Economic Regulation Authority

2023 benchmark reserve capacity price for the 2025/26 capacity year

Draft determination

5 October 2022

D252179

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

Invitation to make submissions

Submissions are due by 4:00 pm WST, Wednesday, 16 November 2022

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

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

You can also send comments through:

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

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

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

For further information please contact

General Enquiries

Richard Cheng
Ph: 08 6557 7947
info@erawa.com.au

Media Enquiries

Danielle Asarpota
Ph: 08 6557 7923 | Mob: 0428 859 826
media@erawa.com.au

Contents

List of appendices

Executive summary

The Economic Regulation Authority has made its draft determination that the 2023 benchmark reserve capacity price will be $185,200 per megawatt per year, applicable to the 2025/26 capacity year. The ERA will consider stakeholder submissions to this draft determination before making its final determination. The Australian Energy Market Operator (AEMO) will use the 2023 benchmark reserve capacity price (BRCP) to determine the reserve capacity price for the 2025/26 capacity year.[1]

The BRCP is an input into the calculation of the reserve capacity price, which is the price paid to generators for each megawatt (MW) of capacity that they make available in that year.[2] The reserve capacity mechanism (RCM) is part of the Wholesale Electricity Market, which operates across Western Australia's South West Interconnected System (SWIS). The RCM aims to ensure that there is enough capacity installed in the SWIS to ensure that electricity is available when it is required. It provides price signals for capacity providers, like generators, to enter the market. The revenue from reserve capacity payments adds to other revenues from generating electricity and providing essential system services to provide an overall return for investors.

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

The 2023 BRCP draft determination of $185,200 per MW per year is 11.8 per cent higher than the 2022 BRCP ($165,700 per MW per year).[4] This change is mostly due to a higher cost of capital from rising debt market interest rates and slightly offset by lower forecast steel and copper prices. Since the 2022 BRCP determination, there have been major global supply chain disruptions and a shift in debt markets from a low interest rate environment to one of rising central bank rates. This has driven increases in the factors that affect the 2023 BRCP.

This report details how the ERA made its BRCP draft determination. The ERA used data and analysis from independent consultants (GHD Advisory and PricewaterhouseCoopers), Western Power and Landgate to determine the 2023 BRCP. These reports are available on the ERA's website.[5]

1 The reserve capacity timeline is defined in Wholesale Electricity Market Rules (WA), 1 September 2022, Rule 4.1, (online).

2 All holders of capacity credits receive capacity payments. 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 Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, section 2.1, (online). The OCGT must be able to also run on liquid fuel.

4 The 2022 BRCP price is available on the ERA's website - Economic Regulation Authority, 'Benchmark Reserve Capacity Price', (online).

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

1. Introduction

The South West Interconnected System (SWIS) is a geographically isolated electricity system located in Western Australia. The SWIS stretches from Kalbarri in the north to Kalgoorlie in the east, down to Albany in the south of Western Australia. The SWIS is not connected to the National Electricity Market's network.

To ensure a reliable supply of electricity, there must be enough electricity generation available to continuously meet consumer demand. To achieve this, Western Australia's Wholesale Electricity Market (WEM) uses a reserve capacity mechanism (RCM) to incentivise capacity to be installed in the SWIS to meet future consumer demand.

The RCM provides a price signal for the supply of electricity generation capacity in the SWIS. Capacity suppliers, which are mostly generators, are paid to make their generating capacity available regardless of whether they are required to supply electricity.[6] The amount that generators are paid for making their generating capacity available is called the reserve capacity price. The BRCP, stated in dollars per megawatt per year, is an input into AEMO's reserve capacity price determination. The reserve capacity price varies from year to year based on factors including the BRCP and the WEM's level of excess capacity.[7, 8, 9]

The BRCP is a cost estimate of building a new 160 MW Open Cycle Gas Turbine (OCGT) generator to provide reserve capacity to the SWIS for a future capacity year, usually two years into the future.[10] The 2023 BRCP assessment applies to the 2025/26 capacity year. The BRCP is based on a bottom-up, engineering-based cost estimate of a 160 MW OCGT with enough fuel to operate for 14 hours continuously at its maximum rated capacity.[11] This cost estimate consists of:

- Fixed operating and maintenance costs for the power station, fuel handling, and transmission connection components.
- Land costs.
- Liquid fuel storage and handling facilities.
- Transmission connection costs.
- Other ancillary and infrastructure costs that are normally incurred when developing a power station.

6 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.).

7 AEMO conducts the reserve capacity price determination process with the reserve capacity timeline defined under Wholesale Electricity Market Rules (WA), 1 September 2022, Rule 4.1, (online).

8 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), 1 September 2022, 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.

9 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.

10 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).

11 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.

- Allowances for legal, insurance, financing, and environmental approvals costs including a contingency margin.

The ERA will consider stakeholder submissions to this draft determination before making its final determination by the end of 2022.

Throughout this determination:

- References to the market procedure refer to the BRCP market procedure unless otherwise specified.[12]
- Cost and price estimates are in Australian dollars excluding Goods and Services Tax, unless otherwise specified.
- All references to the 2023 BRCP refer to the ERA's BRCP draft determination price of $185,200 per MW per year applicable to the 2025/26 capacity year, unless otherwise specified. This is to not to be confused with the BRCP that applies to the 2023/24 capacity year.

1.1 BRCP market procedure

The ERA became responsible for calculating and determining the BRCP from 1 July 2021. Prior to that date, AEMO was responsible for calculating the BRCP, which was then submitted to the ERA for approval. This transfer of responsibilities is reflected in the WEM Rules but not in the BRCP market procedure.

Energy Policy WA (EPWA) is reviewing the RCM, including assessing how any changes to the RCM will affect the BRCP methodology. Once the review is complete, the ERA will update the BRCP market procedure to account for changes arising from the RCM review and include the transfer of responsibility for calculating the BRCP from AEMO to the ERA.

[12] Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, (online).

2. Scope of the BRCP

The 2023 BRCP must include all reasonable costs expected to be incurred when developing a power station for the 2025/26 capacity year. The market procedure details how the BRCP's components must be calculated or determined.[13] The major components are:

- an annualised fixed operating and maintenance component, which includes:[14]
  - transmission connection costs
  - land costs
  - fixed fuel costs
  - a margin for other costs including approvals, legal and financing
- the annualised total capital cost of the power plant.

