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8 November 2019

Our reference: Second Period estimate for 2020 BRCP determination
Your reference: Second period estimate for 2020 BRCP determination

Dear Trevor

2020 Benchmark Reserve Capacity Price Debt Risk Premium for the South West Interconnected System, using the ERA's 'Bond Yield Approach'

The Australian Energy Market Operator (AEMO) engaged PricewaterhouseCoopers Consulting (Australia) Pty Limited (PwC) to advise on the debt risk premium (DRP)[1] derived by applying the Economic Regulation Authority of Western Australia's (ERA) 'Bond Yield Approach'. The estimate of the DRP will be used by AEMO, in conjunction with various other parameters, to estimate a Weighted Average Cost of Capital (WACC), a necessary input for determining the 2020 Benchmark Reserve Capacity Price (BRCP).

AEMO requested the DRP be estimated over the 20 business days ending on and including 23 August 2019 (the First Period) and 18 October 2019 (the Second Period). This memorandum provides our estimate of the DRP for the Second Period.[2]

As instructed by you, we have applied the ERA's 'Bond Yield Approach' that was set out in the ERA's Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline (Goldfields Decision).[3] AEMO requires PwC to use Australian corporate bonds which have a BBB (or equivalent) credit rating from Standard and Poor's, and to use Commonwealth Government bond yields as the risk free rate (RFR), in estimating the DRP as per version 6 of the ERA's Market Procedure document.[4]

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[1] For the avoidance of doubt the estimated DRP reflects only the risk margin attributable to debt financing, and not other debt related costs such as financing arrangement and underwriting fees.

[2] The 7th of October has been excluded from the averaging period as it was a Public Holiday in NSW. Additionally the 14th of October was removed from the sample as it was Columbus Day in the United States, causing bonds denominated in USD to exhibit unusually high yields. As a result the sample period was extended to 19 September to ensure the averaging period captured 20 days of trading data.

[3] See Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline (pages 565-592) - https://www.erawa.com.au/cproot/14401/2/GGP%20-%20GGT%20-%20AA3%20-%20Amended%20Final%20Decision%20-PUBLIC%20VERSION.PDF

[4] https://www.erawa.com.au/cproot/14362/2/Market%20Procedure%20-%20Maximum%20Reserve%20Capacity%20Price.pdf

The ERA's 'Bond Yield Approach' changed following the Goldfields Decision. Compared with the 'Bond Yield Approach' from previous years, the new approach is much more extensive. The ERA's 'Bond Yield Approach' requires the application of three separate methodologies to estimate a DRP, being the:

- Gaussian Kernel methodology (GK)
- Nelson-Siegel methodology (NS)
- Nelson-Siegel Svennson methodology (NSS).

A more detailed explanation of the differences is provided in Appendix A.

This advice is provided pursuant to the scope and terms set out in the consultancy agreement commencing 6 August 2019 between PwC and AEMO.

Disclaimer

We prepared this report solely for AEMO's use and benefit in accordance with and for the purpose set out in our consultancy agreement with AEMO dated 6 August 2019. In doing so, we acted exclusively for AEMO and considered no-one else's interest. We accept no responsibility, duty or liability:

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Results

As shown in Table 3, we estimate a DRP of 223 basis points (bp) for the Second Period applying a modified version of the ERA's 'Bond Yield Approach' to estimating a DRP. The premium is derived from an estimated 10 year BBB yield of 3.21 per cent, less a Commonwealth Government Security (CGS) 10 year yield of 0.98 per cent as the risk free rate (RFR).

The ERA's 'Bond Yield Approach' for regulated gas businesses applies a sample of bonds with a credit rating between BBB- and BBB+.[5] AEMO, in contrast to WA's regulated gas businesses and in accordance with its market procedures, can only:

- consider corporate bonds with a BBB credit rating
- use Commonwealth Government Security (CGS) yields as the RFR rate to estimate the DRP.

Although we have followed the ERA's 'Bond Yield Approach', to be consistent with the BRCP procedures we have restricted the sample of bonds to only those with a Standard and Poor's credit rating of BBB and applied CGS yields as the RFR to estimate the DRP.

