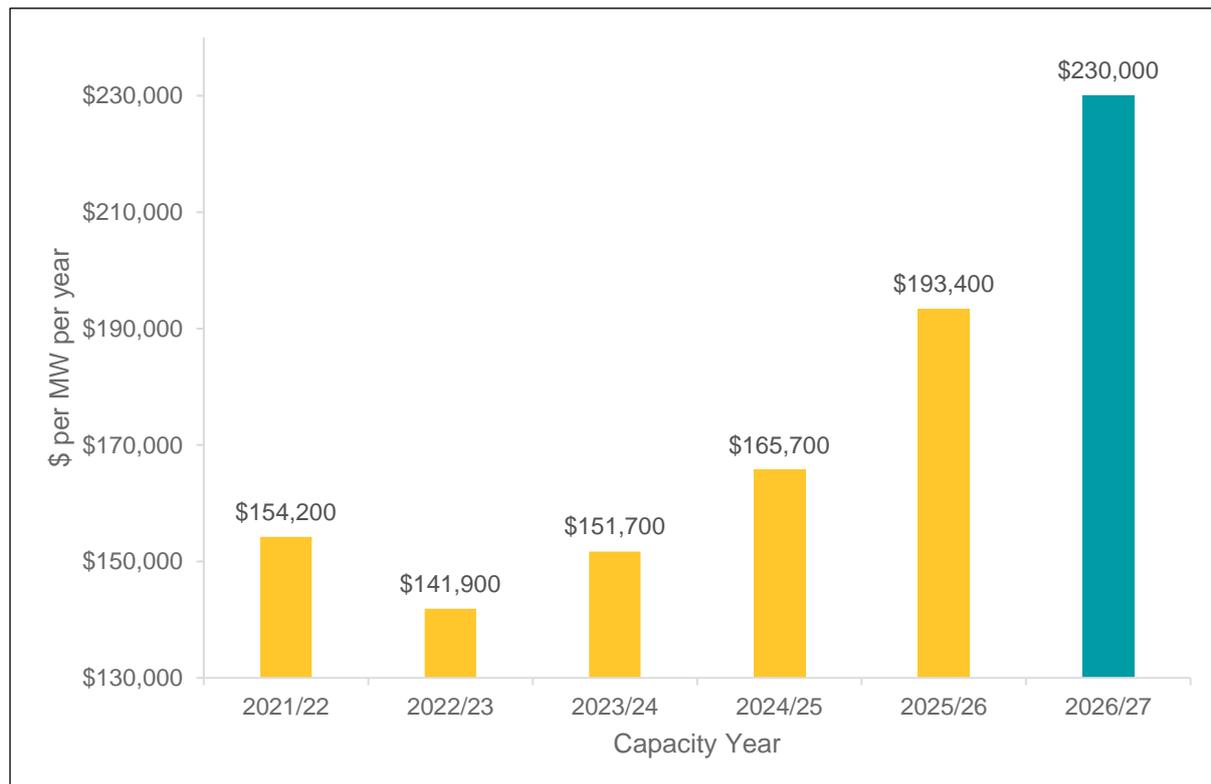
²⁵ Australian Electricity Market Operator. *Wholesale Electricity Market Electricity Statement of Opportunities*, August 2023, pp76-77 ([online](#)).

²⁶ Australian Electricity Market Operator. *Wholesale Electricity Market Electricity Statement of Opportunities*, August 2023, pp76-77 ([online](#)).

2. The BRCP calculation

The ERA has determined that the 2024 BRCP is \$230,000 per MW per year for the 2026/27 capacity year.²⁷ This is the third highest BRCP recorded, exceeded only in 2012/13 (\$238,500 per MW per year) and 2013/14 (\$240,600 per MW per year).²⁸ The significant increase in the BRCP comes from a combination of factors including increases to escalation factors, increases in the WACC and a growth global demand for generation, including OCGTs.²⁹ Figure 2 shows the BRCP since the 2021/22 capacity year.

Figure 2: BRCP from 2021/22 by capacity year including 2024 BRCP determination



Source: ERA analysis of BRCP data.

The formula for calculating the BRCP as stated in the market procedure is:³⁰

$$BRCP = \text{Annualised Fixed Operations and Maintenance costs} + \frac{\text{Annualised Capital Costs}}{\text{Expected Capacity Credits}}$$

Table 1 provides a comparison of the 2024 BRCP draft determination and its components against the 2023 BRCP values.

²⁷ As required by the Wholesale Electricity Market Rules (WA), 13 December 2023, Rule 4.16 ([online](#)).

²⁸ Australian Energy Market Operator, *Benchmark Reserve Capacity Price*. ([online](#)) [accessed 28 November 2023].

²⁹ Economic Regulation Authority, 31 August 2023, *Power station and associated costs*, Report prepared by GHD Advisory, section 2.3 ([online](#)).

³⁰ Economic Regulation Authority, 9 November 2020, *Market Procedure: Benchmark Reserve Capacity Price*, clause 2.10.1, ([online](#)).

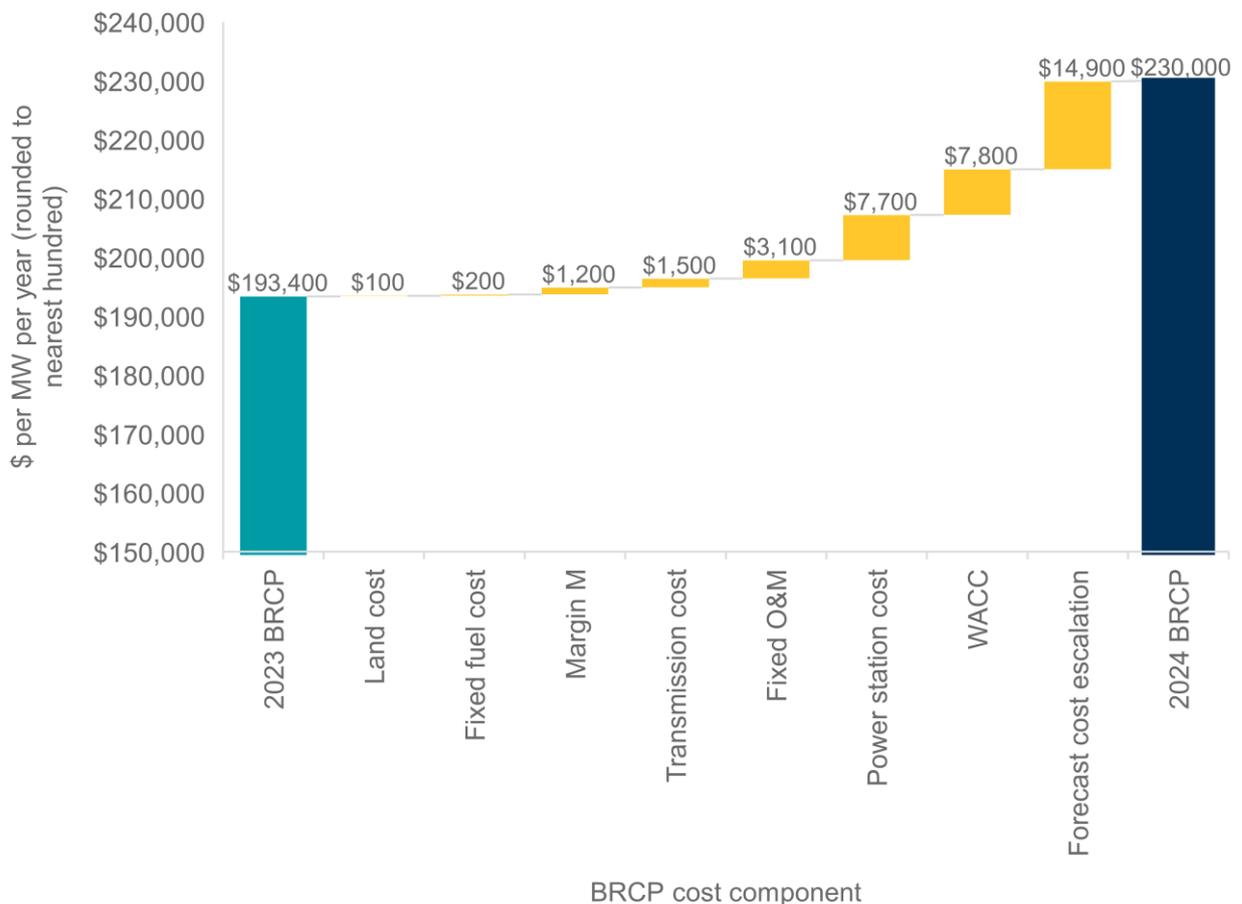
Table 1: Comparison of the 2024 BRCP determination to the 2023 BRCP determination