To determine the 2023 BRCP, the ERA has followed the market procedure and used a combination of public information and advice from independent consultants, Western Power and Landgate.

2.1 Network access quantities and high emissions technologies

To calculate the BRCP, the ERA must estimate the quantity of capacity credits that the BRCP reference generator, a 160 MW OCGT, is expected to receive in the 2025/26 capacity year.

Constrained network access will apply in the SWIS by 2025/26.[15] As part of the implementation of constrained network access, Energy Policy WA (EPWA) developed and consulted on a framework clarifying how capacity credits will be allocated to generators given the SWIS's network constraints. As part of a generator's capacity credit determination, each generator will be awarded a Network Access Quantity (NAQ). EPWA, Western Power and AEMO are currently working on network limit advice and capacity constraint equations for the SWIS, which will set out the NAQs that generators will receive. Since the BRCP reference generator is expected to receive capacity credits, this amount will depend on how much NAQ it would likely receive.

A generator's NAQ is affected by the capacity that it can provide to the grid from that part of the network. The more congested a section of the network, the lower the NAQ available for new generators connecting in that section. The less congestion, the more NAQ will be available for a new generator. Consequently, where the BRCP reference generator connects to the network will determine its level of NAQ.

As EPWA releases information on network constraints and guidance on the BRCP methodology, the ERA will incorporate these in future BRCP determinations. This may require changes to the BRCP market procedure, for which the ERA will undertake the required review and consultation process.

---

13 Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, (online).

14 The capital cost of the OCGT and the weighted average cost of capital (WACC) are used to derive the fixed operating and maintenance costs.

15 Constrained network access will commence as part of the new WEM on 1 October 2023 – Australian Energy Market Operator, 'WEM Reform Implementation Update', (online) [accessed 13 September 2022].

Similarly, recent announcements about changes to the SWIS may affect the ERA's determination of future BRCPs. These announcements include:

- The State Government's assessment of new and existing demand for renewable energy for the SWIS's network.[16] This could lead to investments that allow additional capacity to be added to the network, and generators, like the BRCP reference generator, could be built in these less congested locations that provide generators with a more favourable NAQ allocation.
- The Minister for Energy's Draft Statement of Policy Principles: Penalties for high emission technologies in the WEM.[17] In the future, penalties may apply to generators such as the BRCP's OCGT reference generator.

The ERA has not accounted for these recent announcements in the 2023 BRCP as policy positions are not finalised.

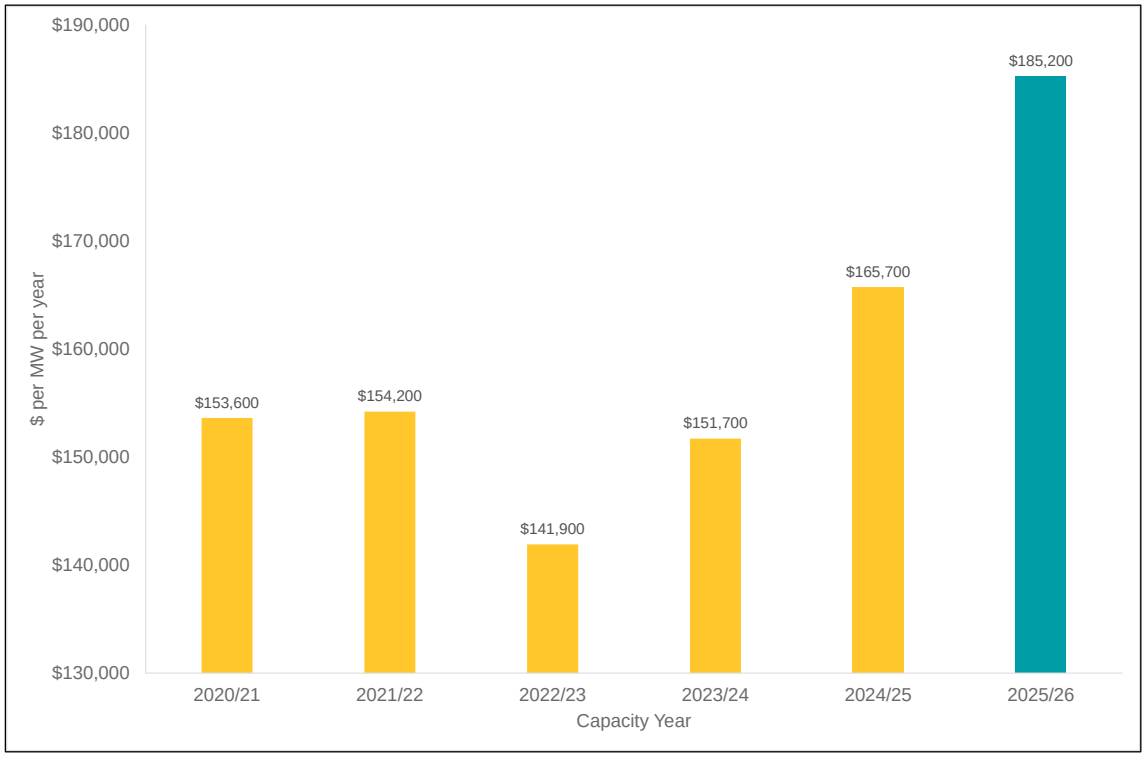
16 Government of Western Australia media statement, 2022, 24 August 2022, 'Assessment of electricity demand to inform WA's future network', (online) [accessed 8 September 2022].

17 Energy Policy WA, 2022, *Draft Statement of Policy Principles: Penalties for high emission technologies in the Wholesale Electricity Market*, (online) [accessed 8 September 2022].

3. The BRCP calculation

The ERA has determined that the 2023 BRCP is $185,200 per MW per year for the 2025/26 capacity year.[18] Figure 1 shows the BRCP since the 2020/21 capacity year.