For the First Period 2019, from a sample of 59 bonds we removed 16 bonds with duplicate features, one bond that did not return results for the required 10 trading days, and one bond that displayed a number of duplicate and unusual features (AZ1682162 Corp). For the Second Period 2019, we began with a sample of 58 bonds and removed 18 bonds with duplicate features and AZ1682162 Corp for the reasons noted above.

Compared with the First Period 2019, applying the ERA's bond sample criteria in the Second Period 2019 added a bond issued by CIMIC Finance,[6] and another issued by Origin Energy which was issued after the First Period. The Period 2 sample removed two bonds issued by Origin Energy because their terms to maturity were fewer than 2 years. Additionally, a bond issued by Newcrest Finance (EI8711810 Corp) and APT Pipelines (EK8095854 Corp) were excluded from the Second Period as they were exhibiting duplicate features.[7]

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[5] ERA (2013), *Rate of Return Guidelines - Meeting the requirements of the National Gas Rules*, 16 December

[6] The underlying characteristics of this bond appear not to have changed. However by applying the specified search criteria from Table 114 of the ERA Bond Yield Approach the CIMIC bond was absent from the First period sample and present in the Second.

[7] Both EI8711810 Corp (Newcrest Finance) and EK8095854 Corp (APT Pipelines) exhibited fractionally different yields to bonds that were otherwise identical on 23rd of August and were not considered duplicate in the First Period. In the Second Period these yields were exactly the same and both EI8711810 and EK8095854 Corp have been excluded from the sample as a duplicate.

First Period DRP estimate - revision

In reviewing the calculations for the First Period we identified a number of methodological errors in the estimation calculations.[8] Correcting for these increased the DRP by 2bp to 235bp.

Tables 1 and 2 summarise the revisions made to the First Period estimate.

Table 1 - Summary of revised Period 1 DRP estimates using the ERA's 'Bond Yield Approach', restricted to bonds with a BBB credit rating – 20 business days to 23 August 2019 (basis points)

Methodology	DRP	Average DRP	Difference*
Gaussian Kernel	231	235	- 5
Nelson-Siegel	234		-2
Nelson-Siegel Svennson	242		7

Note: The difference between the DRP and average DRP does not sum due to rounding.

Table 2: Comparison of submitted period 1 estimates and revised period 1 estimates (bp)

Methodology	Submitted	Revised	Difference
Gaussian Kernel	228	231	3
Nelson-Siegel	231	234	3
Nelson-Siegel Svennson	241	242	1
DRP	233	235	2

[8] Specifically, the methodological errors identified were:

1. Yields for foreign denominated bonds on 6 August and AUD denominated bonds on 29 July had not been correctly extracted.
2. The yields had been incorrectly converted to per cent figures (by dividing the Bloomberg figures by 100) prior to the GK, NS and NSS calculations. This impacted the annualisation of yields, where an exponent had been applied to a fraction rather than a unit figure.
3. The RFR used was the '*Australian Government 10 year bond*' as reported by the RBA in statistical table F02d. This has been updated to the *'Indicate Mid Rates of Australian Government Securities'* as reported by the RBA in statistical table F16 (and F16hist 2009-2018).

Second Period DRP estimate

The DRP estimated by applying the GK, NS and NSS methodologies for the Second Period is shown in Table 3.

Table 3 - Summary of Period 2 DRP estimates using the ERA's 'Bond Yield Approach', restricted to bonds with a BBB credit rating – 20 business days to 18 October 2019 (basis points)