Component	2024 BRCP	2023 BRCP	Change from 2023	
			(\$)	(%)
BRCP (\$/MW/Year)	230,000	193,400	36,600	18.9
Annualised capital costs (\$/Year)	28,751,257	23,757,776	4,993,481	21.0
Annualised fixed O&M costs (\$/MW/Year)	39,809	36,228	3,581	9.9
Expected capacity credits (MW)	151.17	151.17	-	-

Source: ERA analysis of BRCP data.

The breakdown of the different components underlying the annualised capital costs is detailed in Chapter 3 and Appendix 5. The annualised fixed operations and maintenance (O&M) costs discussed in Chapter 4 and Appendix 6.

Figure 3 illustrates the change between the 2024 BRCP determination and 2023 BRCP by cost component.

Figure 3: Changes between the 2024 determination and the 2023 BRCP by cost component

Source: ERA analysis of BRCP data.

The following sections detail the components with large changes that are driving the overall increase from the 2023 BRCP. The components with minor impacts are detailed in the appendices to this report.

2.1 Forecast cost escalation

The ERA calculates the BRCP based on a theoretical power station, that would commence operation on 1 October 2026 which is the start of the 2026/27 capacity year. To do this a range of forecast escalation factors are applied to the costs of a power station today, to escalate them to an expected cost in 2026. Table 2 shows the relationship between different escalation factors and components of the BRCP. The impact of changes to the consumer price index (CPI) and cost escalation factors developed by PricewaterhouseCoopers (PwC) are discussed in more detail in sections 2.1.1 and 2.1.2 below.

Table 2: Escalation factors applied to cost components of the BRCP calculation

Escalation Factor	Cost component applied to	Source
Power station capital cost	Power station capital cost	Base escalation factors such as steel, copper, labour and AUD/USD exchange rate are developed by PwC. The methodology for this is detailed in the PwC consultant report on the ERA website. ³¹
Generation O&M cost	Generation O&M cost	
Connection asset O&M cost	Switchyard O&M cost Transmission line O&M cost	
Consumer Price Index (CPI)	Asset insurance O&M cost Fixed network access and ongoing O&M charges Fixed Fuel cost Land coat	The PwC figures are provided to GHD to determine escalation factors for power station capital cost, generation O&M and connection asset O&M. GHD's approach is summarised in their report, available on the ERA website. ^{32, 33} CPI is a general measure of price inflation used by the Reserve Bank of Australia (RBA) to forecast inflation in macroeconomic variables. The 2025/26 forecast uses the midpoint between the previous year's forecast and 2.5% (mid-point of the RBA's inflation target). The 2026/27 forecast and beyond use the mid-point of the RBA's inflation target band.

³¹ Economic Regulation Authority, August 2023. *2024 Benchmark Reserve Capacity Price – Cost Escalation Factors*, Report prepared by PwC ([online](#)).

³² Economic Regulation Authority, 31 August 2023, *Power station and associated costs*, Report prepared by GHD Advisory, chapter 3 ([online](#)).

³³ During finalisation of the 2024 BRCP a minor error was identified in the GHD report in footnote 3, the calculation for the final year escalation should have read; $(1+((-1.084/100) \times (9/12)))$. There was no change to the result of the calculation in the report and no impact on the ERA calculation of the BRCP.

Escalation Factor	Cost component applied to	Source
Transmission connection cost	Transmission connection cost	Western Power provides the escalation factor for transmission connection costs. This escalation factor is calculated in accordance with section 2.4.1(d) of the Market Procedure. ³⁴

Source: Adapted from prior BRCP determinations published by AEMO ([online](#)) and Economic Regulation Authority, 9 November 2020, Market Procedure: Benchmark Reserve Capacity Price, clause 2.10.1, ([online](#)).

2.1.1 Increase in CPI forecasts

The market procedure requires CPI forecasts to be used in the escalation of costs not covered by the specific cost escalation factors discussed above. CPI forecasts are used to escalate fixed fuel costs, land costs, asset insurance costs and fixed network access and ongoing charges (see Table 2).³⁵ The effect of the CPI forecast change on each of these components is discussed in the relevant sections of the report.³⁶

This final determination uses the Reserve Bank of Australia's CPI forecasts, released in November 2023.³⁷ The November CPI forecasts were higher than the August CPI forecasts used in the draft determination.³⁸

The higher revised CPI forecasts are a small contributor to the increase in the final 2024 BRCP, when compared to the draft determination.

2.1.2 Cost escalation factors developed by PwC

Following feedback on the 2023 BRCP, the ERA committed to considering alternative data sources for the calculation of cost escalation factors for the 2024 BRCP. ERA engaged PwC to review existing and alternative data sources to determine if alternatives could provide more accurate forecasts for the BRCP cost escalation factors.

On review of the approach used for the AUD/USD exchange rate, PwC recommended expanding the number of data sources for exchange rates from 4 to 6 and using a 'long run

³⁴ Economic Regulation Authority, 2022, *Total Transmission Cost Estimate for the Benchmark Reserve Capacity Price for 2026/27*, Report prepared by Western Power, ([online](#)).

³⁵ The CPI escalation is different to the cost escalation applied to other cost components, such as the power station cost and transmission costs. These other cost components are escalated based on the cost escalation factors in Table 5 and GHD's report (Economic Regulation Authority, 2023, *Power station and associated costs*, Report prepared by GHD Advisory, chapter 2 ([online](#))) which are estimated based on other factors, like materials and labour costs, and are not dependent on changes to CPI forecasts.