Figure 1: BRCP from 2020/21 by capacity year



Source: AEMO Benchmark Reserve Capacity Price webpage (online), ERA Benchmark Reserve Capacity Price webpage (online), and ERA's analysis of BRCP data.

The formula for calculating the BRCP is:[19]

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

Table 1 provides a comparison of the 2023 BRCP draft determination and its components against the 2022 BRCP values.

18 As required by Wholesale Electricity Market Rules (WA), 1 September 2022, Rule 4.16, (online).

19 Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, clause 2.10.1, (online). The annualised fixed operations and maintenance cost is expressed in dollars per MW per year.

Table 1: 2023 BRCP draft determination values compared to the 2022 BRCP values

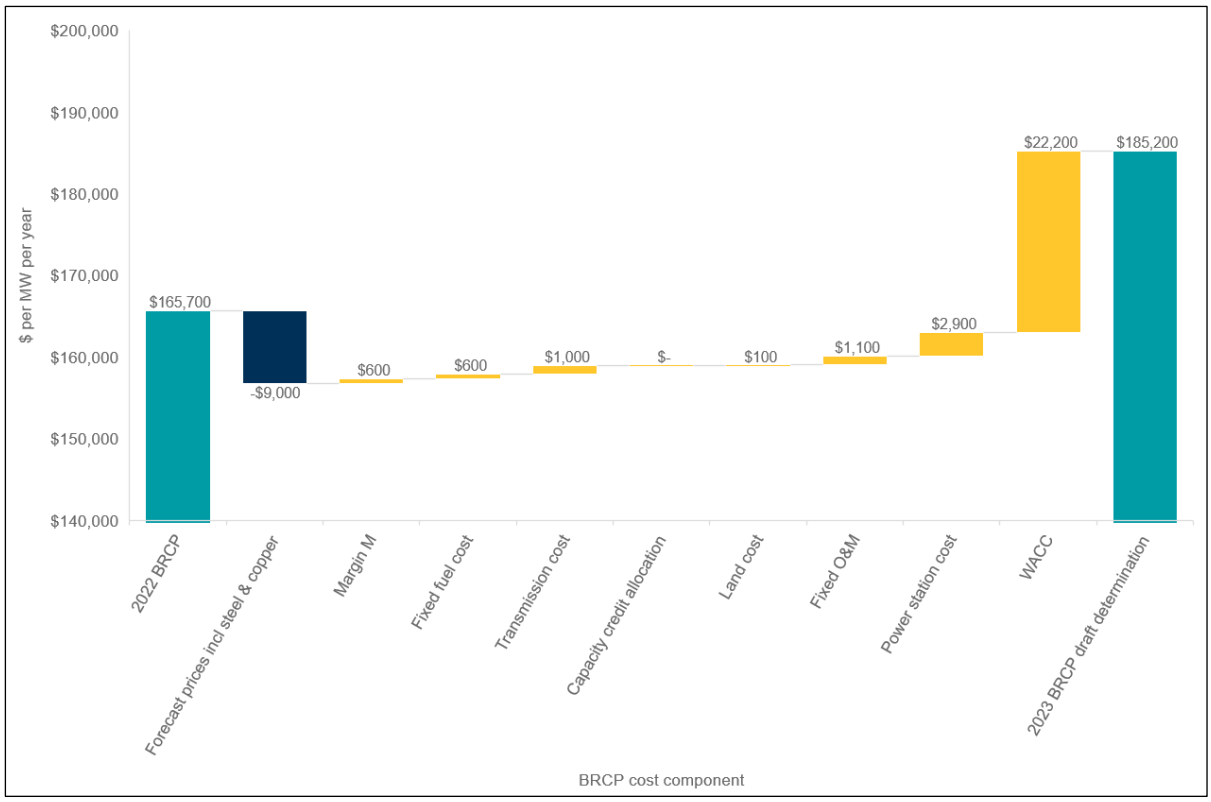
Component	2023 BRCP draft determination	2022 BRCP	Change from 2022
BRCP ($/MW/Year)	**185,200**	**165,700**	**19,500** **+11.8%**
Annualised capital costs ($/Year)	22,611,263	19,887,082	2,724,181 +13.7%
Annualised fixed O&M costs ($/MW/Year)	35,602	34,131	1,471 +4.3%
Expected capacity credits (MW)	151.17	151.12	+0.05 capacity credits +0.03%

Source: ERA analysis of BRCP data

The breakdown of the different components underlying the annualised capital costs is detailed in Chapter 4 and Appendix 4, with the annualised fixed operations and maintenance (O&M) costs discussed in Chapter 5 and Appendix 5. The small change in expected capacity credits is discussed in section 3.1.

Figure 2 illustrates the change between the 2023 BRCP draft determination and 2022 BRCP by cost component.

Figure 2: Changes between the 2023 BRCP draft determination and 2022 BRCP by BRCP cost component[20]



Source: ERA analysis of BRCP data

The following sections detail the main components that are driving the change from the 2022 BRCP. For completeness, the components with minor impacts are detailed in the appendices to this report.

3.1 Expected capacity credits

The expected capacity credits for a 160 MW OCGT entering the SWIS for the 2025/26 capacity year is 151.17 MW. The generator's expected capacity credits are determined based on the likely output of the generator operating at 41 degrees Celsius, adjusted for site conditions, as required by the market procedure.[21] The ERA's independent consultant, GHD Advisory (GHD), assessed generators worldwide and recommended one to use as a proxy for the ERA to derive the expected capacity credits for this determination.[22]

The number of expected capacity credits for the reference generator is slightly higher than that for the 2022 BRCP (151.12 MW). This increase is due to updated information from the generator's manufacturer.

20 A consolidated list of changes to the BRCP cost components is in Appendix 3.

21 See Economic Regulation Authority, 2022, *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).

22 Economic Regulation Authority, 2022, *Power station and associated costs*, Report prepared by GHD Advisory, sections 3.2 to 3.4 (online).

4. Annualised capital costs of the power station

The 2023 BRCP annualised capital costs of the reference generator is $22.6 million, which is 13.7 per cent or $2.7 million higher than the annualised capital costs calculated for the 2022 BRCP. This component is the largest contributor to the 2023 BRCP increase. The increase in the annualised capital costs in the 2023 BRCP draft determination is mostly driven by an increase in financing costs (weighted average cost of capital (WACC)).