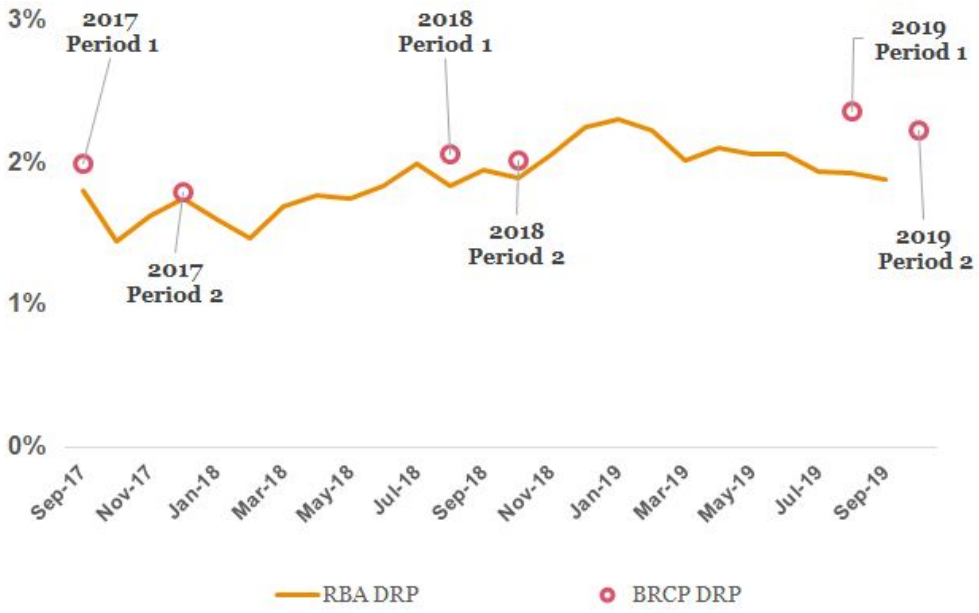
Methodology	DRP	Average DRP	Difference
Gaussian Kernel	218	223	-5
Nelson-Siegel	215		-8
Nelson-Siegel Svennson	236		13

In Figure 1 we compare the spread between the BRCP DRP and the RBA's reported BBB DRP figures.

As noted in the First Period memorandum the RBA's DRP has experienced significant variability over the 12 months since the 2019 BRCP estimate. Between the Second Period last year and January 2019 the RBA's BBB DRP demonstrated a significant upward trend with the spread between the RBA's BBB estimate sitting above 220bp in December 2018, January and February 2019. This spread has been reducing in subsequent months.

As at September 2019 the RBA DRP was 187bp. This is 36bp lower than the Second Period BCRP DRP estimate. This spread is again larger than observed between the BCRP estimates and the RBA DRP in 2017 and 2018.

Figure 1 - Comparison of RBA BBB 10 year DRP with BRCP DRP over the last 3 sets of DRP estimates