³⁶ Fixed fuel costs and land costs are discussed in Appendix 5, and asset insurance costs and fixed network access and ongoing charges are discussed in Appendix 6.

³⁷ Reserve Bank of Australia, 2023, *Statement on Monetary Policy – November 2023*, ([online](#)).

³⁸ Reserve Bank of Australia, 2023, *Statement on Monetary Policy – August 2023*, ([online](#)).

average approach' to estimate the AUD/USD exchange rate in outer forecast years.³⁹ The full report of the data source review is available on the ERA website.⁴⁰

The ERA accepted the recommendation to include two additional sources and use the long run average for the out years. While it is unlikely to increase the accuracy of the forecast, it is not expected to have a detrimental effect. Adding additional sources may moderate outlier forecasts from any one institution given not all sources forecast into years two and three.

PwC recommended retaining the sources and approach used in prior years for steel and copper prices, and labour cost escalation factors.

The ERA also considered and accepted PwC's recommendation to retain the source used for steel and copper prices as it aggregated a wide variety of forecasts. For labour costs, the ERA accepted the view to maintain the current approach on the basis that the timeliness of Treasury forecasts provided a more current view of expected changes to labour costs.

Table 3 summarises the updated year on year cost escalation factors used to inform the development of the 2024 BRCP determination. These cost escalation factors were provided to GHD who used them to calculate the cost escalation factors that are applied to the power station.

Table 3: Year on year cost escalation factors used to calculate the 2024 BRCP by financial year

Cost Escalation Factor	Financial Year				
	2023/24	2024/25	2025/26	2026/27	2027/28
Labour costs – operations and maintenance (Δ%)	4.12	3.87	3.37	3.12	3.12
Labour cost – construction (Δ%)	4.02	3.77	3.27	3.02	3.02
AUD/USD	0.6983	0.7417	0.7733	0.7669	0.7605
Steel price (Δ%)	-0.71	-10.85	-0.58	4.51	0.15
Copper (Δ%)	-2.10	-1.90	-1.38	-0.98	1.00

Source: Economic Regulation Authority, August 2023, *2024 Benchmark Reserve Capacity Price – Cost Escalation Factors, Report prepared by PwC* ([online](#)).

2.2 Expected capacity credits

The expected capacity credits for a 160 MW OCGT entering the SWIS for the 2026/27 capacity year is 151.17 MW. The generator's expected capacity credits are determined based on the expected output of the generator operating at 41°C, adjusted for site conditions including likely output at 41°C, humidity and other relevant factors, as detailed in the market procedure.⁴¹ The

³⁹ Economic Regulation Authority, August 2023, *2024 Benchmark Reserve Capacity Price – Cost Escalation Factors Data Sources*, Report prepared by PwC, p.16 ([online](#)).

⁴⁰ Economic Regulation Authority, August 2023, *2024 Benchmark Reserve Capacity Price – Cost Escalation Factors Data Sources*, Report prepared by PwC, ([online](#)).

⁴¹ Economic Regulation Authority, 31 August 2023, *Power station and associated costs*, Report prepared by GHD Advisory, section 3.4 ([online](#)) and *Market Procedure: Benchmark Reserve Capacity Price*, 9 November 2020, clause 2.3.1, ([online](#)).

ERA's consultant, GHD , assessed generators worldwide and recommended one to use as a proxy for the ERA to derive the expected capacity credits for this determination.⁴²

The expected capacity credits for the reference generator is unchanged from the 2023 BRCP (151.17 MW). The amount of expected capacity credits has also not changed from the ERA's BRCP draft determination.

⁴² Economic Regulation Authority, 31 August 2023, *Power station and associated costs*, Report prepared by GHD Advisory, section 3.2 to 3.4 ([online](#)).

3. Annualised capital cost of the power station

The 2024 BRCP annualised capital costs of the reference generator is approximately \$29 million, which is 18.5 per cent or \$35,800 higher than the 2023 BRCP annualised capital costs. This component is the largest contributor to the 2024 BRCP increase.

Table 4 shows the change in the cost components between the 2023 and the 2024 BRCP determinations. The main changes affecting the annualised capital cost components of the BRCP were increases to power station costs, driven by financing cost and escalation factors. Changes between the 2024 draft and final BRCP determinations are outlined in Appendix 4.

Table 4: Comparison of the annualised capital cost components for the 2024 BRCP final determination with the 2023 BRCP determination

Cost Component	2024 BRCP	2023 BRCP	Change from 2023	
			(unit)	(%)
Annualised capital cost (\$/year)	28,751,257	23,757,776	4,993,481	+21.0
Power station cost (\$/MW)	974,854	819,378	155,476	+19.0
Margin 'M' costs (%)	16.35	16.42	Down 7 basis points	-0.4
Transmission cost (\$/MW)	207,493	195,935	11,558	+5.9
Fixed fuel cost (\$)	8,580,419	8,632,788	-52,369	-0.6
Land cost (\$)	3,075,732	3,048,874	26,858	+0.9
WACC (%)	9.54	8.82	Up 72 basis points	+8.2
Expected capacity credits (MW)	151.17	151.17	-	-

Source: ERA analysis of BRCP data.

3.1 Power station costs

Power station development costs increased to \$974,854 per MW (up 19 per cent from 2023) mostly driven by increases to the input costs driven by the cost of raw materials and a general increase in global demand for new generation capacity.

The power station escalation factor is applied to the current price of the reference generator to derive an estimated future cost of the power station.⁴³ The overall power station cost

⁴³ The power station escalation factor is calculated by GHD based on the cost escalation factors prepared by PwC as outlined in section 2.1.

increased as a higher power station cost was used for the 2024 BRCP determination (Table 5).

Table 5: Annual capital cost escalation factors – 2023 BRCP and 2024 BRCP

BRCP	FY 2023	FY 2024	FY 2024	FY 2026
2023	-4.26%	-4.83%	0.426%	2.35%
2024	-	7.77%	-5.22%	-1.08%

Source: Economic Regulation Authority, 31 August 2023, *Power station and associated costs, Report Prepared by GHD Advisory section 2.3, (online)*. and Economic Regulation Authority, 8 December 2022, *Power station and associated costs, Report prepared by GHD Advisory, section 2.3, (online)*.

3.1.1 Power station generator model selection

The ERA engaged GHD to assess the appropriate generator for the 2024 BRCP determination. GHD selected the Siemens SGT5-2000E as it most closely aligns with the power station requirements in the market procedure, including the output requirement at the specified site conditions, and provides good value in terms of capital and O&M costs.⁴⁴ The power station requirements are:

- An industry standard OCGT power station with a nominal nameplate capacity of 160 MW prior to installing any inlet cooling system.
- It can use distillate for fuel.
- Has a capacity factor of two per cent. This means that the BRCP generator is expected to generate at its maximum capacity for up to two per cent of the year.