Table 2: Annualised capital cost components for the 2023 BRCP draft determination against 2022 BRCP values

Component	2023 BRCP draft determination	2022 BRCP	Change from 2022
Annualised capital cost ($/year)	**22,611,263**	**19,887,082**	**2,724,181** **+13.7%**
Power station cost ($/MW)	802,679	844,150	-41,472 -4.9%
Margin (%)	16.38	16.21	Up 17 basis points +1.0%
Transmission cost ($/MW)	195,935	186,877	9,058 +4.8%
Fixed fuel cost ($)	8,588,684	7,398,376	1,190,308 +16.1%
Land cost ($)	3,017,820	2,699,666	318,155 +11.8%
WACC (%)	8.32	6.08	Up 224 basis points +36.8%
Expected capacity credits (MW)	151.17	151.12	+0.05 capacity credits +0.03%

Source: ERA analysis of BRCP data

Note: The change in the values do not directly correspond to changes in the BRCP due to the operation of the calculation specified in the BRCP market procedure.[23] For example, although land costs have increased by 11.8 per cent, this has a smaller effect on the BRCP than the 4.8 per cent increase in transmission costs as the transmission cost component is a larger contributor to the annualised capital cost component.

Table 2 shows the change in the cost components between the 2022 BRCP and the 2023 BRCP draft determination. The main drivers affecting the annualised capital cost components of the BRCP (the WACC and power station costs) are discussed below with the remaining items discussed in Appendix 4.

[23] Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, clause 2.10.1, (online).

4.1 Weighted Average Cost of Capital (WACC)

The weighted average cost of capital is the largest change driving the 2023 BRCP draft determination. The cost of capital represents the minimum return that a firm must earn on an existing 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 to 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.

The ERA has reviewed and calculated the annual WACC components (see Table 3):

- the nominal risk free rate
- the debt risk premium
- the corporate tax rate.[24]

For the 2023 BRCP draft determination, the indicative nominal pre-tax WACC is 8.32 per cent (see Table 3). This is higher than the 6.08 per cent nominal pre-tax WACC calculated for the 2022 BRCP.[25] The increase in the nominal risk free rate (up 173 basis points) is the main driver of this change and is discussed below.

The WACC will be updated in the ERA's 2023 BRCP final determination to account for changes in the WACC components between the draft and final determinations.

Table 3: Indicative WACC for the 2023 BRCP draft determination

Parameter	2023 BRCP draft determination value	2022 BRCP value[26]
WACC		
Nominal pre-tax WACC (%)	**8.32**	**6.08**
Cost of equity parameters		
Nominal risk free rate (%)	3.45	1.72
Equity beta	0.83	0.83
Market risk premium (%)	5.90	5.90
Pre-tax return on equity (%)	9.82	7.78
Cost of debt parameters		
Nominal risk free rate (%)	3.45	1.72
Debt risk premium (%)	2.508	1.697
Debt issuance costs (%)	0.100	0.100

[24] 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).

[25] ERA, 2022, *2022 benchmark reserve capacity price for the 2024/25 capacity year: Final determination,* p.8.

[26] Ibid, p.8.

Parameter	2023 BRCP draft determination value	2022 BRCP value[26]
Pre-tax return on debt (%)	6.06	3.52
Other parameters		
Debt proportion (gearing) (%)	40	40
Franking credits (gamma) (%)	50	50
Corporate tax rate (%)	30	30

Source: ERA analysis of BRCP data

4.1.1.1 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 of the WACC. To estimate a long-term risk free rate of return, the BRCP market procedure requires the ERA to use 10-year Commonwealth Government bonds as a proxy for risk free assets in Australia.[27] The BRCP WACC calculation uses a nominal risk free rate, which includes financial markets' inflation expectations.

The ERA's indicative estimate of the nominal risk free rate is 3.45 per cent for this draft determination. This is higher than the 1.72 per cent nominal risk free rate used for the 2022 BRCP.[28,29] The increase is due to higher interest rates on the 10-year Commonwealth Government bonds used to estimate the 2023 BRCP draft determination WACC. Over the last year, financial markets have experienced large upward pressure on interest rates as central banks have increased rates to curb inflation.

The nominal risk free rate in the ERA's 2023 BRCP final determination may differ depending on changes to market conditions since this draft figure was calculated.

4.1.1.2 Debt risk premium

The debt risk premium is the 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 BRCP market procedure requires the ERA to assess corporate bonds that have a credit rating of BBB (or equivalent).[30,31] 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 6.

27 Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, clause 2.9.7, (online). To calculate the risk free rate, the market procedure uses indicative mid rates published by the Reserve Bank of Australia. 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.

28 The nominal risk free rate of 3.45 per cent is based on a 20-trading day averaging period up to 29 July 2022.

29 ERA, 2022, *2022 benchmark reserve capacity price for the 2024/25 capacity year: Final determination,* p.8.

30 Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, clause 2.9.7(h), (online).

31 BBB is a credit rating designated by Standard and Poor's and indicates that a business is of medium credit quality and is investment grade – Investopedia, 'Investment Grade', (online) [accessed 4 August 2022].

The ERA's indicative estimate of the debt risk premium for this draft determination is 2.508 per cent. This is higher than the 1.697 per cent debt risk premium used for the 2022 BRCP.[32,33] The difference is due to changes in credit markets since the 2022 BRCP final determination.

The debt risk premium for the ERA's final determination may differ depending on changes to debt markets since the draft figure was calculated.

4.1.1.3 Corporate tax rate

The Australian corporate tax rate is 30 per cent and has not changed since the 2022 BRCP.