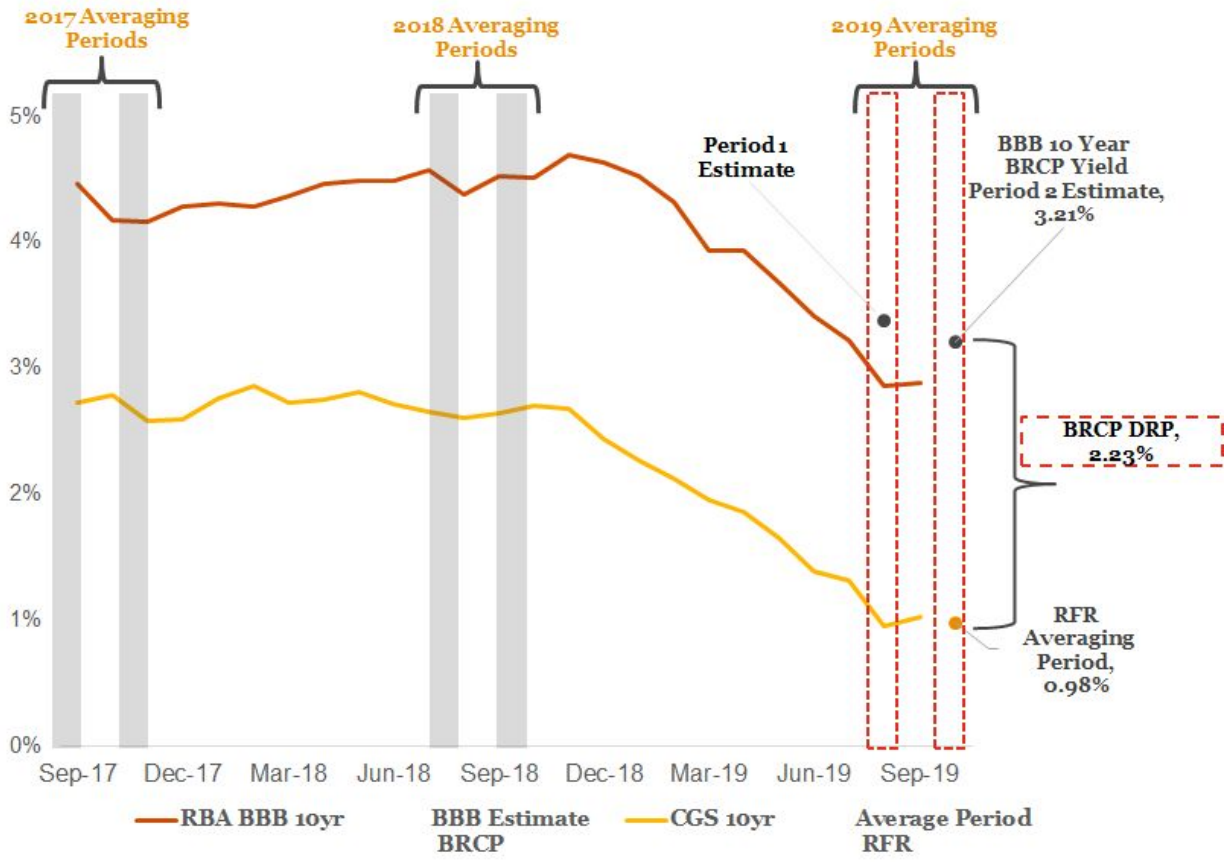


Source: PwC's analysis applying the ERA's 'Bond Yield Approach', Bloomberg, RBA[9]

In Figure 2 we plot the 10 year CGS yield (yellow) and the RBA BBB 10 year bond yield (orange) and show the Second Period BRCP BBB yield estimate (grey dot) and the averaging period RFR (yellow dot). It demonstrates that the RFR of 0.98% is at a historical low. The daily CGS 10 year figures indicate that the yields have remained around or below 1.00% since early August 2019.

[9] This chart has been amended relative to that published in the First Period estimate to visualise the spread between the annualized yield for *Non-financial corporate BBB-rated bonds – Yield – 10 year target tenor* and the *CGS 10 Year Bond Yield*

Figure 2 - Comparison of BBB bonds yields and Commonwealth Government Securities - 10 year target tenor



Source: RBA (CGS 10 year yield & BBB 10 year target tenor (non-financial)), Bloomberg

The RBA BBB estimate is also exhibiting historically low yields. The RBA's reported yield of 2.91% for September 2019 is 167bp lower than the reported figured in September 2018.

We note there are a number of methodological differences in the RBA and BRCP approach to estimating the cost of debt, which could contribute to the variance between the RBA's published margin and the margin we estimate in this letter. This includes that the RBA:

1. Only use the Gaussian Kernel (GK) approach
2. Excludes any bonds with a face value of less than $100m
3. Include BBB+ and BBB- bonds - resulting in a larger sample of bonds (n=91)[10]

If you wish to discuss further the derivation of these estimates, please do not hesitate to call me on the number provided below.

Yours sincerely,

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[10] See the RBA Statistical Table F3 Notes for further details. Available here.

Appendix A – ERA's 'Bond Yield Approach'

The ERA changed its 'Bond Yield Approach' in 2016 following its Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline (Goldfields Decision).[11] Compared with the previous 'Bond Yield Approach' there are three major differences:

- Bond criteria - Bonds issued in foreign currencies are now accepted in the sample, but those issued by financial institutions or which are inflation-linked are now excluded.
- Estimation methodology – Estimating the DRP now follows a more extensive process. Instead of taking a simple weighted average of each bond's DRP, the Gaussian Kernel methodology, Nelson-Siegel methodology, and Nelson-Siegel Svennson methodology are applied to estimate three individual 10 year DRPs, which are then averaged to estimate the final DRP.
- Risk free rate – Interest rate swap yields are used as the RFR, instead of Commonwealth Government Security yields.