When determining the capital costs of this power station, GHD incorporated other power station requirements, such as:

- Technologies like low nitrous oxide burners, which are commonly used for this type of power station.
- An inlet air cooling system and water receipt and storage facilities to allow 14 hours of continuous operation where this would be cost effective.

This generator is the same generator used in the 2022 and 2023 BRCP determinations with technical updates by the manufacturer applied.

3.2 Weighted Average Cost of Capital (WACC)

The cost of capital represents the minimum return that a firm must earn on an asset to satisfy its creditors, owners, and other providers of capital. A weighted average cost of capital (WACC) weights a firm's cost of capital in line with its debt and equity financing structure. For the BRCP, the WACC is used to estimate the financing costs of the power station and represents the long term required rate of return when determining the power station's annualised cost. Consequently, small changes in the WACC can have a large effect on the BRCP, as the power station's life is projected over 50 years.

⁴⁴ Economic Regulation Authority, 31 August 2023, *Power station and associated costs, Report prepared by GHD Advisory, section 3.2 (online)*.

The ERA has reviewed and calculated the annual WACC components: the nominal risk free rate, the debt risk premium, and the corporate tax rate.⁴⁵

For the 2024 BRCP final determination, the nominal pre-tax WACC is 9.54 per cent (see Table 6). This is higher than the 8.82 per cent nominal pre-tax WACC for the 2023 BRCP.⁴⁶ The increase in the nominal risk free rate is the main driver of this change. The higher nominal risk free rate is partly offset by a lower debt risk premium for the 2024 BRCP.

Table 6: WACC values for the 2024 BRCP compared to the 2023 BRCP WACC values

Parameter	2024 BRCP final determination value	2023 BRCP value ⁴⁷
WACC		
Nominal pre-tax WACC (%)	9.54	8.82
Cost of equity parameters		
Nominal risk free rate (%)	4.69	3.96
Equity beta	0.83	0.83
Market risk premium (%)	5.90	5.90
Pre-tax return on equity (%)	11.28	10.42
Cost of debt parameters		
Nominal risk free rate (%)	4.69	3.96
Debt risk premium (%)	2.153	2.369
Debt issuance costs (%)	0.100	0.100
Pre-tax return on debt (%)	6.94	6.43
Other parameters		
Debt proportion (gearing) (%)	40	40
Franking credits (gamma) (%)	50	50
Corporate tax rate (%)	30	30

Source: ERA analysis of BRCP data.

3.2.1.1 Nominal risk free rate

The risk free rate is the return an investor expects from investing in an asset with no risk and is a fundamental component to calculate the WACC. The ERA uses 10-year Commonwealth Government bonds as a proxy for risk free assets in Australia to estimate a long-term risk free

⁴⁵ The WACC components that are required to be reviewed by the ERA are in *Market Procedure: Benchmark Reserve Capacity Price*, 9 November 2020, section 2.9. ([online](#)).

⁴⁶ Economic Regulation Authority, 2022, *2023 Benchmark Reserve Capacity Price for the 2025/26 capacity year: Final determination*, p.9, ([online](#)).

⁴⁷ Economic Regulation Authority, 2022, *2023 Benchmark Reserve Capacity Price for the 2025/26 capacity year: Final determination*, pp.9-10, ([online](#)).

rate of return. This aligns the WACC with a long-term rate of return for the capital costs of the BRCP power station. The BRCP WACC calculation uses a nominal risk free rate, which includes the market's inflation expectations.

For this final determination, the ERA's estimate of the nominal risk free rate is 4.69 per cent.⁴⁸ This is higher than the 3.96 per cent nominal risk free rate for the 2023 BRCP.⁴⁹ The increase is due to increasing interest rates being factored into financial markets since the 2023 BRCP WACC.

3.2.1.2 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 and is closely aligned with the risk of the business. The ERA assesses corporate bonds that have a credit rating of BBB (or equivalent).⁵⁰ A bond's credit rating reflects the probability of default of the issuer, which is the risk that the bondholder bears. The ERA's approach to determining the debt risk premium for the BRCP is detailed in Appendix 7.

For this final determination, the ERA calculated the debt risk premium to be 2.153 per cent, which is lower than the 2.369 per cent debt risk premium for the 2023 BRCP.^{51,52}

3.2.1.3 Corporate tax rate

The corporate tax rate is 30 per cent and has not changed since the 2023 BRCP final determination.

3.2.2 Changes to the WACC between the draft and final determination

Table 7 shows the differences in the WACC values used in the draft and final determination due to changes in credit markets. The WACC figures for the 2024 BRCP draft determination were determined up to 30 July 2023 with the updated figures for the 2023 BRCP final determinations revised to 31 October 2023.

Table 7: Changes to the WACC and annual components between draft and final 2024 BRCP determinations

Parameter	2024 BRCP final	2024 BRCP draft	Change to draft
Nominal pre-tax WACC (%)	9.54	8.83	Up 71 basis points
Nominal risk free rate (%)	4.69	3.97	Up 72 basis points

⁴⁸ The nominal risk free rate of 4.69 per cent is based on a 20-trading day averaging period up to 31 October 2023.

⁴⁹ Economic Regulation Authority, 2022, *2023 Benchmark Reserve Capacity Price for the 2025/26 capacity year: Final determination*, p.10, ([online](#)).

⁵⁰ Economic Regulation Authority, 2020, *Market Procedure: Benchmark Reserve Capacity Price*, clause 2.9.7(h), ([online](#)).

⁵¹ The debt risk premium of 2.153 per cent is based on a 20-trading day averaging period up to 31 October 2023.

⁵² Economic Regulation Authority, 2022, *2023 Benchmark Reserve Capacity Price for the 2025/26 Capacity Year: Final determination*, p.11, ([online](#)).

Parameter	2024 BRCP final	2024 BRCP draft	Change to draft
Debt risk premium (%)	2.153	2.360	Down 20.7 basis points
Corporate tax rate (%)	30	30	-

Source: ERA analysis of BRCP data.

3.3 Other capital cost components

The other power station cost components, including land costs and fixed fuel costs did not significantly contribute to the increase in power station capital costs. These are covered in Appendix 5.

4. Annualised fixed O&M costs

The annualised fixed operating and maintenance (O&M) cost for the 2024 BRCP is \$39,809 per MW per year, up \$3,581 or 9.9 per cent from 2023.

The O&M costs component consists of five parts: generation O&M costs, switchyard O&M costs, transmission line O&M costs, asset insurance costs and network charges. These costs are expected to be annually incurred in operating and maintaining the BRCP 160 MW OCGT generator and are detailed in Table 8.

Table 8: Comparison of the 2024 BRCP determination annualised fixed O&M costs to the 2023 BRCP determination

Component	2024 BRCP determination	2023 BRCP determination	Change from 2023	
			(\$)	(%)
Annualised fixed O&M costs (\$/MW/year)	39,809	36,228	3,581	+9.9
Generation O&M costs (\$/MW/year)	17,688	15,934	1,754	+11.0
Switchyard O&M costs (\$/MW/year)	650	572	78	+13.7 ⁵³
Transmission O&M costs (\$/MW/year)	40.6	35.7	5	
Asset insurance costs (\$/MW/year)	8,392	7,154	1,238	+17.3
Fixed network access and ongoing charges (\$/MW/year)	13,037	12,531	506	+4.0

Source: ERA analysis of BRCP data. Some figures may not add up due to rounding.