4.2 Power station costs

Since the BRCP reference generator is to be built in the future, forecasts for these input costs are required to estimate the cost of building the power plant in the 2025/26 capacity year.[34] The ERA engaged PricewaterhouseCoopers (PwC) to forecast these input costs, called cost escalation factors, for the 2023 BRCP (Table 4).[35] The cost escalation factors are estimated by financial year. Power station development costs decreased to $802,679 per MW (down 4.9 per cent from 2022) mostly driven by larger forecast decreases in material prices (steel and copper) which are a significant part of the building component's cost.[36]

Table 4: Cost escalation factors used to calculate the 2023 BRCP by financial year

Cost Escalation Factor	Financial year				
	2022/23	**2023/24**	**2024/25**	**2025/26**	**2026/27**
Labour costs – operations and maintenance (% change)	2.79	3.04	3.04	3.04	2.83
Labour costs – construction (% change)	2.49	2.74	2.74	2.74	2.53
AUD/USD ($)	0.7169	0.7563	0.7750	0.7750	0.7750
Steel price (% change)	-27.18	-20.67	-13.44	-3.57	-4.12
Copper price ($ change)	-8.95	-11.90	-4.41	0.15	1.76

Source: Economic Regulation Authority, 2022, 2023 Benchmark Reserve Capacity Price, Report prepared by PwC (online)

These cost escalation factors were provided to GHD who determined a power station escalation factor to apply to the power station costs (Table 5).[37] The power station escalation

32 The debt risk premium of 2.508 per cent is based on a 20-trading day averaging period up to 29 July 2022.

33 ERA, 2022, *2022 benchmark reserve capacity price for the 2024/25 capacity year: Final determination,* p.8.

34 This approach of applying cost escalation factors to the BRCP reference generator priced at today's costs has been used consistently in previous BRCP determinations.

35 Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, section 2.3, (online).

36 This is the total capital cost escalated to 1 April 2025 divided by the expected capacity credits of 151.17 MW. Expected capacity credits for the power station is discussed in section 3.1.

37 The cost escalation factors are used to estimate the power plant, fixed operating and maintenance, fixed fuel and margin M costs as at the dates required by the BRCP market procedure. Details of each cost escalation is in Economic Regulation Authority, 2021, *Power station and associated costs*, Report prepared by GHD Advisory (online).

factor (see Table 5) is applied to the current price of the reference generator to derive an estimated future cost of the power station.

Table 5: Power station escalation factors

Cost escalation	Total applicable power station escalation factor (%)
2022 BRCP[38]	-4.1
2023 BRCP[39]	-10.4

Source: Economic Regulation Authority, 2022, Power station and associated costs, Report prepared by GHD Advisory, chapter 2 (online); and Economic Regulation Authority, 2021, Power station and associated costs, Report prepared by GHD Advisory, chapter 2 (online).

The overall power station cost decreased as a lower power station escalation factor was used for the 2023 BRCP draft determination than for the 2022 BRCP. The lower power station escalation factor is driven by lower steel and copper price forecasts which are due to an expected oversupply of these materials in the coming years.[40]

Table 6: Change in cost escalation factors between the 2022 and 2023 BRCP

Cost Escalation Factor	2022/23	2023/24	2024/25	2025/26
Labour costs – operations and maintenance (basis points)	+34	+34	+34	+62
Labour costs – construction (basis points)	+48	+48	+48	+76
AUD/USD (cents)	-6.94	-1	+0.87	+0.87
Steel price (basis points)	79	-1,046	-646	-78
Copper price (basis points)	-34	-1,029	-825	-219

Source: Economic Regulation Authority, 2022, 2023 Benchmark Reserve Capacity Price, Report prepared by PwC (online)

The lower power station escalation costs led to an overall decrease in the total capital costs of 1.2% (see Appendix 3). However, when these total capital costs are annualised, incorporating the WACC leads to an increase in the 2023 BRCP annualised capital costs when compared to the 2022 BRCP (see start of Chapter 4 and section 4.1).

[38] The -4.1 per cent is the overall escalation factor applied to the power station cost using the cost escalation factors from the 2022 BRCP. This is calculated as the final estimated cost of the generator relative to the cost of the generator today ($126,073,156 / $131,397,654 – 1) - Economic Regulation Authority, 2021, *Power station and associated costs*, Report prepared by GHD Advisory, chapter 2 (online).

In the 2022 BRCP, the cost escalation factor was provided as a yearly annualised figure (-2.36 per cent). For the 2023 BRCP, the reporting of this figure was changed to the total applicable power station cost escalation factor which provides a more accurate reference of how much the cost escalation estimates affect the total cost of the power station.

[39] The -10.4 per cent is the overall escalation factor applied to the power station cost using the cost escalation factors from the 2023 BRCP. This is calculated as the final estimated cost of the generator relative to the cost of the generator today ($121,352,516 / $135,508,167 – 1) - Economic Regulation Authority, 2022, *Power station and associated costs*, Report prepared by GHD Advisory, chapter 2 (online).

[40] Economic Regulation Authority, 2022, *2023 Benchmark Reserve Capacity Price,* Report prepared by PricewaterhouseCoopers (online).

4.2.1 Power station generator model selection

The ERA engaged GHD to assess the appropriate machine for the 2023 BRCP. GHD selected the Siemens SGT5-2000E, which is consistent with the machine chosen for the 2022 BRCP, as it closely aligns with the power station requirements in the market procedure.[41] The power station requirements are that it:

- Is an industry standard OCGT power station with a nominal nameplate capacity of 160 MW prior to installing any inlet cooling system.
- Can use distillate for its fuel.
- Has a capacity factor of 2 per cent. This means that the BRCP reference generator is expected to generate at its maximum capacity for 2 per cent of the year.

When determining the capital costs of this power station, GHD incorporated other power station requirements, such as:[42]

- Technologies that are required to demonstrate good practice for developing this type of power station, like nitrous oxide burners.
- An inlet air cooling system and water receival and storage facilities to allow 14 hours of continuous operation where this would be cost effective.

4.3 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 4.

41 Economic Regulation Authority, 2022, *Power station and associated costs*, Report prepared by GHD Advisory, chapter 3 (online).

42 Ibid.

5. Annualised fixed O&M costs

The annualised fixed operating and maintenance costs for the 2023 BRCP is $35,602 per MW per year, up 4.3 per cent from the 2022 BRCP ($34,131 per MW per year). This increase is mostly due to a rise in asset insurances costs and the effect of inflation on Western Power's network access and ongoing charges estimates.

The operating and maintenance 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 incurred in operating and maintaining the reference generator annually and are detailed in Table 7.[43]

Table 7: Comparison of 2023 BRCP draft determination annualised fixed O&M costs to 2022 BRCP values

Component	2023 BRCP draft determination	2022 BRCP	Change from 2022
Annualised fixed O&M costs ($/MW/year)	**35,602**	**34,131**	**1,471 +4.3%**
Generation O&M costs ($/MW/year)	15,699	15,318	381 +2.5%
Switchyard O&M costs ($/MW/year)	570	576	-6 -1.0%
Transmission line O&M costs ($/MW/year)	36	36	-0.4 -1.0%
Asset insurance costs ($/MW/year)	6,904	6,426	478 +7.4%
Fixed network access and ongoing charges ($/MW/year)	12,393	11,775	618 +5.3%

Source: ERA analysis of BRCP data

The main drivers of the fixed O&M cost increase are discussed below with the remainder covered in Appendix 5.

5.1 Asset insurance costs

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, the ERA sourced the insurance quote from an independent insurance broker, which is one of the leading global insurance brokers with expertise in power generation

[43] These fixed operation and maintenance costs have been escalated to 1 October 2025.

insurance, particularly in Western Australia.[44] The asset insurance cost components are in Table 8.

Table 8: Comparison of 2023 BRCP draft determination asset insurance costs to 2022 BRCP values

Component	2023 BRCP draft determination	2022 BRCP	Change from 2022
Asset insurance costs ($/MW/Year)	**6,904**	**6,426**	**478** **7.4%**
Asset replacement insurance ($/Year)	594,279	588,066	6,213 +1.1%
Business interruption insurance ($/Year)	269,285	228,984	40,301 +17.6%
Public and products liability insurance ($/Year)	166,074	142,452	23,622 +16.6%

Source: ERA analysis of insurance cost information provided for the 2023 BRCP

Asset insurance costs for the 2023 BRCP draft determination rose by 7.4 per cent to $6,904 per MW per year when compared to the asset insurance costs for the 2022 BRCP. This is mostly due to significant increases in the cost of business interruption and public and products liability insurance.

Business interruption insurance increased due to the higher business interruption insurable value of the power station.[45] The business interruption insurable value rose to $28 million due to the increased overall cost of the BRCP reference generator. This is greater than the $25 million business interruption insurable value used in the 2022 BRCP.

The increase in public and products liability insurance is due to an increase in perceived risks in the power sector, particularly around new technologies disrupting the industry, global supply chain and related inflationary issues, and broader geopolitical, environmental and pandemic related concerns. These have led to an overall trend of increasing insurance premiums across the board.

5.2 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 $12,393 per MW per year, an increase of 5.3 per cent (or $618 per MW per year) when compared to the 2022 BRCP value ($11,775 per MW per year).

Network access charges were determined using Western Power's network access tariffs data from the 2021/22 price list, as the 2022/23 price list will not be published before the ERA

[44] The insurance broker is the same broker used by AEMO and then the ERA for determining past BRCPs. For confidentiality, the broker has requested to not be named.

[45] The business interruption value of the power station is the expected capacity credits multiplied by the expected BRCP.

makes its BRCP determination.[46] Since the fixed network access and ongoing charges are a small contributor to the BRCP, it is unlikely that the updated prices would 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.[47] 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. This 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 generators proportionately per kilowatt.
- Transmission metering service charges – this is a fixed daily charge per revenue meter.

Table 9 provides a comparison of these cost inputs against the 2022 BRCP values for fixed network access and ongoing charges. Although Western Power's price list has not changed, the cost escalation (i.e., inflation expectations) for the 2023 BRCP is higher than those for the 2022 BRCP, which results in the cost increase.

Table 9: Comparison of 2023 BRCP draft determination fixed network and ongoing charges to 2022 BRCP values

Component	2023 BRCP draft determination	2022 BRCP	Change from 2022
Control system service charge ($/year)	121,390	121,349	41 +0.03%
Transmission metering ($/year)	3,209	3,209	No change
Use of system charge ($/year)	1,520,128	1,519,625	503 +0.03%
Total annual Western Power charges ($)	1,644,726	1,644,183	543 +0.03%
Cost per MW per year[48]	12,393	11,775	618 +5.2%

Source: ERA analysis of BRCP data

[46] The Transmission Reference Tariff 2 was used as it applies to generators – Western Power, 2021, *2021/22 Price List*, (online) [accessed 29 August 2022].

[47] These regions are Collie, Kemerton Industrial Park, Pinjar, Kwinana, North Country (Eneabba and Geraldton) and Kalgoorlie – Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, clause 2.7.1, (online).

[48] Includes escalation by forecast inflation.

The 2023 BRCP fixed network and ongoing charges were calculated as of July 2022 with the total cost per MW figure escalated by the forecast inflation rates to 1 October 2025 as required by the market procedure.

5.3 Other operating and maintenance components

The other components making up the fixed operating and maintenance costs (switchyard O&M and transmission line O&M) did not significantly contribute to its increase. These components are covered in Appendix 5 and are similar to the 2022 BRCP amounts.

Appendix 1 List of Tables

Appendix 2 List of Figures

Appendix 3 Components of the 2023 BRCP draft determination compared to 2022 BRCP

Table 10 is a consolidation of the differences between 2023 and 2022 of each component of the BRCP.