The main drivers of the fixed O&M cost increase are discussed below with the remainder covered in Appendix 6.

4.1 Generation O&M cost

Generation O&M costs are based on a single gas turbine that can deliver a nominal 160 MW of electricity using diesel fuel with an operating life of up to 60 years and a two per cent capacity factor as outlined in the market procedure. An allowance for balance of plant costs is included, which includes items like the servicing of pumps, water plants, fire systems, etc.

The increase in generation O&M cost is largely driven by the increase in labour costs (see Table 3) for services including plant operations, electrical sub-contractors, and engineering support.

⁵³ These components use a common escalation factor.

4.1.1 Changes to generation O&M costs between draft and final determinations

There were no changes to the Generation O&M costs between the draft and final determinations.

4.2 Asset insurance

The asset insurance costs cover power station asset replacement, business interruption and public and products liability insurance. To maintain consistency with previous insurance estimates for the BRCP calculations, the ERA sourced the insurance quote from an independent insurance broker with expertise in power generation insurance, particularly in Western Australia.⁵⁴ The asset insurance cost components are detailed in Table 9.

Table 9: Comparison of the 2024 BRCP final determination asset insurance costs to the 2023 BRCP determination

Component	2024 BRCP determination	2023 BRCP determination	Change from 2023	
			(\$)	(%)
Asset insurance costs (\$/MW/year)	8,392	7,154	1,238	+17
Asset replacement (\$/year)	742,093	614,560	127,533	+21
Business interruption insurance (\$/year)	338,376	283,711	54,665	+19
Public and products liability	171,407	167,783	3,624	+2

Source: ERA analysis of insurance cost information provided for the 2024 BRCP.

4.2.1 Changes to asset insurance costs between draft and final determinations

Changes in the underlying BRCP cost components increased the insurable amounts for a BRCP 160 MW OCGT generator. During finalisation, the ERA discovered an un-escalated figure was incorrectly provided to the consultant for the draft determination, which has been corrected in the final insurance costs. The increase in the BRCP cost components has led to a higher insurable value for the BRCP generator that results in higher insurance costs. Table 10 details the changes which, in addition to the correction, are due to a higher replacement value for the generator and a rise in the insurable value for business interruption.

Table 10: Comparison of the 2024 BRCP final to draft determination asset insurance costs

Component	2024 final BRCP determination	2024 draft BRCP determination	Change from draft to final	
			(\$)	(%)
Asset insurance costs (\$/MW/year)	8,392	7,575	817	11

⁵⁴ The insurance broker is the same broker used by AEMO and the ERA for determining past BRCPs. The broker has requested for their name to be withheld.

Component	2024 final BRCP determination	2024 draft BRCP determination	Change from draft to final	
			(\$)	(%)
Asset replacement (\$/year)	742,093	634,733	107,360	17
Business interruption insurance (\$/year)	338,376	325,043	13,333	4
Public and products liability	171,407	170,456	951	1

Source: ERA analysis of insurance cost information provided for the 2024 BRCP.

4.3 Other operating and maintenance components

The other components making up the fixed operating and maintenance costs (asset insurance, fixed network access and ongoing charges, switchyard O&M and transmission line O&M) did not significantly contribute to its increase. These components are covered in Appendix 6.

Appendix 1 List of Tables

Table 1:	Comparison of the 2024 BRCP determination to the 2023 BRCP determination	6
Table 2:	Escalation factors applied to cost components of the BRCP calculation	7
Table 3:	Year on year cost escalation factors used to calculate the 2024 BRCP by financial year.....	9
Table 4:	Comparison of the annualised capital cost components for the 2024 BRCP final determination with the 2023 BRCP determination	11
Table 5:	Annual capital cost escalation factors – 2023 BRCP and 2024 BRCP	12
Table 6:	WACC values for the 2024 BRCP compared to the 2023 BRCP WACC values	13
Table 7:	Changes to the WACC and annual components between draft and final 2024 BRCP determinations	14
Table 8:	Comparison of the 2024 BRCP determination annualised fixed O&M costs to the 2023 BRCP determination.....	16
Table 9:	Comparison of the 2024 BRCP final determination asset insurance costs to the 2023 BRCP determination	17
Table 10:	Comparison of the 2024 BRCP final to draft determination asset insurance costs	17
Table 11:	Comparison of BRCP cost component between the 2024 BRCP determination and the 2023 BRCP.....	21
Table 12:	Changes of components between the 2023 BRCP final and draft determinations	22
Table 13:	Comparison of the capital costs between the 2024 BRCP determination and the 2023 BRCP determination	23
Table 14:	Comparison of the 2024 BRCP annualised fixed O&M costs to the 2023 BRCP determination.....	26
Table 15:	Comparison of 2024 BRCP determination fixed network and ongoing charges to the 2023 BRCP determination.....	28
Table 16:	CAPM parameters for the BRCP calculation.....	31
Table 17:	WACC for the 2024 BRCP compared to the 2023 BRCP WACC values.....	33

Appendix 2 List of Figures

Figure 1:	Comparison of historical BRCP and Reserve Capacity Prices	4
Figure 2:	BRCP from 2021/22 by capacity year including 2024 BRCP determination	5
Figure 3:	Changes between the 2024 determination and the 2023 BRCP by cost component	6

Appendix 3 Components of the 2024 BRCP final determination compared to 2023 BRCP

Table 11 is a consolidation of the differences between 2024 and 2023 of each component of the BRCP.

Table 11: Comparison of BRCP cost component between the 2024 BRCP determination and the 2023 BRCP

Component	2024 BRCP determination	2023 BRCP determination	Change from 2023
Expected capacity credits (MW)	151.17	151.17	-
Weighted Average Cost of Capital	9.54%	8.82%	Up 72 basis points
Power station cost (\$/MW)	974,854	819,378	155,476
Margin for legal, financing, and other costs	16.35%	16.42%	Down 7 basis points
Transmission Costs (\$/MW)	207,493	195,935	11,558
Fixed Fuel Costs (\$)	8,580,419	8,632,788	-52,369
Land Costs (\$)	3,075,732	3,048,874	26,858
Generation O&M cost (\$/MW/year)	17,688	15,934	1,754
Switchyard O&M cost (\$/MW/year)	650	572	78
Transmission Line O&M cost (\$/MW/year)	40.6	35.7	5
Asset Insurance Costs (\$/MW/year)	8,392	7,154	1,238
Fixed Network Access and ongoing charges (\$/MW/year)	13,037	12,531	506
Total Capital Costs (\$)	224,489,747	193,514,674	30,975,073
Annualised capital costs (\$/year)	28,751,257	23,757,776	4,993,481
Annualised fixed O&M (\$/MW/year)	39,809	36,228	3,581
BRCP (\$/MW/year)	230,000	193,400	36,600

Source: ERA analysis of BRCP data.