Table 10: Comparison of components between the 2023 BRCP draft determination and 2022 BRCP

Component	2023 BRCP draft determination	2022 BRCP	Change from 2022
Expected capacity credits (MW)	151.17	151.12	0.05
Weighted Average Cost of Capital	8.32%	6.08%	Up 224 basis points
Power station cost ($/MW)	802,679	844,150	41,472
Margin for legal, financing, and other costs	16.38%	16.21%	Up 17 basis points
Transmission Costs ($/MW)	195,935	186,877	9,058
Fixed Fuel Costs ($)	8,588,684	7,398,376	1,190,308
Land Costs ($)	3,017,820	2,699,666	318,155
Generation O&M cost ($/MW/year)	15,699	15,318	381
Switchyard O&M cost ($/MW/year)	570	576	-6
Transmission Line O&M cost ($/MW/year)	35.6	35.9	-0.4
Asset Insurance Costs ($/MW/year)	6,904	6,426	478
Fixed Network Access and ongoing charges ($/MW/year)	12,393	11,775	618
Total Capital Costs ($)	**189,870,739**	**192,172,433**	**-2,301,694**
Annualised capital costs ($/Year)	**22,611,263**	**19,887,082**	**2,724,181**
Annualised fixed O&M ($/MW/year)	**35,602**	**34,131**	**1,471**
BRCP ($/MW/Year)	**185,200**	**165,700**	**19,500**

Source: ERA analysis of BRCP data

Appendix 4 Annualised capital costs

The formula for calculating the BRCP capital costs is:[49]

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

The values for each input in the capital cost formula is provided in Table 11. An explanation of each of the unshaded input values is provided below the table.[50]

Table 11: Comparison of the 2023 BRCP draft determination and 2022 BRCP capital costs

Component	2023 BRCP draft determination	2022 BRCP	Change from 2022
Power station cost (PC) ($/MW)	802,679	844,150	-41,472 -4.9%
Weighted Average Cost of Capital (WACC)	8.32%	6.08%	Up 224 basis points +36.8%
Expected capacity credits (CC) (MW)	151.17	151.12	0.05 +0.03%
Margin for legal, financing, and other costs (M) (%)	16.38	16.21	Up 17 basis points +1.0%
Transmission Costs (TC) ($/MW)	195,935	186,877	9,058 +4.8%
Fixed Fuel Costs (FFC) ($)	8,588,684	7,398,376	1,190,308 +16.1%
Land Costs (LC) ($)	3,017,820	2,699,666	318,155 +11.8%
Total Capital Costs ($)	**189,870,739**	**192,172,433**	**-2,301,694 -1.2%**
Annualised capital costs ($/Year)	**22,611,263**	**19,887,082**	**2,724,181 +13.7%**

Source: ERA analysis of BRCP data

Note: Shaded components are discussed in section 3.1 or Chapter 4.

This appendix covers the other components that were minor contributors to the overall change in the power station capital costs.[51]

[49] Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, clause 2.10.1, (online).

[50] The power station costs and WACC are discussed in Chapter 4, and expected capacity credits in section 3.1.

[51] The increase in the WACC and power station cost are the major contributors to the rise in the annualised capital cost component.

Margin cost (M)

The 'M' margin includes costs for regulatory approval, financing, contingencies and legal.[52] This margin is added as a percentage of the capital cost of developing the power station and is 16.38 per cent for this draft determination. This is higher than the 2022 BRCP value (16.21 per cent) as the costs for these services all increased relative to the 2023 BRCP power station cost.[53]

Transmission costs

Western Power estimated the shallow connection costs for the 2023 BRCP draft determination at $25.3 million.[54] Applying the specific escalation requirements set out in the market procedure, this comes to $195,935 per MW.[55] Shallow connection costs include the construction of a substation, two kilometres of overhead line and the associated easement for that line.[56] The increase of 4.8 per cent compared to the 2022 BRCP is driven by increases in land, substation, and transmission line costs.

Western Power provided an independently audited report that verifies their estimates as the underlying data is confidential and cannot be published. Western Power's report, with EY's audit report, is available on the ERA's website.[57]

Fixed fuel costs

Fixed fuel costs are estimated at $8.6 million for the 2023 BRCP, 16.1 per cent higher than for the 2022 BRCP. This increase is due to the rising diesel price affected by worldwide events including the COVID-19 pandemic, global supply issues and disruptions to oil and gas markets.

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 of delivery and any excise rebate.[58]

Land costs

The land costs provided by Landgate for the six regions assessed under the market procedure increased to $3.0 million for the 2023 BRCP. This is $318,155 higher than the 2022 BRCP

52 Full details are in Economic Regulation Authority, 2022, *Power station and associated costs*, Report prepared by GHD Advisory, section 6 (online).

53 Details on the capital cost of the power station is in Economic Regulation Authority, 2022, *Power station and associated costs*, Report prepared by GHD Advisory, section 3.5 (online).

54 Economic Regulation Authority, 2022, *Total Transmission Cost Estimate for the Benchmark Reserve Capacity Price for 2025/26*, Report prepared by Western Power, (online), p 5.

55 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 2025/26*, Report prepared by Western Power, (online), p 6.

56 The ERA provided the land costs to Western Power for their calculation. The land costs are from Economic Regulation Authority, 2022, *Land values for the 2023 Benchmark Reserve Capacity Price*, Report prepared by Landgate (online).

57 Economic Regulation Authority, 2022, *Total Transmission Cost Estimate for the Benchmark Reserve Capacity Price for 2025/26*, Report prepared by Western Power, (online).

58 Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, section 2.6, (online).

land costs due to increases in land costs for all regions except Eneabba (part of the North Country region). Landgate's assessment is available on the ERA's website.[59]

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 2022 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 2025.[60]

[59] Economic Regulation Authority, 2022, *Land values for the 2023 Benchmark Reserve Capacity Price*, Report prepared by Landgate (online).

[60] The land costs are escalated to 1 April 2025 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 5 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 5 and are detailed in Table 12.

Table 12: Comparison of 2023 BRCP annualised fixed O&M costs draft determination values to 2022 BRCP values

Component	2023 BRCP draft determination	2022 BRCP	Change from 2022
Annualised fixed O&M costs ($/MW/year)	**35,602**	**34,131**	**1,471 +4.3%**
Generation O&M costs ($/MW/year)	15,699	15,318	381 +2.5%
Fixed network access and ongoing charges ($/MW/year)	12,393	11,775	618 +5.3%
Switchyard O&M costs ($/MW/year)	570	576	-6 -1.0%
Transmission line O&M costs ($/MW/year)	35.6	35.9	-0.4 -1.0%
Asset insurance costs ($/MW/year)	6,904	6,426	478 +7.4%

Source: ERA analysis of BRCP data

Note: Shaded components are discussed in Chapter 5.

Generation O&M cost

Generation O&M costs are an estimate of the operating and maintenance costs of a 160 MW OCGT reference generator operating on diesel fuel as required by the market procedure.[61] These costs are estimated over the generator's operating life of up to 60 years with the generator operating at its maximum output for 2 per cent of each year.[62] Additionally, an allowance for balance of plant costs is included, which comprises items like the servicing of pumps, water plants and fire systems.

The increase in generation O&M cost ($381 per MW per year or 2.5 per cent) is largely driven by the increase in labour costs (see Table 4) for services including plant operations, electrical

61 Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, section 2.1, (online).

62 Details on fixed operating and maintenance costs are in Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, section 2.5, (online). This excludes the costs of gas connections as the market procedure requires the OCGT to be able to run on diesel.

sub-contractors, and corporate overheads.[63] Other increases include rates, market fees and balance of plant costs.[64]

Switchyard operating and maintenance costs

The estimated switchyard O&M cost ($570 per MW per year) was lower than for the 2022 BRCP. The decrease is due to a forecast fall in material costs as detailed in the cost escalation factors estimates (see Table 4).[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]

Transmission line operating and maintenance costs

The estimated transmission line O&M cost ($35.6 per MW per year) did not significantly change from the 2022 BRCP value. The decrease is due to a forecast fall in material costs as detailed in the cost escalation factors estimates (see Table 4).[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.

63 Economic Regulation Authority, 2022, *Power station and associated costs*, Report prepared by GHD Advisory, section 4.3 (online) – for details of these costs.

64 The changes in generation O&M is available in: Economic Regulation Authority, 2022, *Power station and associated costs*, Report prepared by GHD Advisory, Table 10, p 14 (online).

65 Economic Regulation Authority, 2022, *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).

67 Ibid, sections 2.4 and 4.3 (online) – discusses how the cost escalation for switchyard O&M is derived and applied.

Appendix 6 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.[68]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:
>
> (a) The WACC shall use the Capital Asset Pricing Model (CAPM) as the basis for calculating the return to equity.
>
> (b) The WACC shall be computed on a Pre-Tax basis.
>
> (c) 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:
>
> (a) 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.
>
> (b) R_d is the nominal return on debt and is calculated as:
>
> $$R_d = R_f + DM$$

[68] Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, section 2.9, (online).

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).

(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, 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;

(h) 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.[69]

(i) 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.

(j) 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 2023 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. This comprises the risk free rate, debt risk premium and corporate tax rate.
- 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

[69] 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.

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 13):

Table 13: CAPM parameters for the BRCP calculation

CAPM Parameter	Notation	Review frequency	Value
The following variables are to be determined[70]			
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	0.50
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.

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 BRCP market procedure requires the use of indicative mid rates published by the Reserve

[70] See Table 14 for these values for the indicative 2023 BRCP.

Bank of Australia. 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 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.

The ERA's indicative estimate of the nominal risk free rate is 3.45 per cent for the 2023 BRCP draft determination.[71] This is higher than the 1.72 per cent nominal risk free rate used for the 2022 BRCP.[72]

The nominal risk free rate will be updated in the ERA's BRCP final determination to account for changes to market conditions since the ERA's draft determination.

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 BRCP market procedure requires the use of a BBB (or equivalent) credit rating from Standard and Poor's.[73]

The ERA uses a "revised bond yield approach" to determine the debt risk premium at a point in time by: [74]

- Determining the benchmark sample, which requires identifying a sample of relevant corporate bonds that have a BBB credit rating (or equivalent).[75]
- Converting the bond yields from the benchmark sample into Australian dollar equivalent yields.
- Calculating an average Australian dollar equivalent bond yield for each bond across the averaging period.
- Estimating yield curves on the bond data by applying various techniques including Gaussian Kernel, Nelson-Siegel and Nelson-Siegel-Svensson techniques.[76]

---

71 The nominal risk free rate of 3.45 per cent is based on a 20-trading day averaging period up to 29 July 2022.

72 ERA, 2022, *2022 benchmark reserve capacity price for the 2024/25 capacity year: Final determination,* p.8.

73 Market Procedure: Benchmark Reserve Capacity Price, 9 November 2020, clause 2.9.7(h), (online).

74 Economic Regulation Authority, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, Chapter 10.

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

76 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.

- Estimating the 10-year cost of debt by averaging the three yield curves of 10-year cost of debt based on the techniques used in the previous point.
- Calculating the debt risk premium by subtracting the 10-year risk free rate (or base 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.

The ERA's indicative estimate of the debt risk premium is 2.508 per cent for the 2023 BRCP draft determination.[77] This is higher than the 1.697 per cent debt risk premium used for the 2022 BRCP.[78]

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

Corporate tax rate

The ERA has reviewed the corporate tax rate which has not changed from the 30 per cent rate. The corporate tax rate is not expected to change by the final determination.

Updated BRCP WACC

This appendix provides an illustrative rate of return for the BRCP based on the approach detailed in the BRCP market procedure and uses values derived by averaging over a 20-trading day period up to 29 July 2022 as a placeholder.

For the 2023 BRCP draft determination, the indicative nominal pre-tax WACC is 8.32 per cent (see Table 14). This is higher than the 6.08 per cent nominal pre-tax WACC for the 2022 BRCP.[79]

[77] The debt risk premium of 2.508 per cent is based on a 20-trading day averaging period up to 29 July 2022.

[78] ERA, 2022, *2022 benchmark reserve capacity price for the 2024/25 capacity year: Final determination,* p.8.

[79] Ibid, p.8.

Table 14: Indicative WACC for the draft 2023 BRCP

Parameter	2023 BRCP draft determination values	2022 BRCP values[80]
Cost of equity parameters		
Nominal risk free rate (%)	3.45	1.72
Equity beta	0.83	0.83
Market risk premium (%)	5.90	5.90
Pre-tax return on equity (%)	9.82	7.78
Cost of debt parameters		
Nominal risk free rate (%)	3.45	1.72
Debt risk premium (%)	2.508	1.697
Debt issuance costs (%)	0.100	0.100
Pre-tax return on debt (%)	6.06	3.52
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 (%)	**8.32**	**6.08**

Source: ERA analysis of BRCP data

[80] ERA, 2022, *2022 benchmark reserve capacity price for the 2024/25 capacity year: Final determination,* p.8.