Appendix 4 Changes between the 2024 BRCP final and draft determinations

Changes to the WACC and CPI has changed some cost components between draft and final determinations. Table 12 consolidates these changes.

Table 12: Changes of components between the 2023 BRCP final and draft determinations

Component	2024 BRCP final determination	2024 BRCP draft determination	Change
Expected capacity credits (MW)	151.17	151.17	-
Weighted Average Cost of Capital	9.54%	8.83%	Up 71 basis points
Power station cost (\$/MW)	974,854	974,854	0
Margin for legal, financing, and other costs	16.35%	16.35%	0
Transmission Costs (\$/MW)	207,493	207,493	-
Fixed Fuel Costs (\$)	8,580,419	8,532,826	47,593
Land Costs (\$)	3,075,732	3,058,672	17,060
Generation O&M cost (\$/MW/year)	17,688	17,688	0
Switchyard O&M cost (\$/MW/year)	650	650	0
Transmission Line O&M cost (\$/MW/year)	40.6	40.6	0
Asset Insurance Costs (\$/MW/year)	8,392	7,575	817
Fixed Network Access and ongoing charges (\$/MW/year)	13,037	12,962	75
Total Capital Costs (\$)	224,489,747	223,690,084	799,663
Annualised capital costs (\$/year)	28,751,257	27,474,573	1,276,684
Annualised fixed O&M (\$/MW/year)	39,809	38,916	893
BRCP (\$/MW/year)	230,000	220,700	9,300

Source: ERA analysis of BRCP data.

Appendix 5 Annualised capital costs

The formula for calculating the BRCP capital costs is:

$$CAPCOST = ((PC \times (1 + M) + TC) \times CC + FFC + LC) \times (1 + WACC)^{0.5}$$

The values for each input in the capital cost formula is provided in Table 13. An explanation of each of the unshaded input values is provided below the table.

Table 13: Comparison of the capital costs between the 2024 BRCP determination and the 2023 BRCP determination

Component	2024 BRCP determination	2023 BRCP determination	Change from 2023	
			(unit)	(%)
Power station cost (PC) (\$/MW)	974,854	819,378	155,476	19
Weighted Average Cost of Capital (WACC)	9.54%	8.82%	Up 72 basis points	8.2
Expected capacity credits (CC) (MW)	151.17	151.17	-	-
Margin for legal, financing, and other costs (M) (%)	16.35	16.42	Down 7 basis points	-0.4
Transmission Costs (TC) (\$/MW)	207,493	195,935	11,558	5.9
Fixed Fuel Costs (FFC) (\$)	8,580,419	8,632,788	-52,369	-0.6
Land Costs (LC) (\$)	3,075,732	3,048,874	26,858	0.9
Total Capital Costs (\$)	224,489,747	193,514,674	30,975,073	16
Annualised capital costs (\$/Year)	28,751,257	23,757,776	4,993,481	21

Source: ERA analysis of BRCP data.

Note: Shaded components are discussed in chapter 3

Margin cost (M)

The 'M' margin includes costs for regulatory approval, financing, contingencies and legal. This margin is added as a percentage of capital cost of developing the power station and is 16.35 per cent for this final determination. This is lower than the 2023 BRCP value of 16.42 per cent.

While the base M cost increased,⁵⁵ as a proportion of the overall power station costs the change was lower in comparison to last year.

Transmission costs

Western Power estimated the shallow connection cost for the 2024 BRCP draft determination at \$26.6 million.⁵⁶ Applying the specific escalation requirements set out in the market procedure this comes to \$207,493 per MW.⁵⁷ Shallow connection costs include the construction of a substation, two kilometres of overhead line and the associated easement for that line.⁵⁸ The overall transmission cost increase of 5.9 per cent compared to the 2023 BRCP is driven by increases in land, substation, and transmission line costs.

Western Power provided an independently audited report that verifies its estimates as the underlying data is confidential and cannot be published. Western Power's report, with KPMG's audit report, is available on the ERA's website.⁵⁹

Fixed fuel costs

Fixed fuel costs are estimated at \$8.6 million for the 2024 BRCP, 0.6 per cent lower than the fixed fuel cost inputs for the 2023 BRCP. The decrease is due to a lower CPI forecast by the RBA in its November 2023 Statement of Monetary Policy which are used to escalate future costs.⁶⁰

The fixed fuel costs include the development and construction of an onsite liquid fuel storage and supply facility with supporting infrastructure. In addition, 14 hours of fuel is added to the costs, as required by the market procedure, which includes the cost to deliver, and any excise rebate.⁶¹

The increase in fixed fuel costs between the draft and final determinations is due to updated CPI data (see Appendix 4).

Land costs

The land costs provided by Landgate for the six regions assessed under the market procedure increased to \$3.08 million for the 2024 BRCP. This is \$26,858 higher than the 2023 BRCP

⁵⁵ Economic Regulation Authority, 31 August 2023, *Power station and associated costs*, Report prepared by GHD Advisory, section 5.3, ([online](#)).

⁵⁶ Economic Regulation Authority, 2022, *Total Transmission Cost Estimate for the Benchmark Reserve Capacity Price for 2026/27*, Report prepared by Western Power, p 5 ([online](#)).

⁵⁷ Economic Regulation Authority, 9 November 2020, *Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020*, section 2.4.1, ([online](#)) and Economic Regulation Authority, 2022, *Total Transmission Cost Estimate for the Benchmark Reserve Capacity Price for 2026/27*, Report prepared by Western Power, ([online](#)).

⁵⁸ The ERA provided the land costs to Western Power for their calculation. The land costs are from Economic Regulation Authority, 2023, *Land values for the 2024 Benchmark Reserve Capacity Price*, Report prepared by Landgate ([online](#)).

⁵⁹ Economic Regulation Authority, 2022, *Total Transmission Cost Estimate for the Benchmark Reserve Capacity Price for 2026/27*, Report prepared by Western Power, ([online](#)).

⁶⁰ Reserve Bank of Australia. November 2023. *Statement on Monetary Policy*, Appendix: Forecasts. ([online](#))

⁶¹ Economic Regulation Authority, 9 November 2020, *Market Procedure: Benchmark Reserve Capacity Price*, section 2.6, ([online](#)).

land costs due to increases in all regions except Eneabba (part of the North Country region). Landgate's assessment is available on the ERA's website.⁶²

The hypothetical land sites were assessed for each region specified in the market procedure (Collie, Kalgoorlie, Kemerton Industrial Park, Kwinana, North Country, and Pinjar) that are suitable for building a BRCP reference generator. These assessments were made as at 30 June 2023 with the ERA applying the applicable transfer duty. The per hectare cost for the BRCP is averaged over these regions and escalated to 1 April 2026.⁶³

The increase in fixed fuel costs between the draft and final determinations is due to updated CPI data (see Appendix 4).

⁶² Economic Regulation Authority, 2023, *Land values for the 2024 Benchmark Reserve Capacity Price*, Report prepared by Landgate ([online](#)).

⁶³ The land costs are escalated to 1 April 2026 as the land must be acquired prior to construction of the BRCP reference generator. This is specified in *Market Procedure: Benchmark Reserve Capacity Price*, 9 November 2020, clause 2.7.5, ([online](#)).

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 4 and Table 14 below.

Table 14: Comparison of the 2024 BRCP annualised fixed O&M costs to the 2023 BRCP determination.

Component	2024 BRCP determination	2023 BRCP determination	Change from 2023	
			(\$)	(%)
Annualised fixed O&M costs (\$/MW/year)	39,809	36,228	3,581	+9.9
Generation O&M costs (\$/MW/year)	17,688	15,934	1,754	+11.0
Asset insurance costs (\$/MW/year)	8,392	7,154	1,238	+17.3
Switchyard O&M costs (\$/MW/year)	650	572	78	+13.7 ⁶⁴
Transmission O&M costs (\$/MW/year)	40.6	35.7	5	
Fixed network access and ongoing charges (\$/MW/year)	13,037	12,531	506	+4.0

Source: ERA analysis of BRCP data. Some figures may not add up due to rounding.

Note: Shaded components are discussed in chapter 4

Changes between the draft and final determination value is detailed in Appendix 4.

Switchyard operating and maintenance costs

The estimated switchyard O&M cost (\$650 per MW per year) was higher than the 2023 BRCP. The increase was due to an increase in the forecast material costs as detailed in the cost escalation factors estimate (see Table 3).⁶⁵

The switchyard O&M costs are derived from the isolator on the high voltage side of the generator's transformer and does not include any generator transformer or switchgear costs. These costs are based on the annual charge for connection assets and includes estimates of overheads, machine hire and labour for maintenance services. Details are available in GHD's report on the ERA's website.⁶⁶

⁶⁴ These components have a common escalation factor.

⁶⁵ Economic Regulation Authority, 2023, *Power station and associated costs*, Report prepared by GHD Advisory, sections 2.4 and 4.3 ([online](#)) – discusses how the cost escalation for switchyard O&M is derived and applied.

⁶⁶ Ibid, section 4.4 ([online](#)).

Transmission operating and maintenance costs

The estimated transmission line O&M cost (\$40.60 per MW per year) increased from the 2023 BRCP value. The increase was due to an increase in the forecast material costs as detailed in the cost escalation factors estimate (see Table 3).⁶⁷

The transmission line O&M is derived from a transmission line that is assumed to be a single circuit 330 kilovolt construction with two conductors per phase with a 60-year asset life. The line can transport up to 200 megavolt amperes with a power factor of 0.8.

Fixed network access and ongoing charges

The other main contributor to the rise in fixed O&M costs is the increase in Western Power's fixed network access and ongoing charges to \$13,037 per MW per year, an increase of 4 per cent (or \$506 per MW per year) when compared to the 2023 BRCP value (\$12,531 per MW per year).

Network access charges were determined using Western Power's network access tariffs data from the 2023/24 price list.⁶⁸ Since the fixed network access and ongoing charges are a small contributor to the BRCP, changes to these prices will not significantly affect the overall BRCP. In line with how network access charges have been assessed in previous BRCP determinations, the ERA applied the highest Transmission Reference Tariff 2 unit price from across the regions where the BRCP can be located.⁶⁹ The Muja Power Station substation has the highest unit price, which the ERA used to estimate the fixed network access charges applicable to the BRCP generator. The charge is based on the cost to Western Power of that generator using the SWIS network and depends on factors including the location, transmission, line-length and the complexity of the grid connection.

The other inputs for this cost component are:

- Control system service charges – this is the general overhead of Western Power's control system costs applied to generator proportionately per kilowatt.
- Transmission metering service charges – this is a fixed daily charge per revenue meter.

Table 15 provides a comparison of these cost inputs against the 2023 BRCP values for fixed network access and ongoing charges.

⁶⁷ Economic Regulation Authority, 2023, *Power station and associated costs*, Report prepared by GHD Advisory, sections 2.4 and 4.3 ([online](#)) – discusses how the cost escalation for switchyard O&M is derived and applied.

⁶⁸ Transmission Reference Tariff 2 was used as it applies to generators – Western Power, 2023, 2023/24 Price List for the Western Power network ([online](#)) [accessed 21 August 2023].

⁶⁹ These regions are Collie, Kemerton Industrial Park, Pinjar, Kwinana, North Country (Eneabba and Geraldton) and Kalgoorlie – Economic Regulation Authority, 2020, *Market Procedure: Benchmark Reserve Capacity Price*, Clause 2.7.1 ([online](#)).

Table 15: Comparison of 2024 BRCP determination fixed network and ongoing charges to the 2023 BRCP determination.

Component	2024 BRCP	2023 BRCP	Change from 2023	
			(unit)	(%)
Control system service charge (\$/year)	131,131	121,390	9,741	8.0
Transmission metering (\$/year)	3,459	3,209	250	7.8
Use of system charge (\$/year)	1,638,758	1,520,128	118,630	7.8
Total annual Western Power charges (\$)	1,773,539	1,644,726	128,813	7.8
Cost per MW per year ⁷⁰	13,037	12,531	506	4.0

Source: ERA analysis of BRCP data.

The increase in fixed network access and ongoing charges between the draft and final determinations is due to updated CPI data (see Appendix 4).

⁷⁰ Includes escalation by forecast inflation.

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.

When calculating the BRCP, the WACC is used in:

- Estimating financing costs, which are added into the reference power station's capital expenditures. This accounts for project financing costs before the commissioning of the power station and the realisation of revenues from participation in the wholesale electricity market.
- Converting the power station's capital costs into an annualised cost that can be recovered over the assumed life of the power station. In this annuity approach, the WACC represents a long-term required rate of return over the life of the asset.

Calculation of the WACC in the market procedure

Section 2.9 of the market procedure directs the ERA on how the WACC for the BRCP is to be calculated.⁷¹

Specifically, clauses 2.9.6 and 2.9.7 of the market procedure detail the high-level framework to be used:

2.9.6 [ERA] shall compute the WACC on the following basis:

- The WACC shall use the Capital Asset Pricing Model (CAPM) as the basis for calculating the return to equity.
- The WACC shall be computed on a Pre-Tax basis.
- The WACC shall use the standard Officer WACC method as the basis of calculation.

2.9.7 The pre-tax Officer WACC shall 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:

R_e is the nominal return on equity (determined using the Capital Asset Pricing Model) and is calculated as:

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

Where:

R_f is the nominal risk free rate for the Capacity Year;

β_e is the equity beta; and

MRP is the market risk premium.

⁷¹ Economic Regulation Authority, 2020, *Market Procedure: Benchmark Reserve Capacity Price*, Section 2.9, ([online](#)).

R_d is the nominal return on debt and is calculated as:

$$R_d = R_f + DM$$

Where:

R_f is the nominal risk free rate for the Capacity Year;

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

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

γ is the value of franking credits;

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

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

The nominal risk free rate, for a Capacity Year is the rate determined for that Capacity Year by [ERA] on a moving average basis from 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;
- The debt risk premium, DRP, for a Capacity Year is a margin above the risk free rate reflecting the risk in provision of debt finance. This will be estimated by [ERA] as the margin between the observed 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. [ERA] must determine the methodology to estimate the DRP, which in the opinion of [ERA] is consistent with current accepted Australian regulatory practice.⁷²
- If there are no Commonwealth Government bonds with a maturity of 10 years on any day in the period referred to in step 2.9.7(g), [ERA] must determine 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.
- If the methods used in step 2.9.7(i) cannot be applied due to suitable bond terms being unavailable, [ERA] may determine the nominal risk free rate by means of an appropriate approximation.

Since the ERA is responsible for calculating the 2024 BRCP, the ERA must estimate the WACC following the market procedure. The ERA's annual BRCP determination involves two sets of components listed in clause 2.9.3:

- Annual components, which require review each year which comprises the risk free rate, debt risk premium and corporate tax rate.

⁷² The ERA has adopted an alternative 'Bond-Yield Approach' to establishing the DRP and has applied this since its Final Decision on revisions proposed by WA Gas Networks (WAGN) to the access arrangement for the Mid West and South West gas distribution systems in 2011.

- Structural components, which are fixed in the market procedure and remain constant between the ERA's five-yearly methodology reviews of the BRCP. As part of the annual review, the ERA may review and determine values for structural components that differ from those specified in the market procedure if it considers that a significant economic event has influenced those components. These structural components include the market risk premium, equity beta, debt issuance costs, franking credit value and gearing ratio.

Clause 2.9.8 of the market procedure details the parameters that the CAPM must use as variables each year (see Table 16):

Table 16: CAPM parameters for the BRCP calculation

CAPM parameter	Notation	Review frequency	Value
The following variables are to be determined⁷³			
Nominal risk free rate (%)	R_f	Annual	
Debt risk premium (%)	DRP	Annual	
Corporate tax rate (%)	t	Annual	
The following variables are specified in the market procedure			
Market risk premium (%)	MRP	5-Yearly	5.90
Asset beta	β_a	5-Yearly	0.5
Equity beta	β_e	5-Yearly	0.83
Debt issuance costs (%)	d	5-Yearly	0.100
Franking credit value	γ	5-Yearly	0.5
Debt to total assets ratio (%)	$\frac{D}{V}$	5-Yearly	40
Equity to total assets ratio (%)	$\frac{E}{V}$	5-Yearly	60

Source: ERA analysis of BRCP data.

Updated annual WACC

The ERA has reviewed and calculated the annual components listed in the market 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.

⁷³ See Table 6 for these values for the final 2024 BRCP.

The BRCP market 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 market procedure uses information 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.

On 31 March 2023, the RBA ceased publishing the new F16 data series “Indicative Mid Rates of Australian Government Securities” and removed all historical data from its website. As the F16 data series is no longer available, the ERA uses RBA F2 data series ‘Capital Market Bonds – Government – Daily’ for the 10-year nominal risk free rate calculation. This data series provides the RBA’s own linear interpolation of yields for maturities of two, three, five and 10 years.

The use of a 10-year term for the risk free rate is to reflect a long-term rate of return for the capital costs of the reference generator. This is consistent with the purposes of the BRCP calculations and aligns the WACC to represent a long-term rate of return for the capital costs over the life of the reference plant.

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

For the 2024 BRCP WACC, the ERA determined a nominal risk free rate of 4.69 per cent.⁷⁴ This is higher than the 3.96 per cent nominal risk free rate for the 2023 BRCP.⁷⁵

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 market procedure requires the use of a BBB (or equivalent) credit rating from Standard and Poor’s.⁷⁶

The ERA uses a “revised bond yield approach” to determine the debt risk premium at a point in time by:⁷⁷

- Step 1: Determining the benchmark sample – Identifying a sample of relevant domestic and international corporate bonds that reflect the BBB credit rating.⁷⁸
- Step 2: Collecting data and converting the bond yields to Australian dollar equivalents – converting the bond yields from the sample into hedged Australian dollar equivalent yields inclusive of Australian swap rates.

⁷⁴ The nominal risk free rate of 4.69 per cent is based on a 20-trading day averaging period up to 31 October 2023.

⁷⁵ Economic Regulation Authority, 2022, *2023 Benchmark Reserve Capacity Price for the 2025/26 capacity year: Final determination*, p.9, ([online](#)).

⁷⁶ Economic Regulation Authority, 2020, *Market Procedure: Benchmark Reserve Capacity Price*, clause 2.9.7(h), ([online](#)).

⁷⁷ Economic Regulation Authority, 2022, *Explanatory Statement for the 2022 final gas rate of return instrument*, p.84, ([online](#)).

⁷⁸ The market procedure details that a benchmark generator for the purposes of BRCP having a credit rating of BBB.

- 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.⁷⁹
- Step 5: Estimating the cost of debt – Calculating the simple average of the three yield curves' 10-year cost of debt to arrive at a market estimate of the 10-year cost of debt.
- Step 6: Calculating the debt risk premium - Calculating the debt risk premium by subtracting the 10-year risk free rate from the 10-year cost of debt.
- The ERA estimates the latest value of the debt risk premium over the specified averaging period each year for the BRCP.
- For the 2024 BRCP WACC, the ERA determined a debt risk premium of 2.153 per cent.⁸⁰ This is lower than the 2.369 per cent debt risk premium for the 2023 BRCP.⁸¹

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 a WACC for the BRCP based on the approach detailed in the BRCP market procedure and the 20-trading day averaging period ending 31 October 2023.

For the 2024 BRCP, the indicative nominal pre-tax WACC is 9.54 per cent (see Table 17). This is higher than the 8.82 per cent nominal pre-tax WACC for the 2023 BRCP.⁸²

Table 17: WACC for the 2024 BRCP compared to the 2023 BRCP WACC values

Parameter	2024 BRCP value	2023 BRCP value ⁸³
Cost of equity parameters		
Nominal risk free rate (%)	4.69	3.96
Equity beta	0.83	0.83
Market risk premium (%)	5.90	5.90
Pre-tax return on equity (%)	11.28	10.42

⁷⁹ 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.

⁸⁰ The debt risk premium of 2.153 per cent is based on a 20-trading day averaging period up to 31 October 2023.

⁸¹ Economic Regulation Authority, 2022, *2023 Benchmark Reserve Capacity Price for the 2025/26 capacity year: Final determination*, p.9, ([online](#)).

⁸² Ibid, p.9.

⁸³ Economic Regulation Authority, 2022, *2023 Benchmark Reserve Capacity Price for the 2025/26 capacity year: Final determination*, pp.9-10, ([online](#)).

Parameter	2024 BRCP value	2023 BRCP value ⁸³
Cost of debt parameters		
Nominal risk free rate (%)	4.69	3.96
Debt risk premium (%)	2.153	2.369
Debt issuance costs (%)	0.100	0.100
Pre-tax return on debt (%)	6.94	6.43
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 (%)	9.54	8.82

Source: ERA analysis of BRCP data.

The difference between the WACC used in the draft and final determinations is detailed in section 3.2.2.