A detailed exposition of the precise process of the 'Bond Yield Approach' is provided in the Goldfields Decision. We have provided the results of applying the bond criteria in Table 2, though only restricted to bonds with an S&P rating of BBB.

[11] See Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline (pages 565-592) - https://www.erawa.com.au/cproot/14401/2/GGP%20-%20GGT%20-%20AA3%20-%20Amended%20Final%20Decision%20-PUBLIC%20VERSION.PDF

Table 4 – Debt risk premium key statistics for 20 business days to 18 October 2019

Source: PwC's analysis of the ERA's 'Bond Yield Approach', Bloomberg

Issuer Name	S&P Rating	Currency	Issuance size ($m AUD)	Maturity	Term to maturity	Average yield (Semi-Annual)
Amcor Finance USA Inc	BBB	USD	$787	28/04/2026	6.53	2.70%
Amcor Finance USA Inc	BBB	USD	$669	15/05/2028	8.58	2.95%
Amcor Finance USA Inc	BBB	USD	$854	28/04/2026	6.53	2.66%
Amcor Finance USA Inc	BBB	USD	$719	15/05/2028	8.58	2.98%
Amcor Ltd/Australia	BBB	EUR	$373	22/03/2023	3.43	1.97%
APT Pipelines Ltd	BBB	USD	$731	11/10/2022	2.98	1.88%
APT Pipelines Ltd	BBB	GBP	$536	26/11/2024	5.11	2.05%
APT Pipelines Ltd	BBB	EUR	$974	22/03/2022	2.43	1.62%
APT Pipelines Ltd	BBB	EUR	$905	22/03/2027	7.43	2.59%
APT Pipelines Ltd	BBB	GBP	$1 154	22/03/2030	10.43	3.05%
APT Pipelines Ltd	BBB	USD	$1 396	23/03/2025	5.43	2.43%
APT Pipelines Ltd	BBB	USD	$381	23/03/2035	15.43	4.05%
APT Pipelines Ltd	BBB	AUD	$200	20/10/2023	4.01	1.72%
APT Pipelines Ltd	BBB	USD	$1 114	15/07/2027	7.74	2.86%
APT Pipelines Ltd	BBB	GBP	$746	18/07/2031	11.75	3.13%
Ausgrid Finance Pty Ltd	BBB	EUR	$1 042	30/07/2025	5.78	2.11%
Ausgrid Finance Pty Ltd	BBB	USD	$668	01/05/2023	3.54	1.90%
Ausgrid Finance Pty Ltd	BBB	USD	$668	01/08/2028	8.79	2.84%

Issuer Name	S&P Rating	Currency	Issuance size ($m AUD)	Maturity	Term to maturity	Average yield (Semi-Annual)
AusNet Services Holdings Pty Ltd	BBB	USD	$490	17/03/2076	56.41	2.27%
Boral Finance Pty Ltd	BBB	USD	$586	01/11/2022	3.04	2.19%
Boral Finance Pty Ltd	BBB	USD	$651	01/05/2028	8.54	3.10%
Brisbane Airport Corp Pty Ltd	BBB	AUD	$350	24/04/2025	5.52	1.91%
CIMIC Finance USA Pty Ltd	BBB	USD	$479	13/11/2022	3.07	2.77%
DBNGP Finance Co Pty Ltd	BBB	AUD	$125	28/09/2023	3.94	1.82%
DBNGP Finance Co Pty Ltd	BBB	AUD	$350	28/05/2025	5.61	2.06%
Incitec Pivot Finance LLC	BBB	USD	$503	03/08/2027	7.79	3.53%
Incitec Pivot Ltd	BBB	AUD	$450	18/03/2026	6.42	2.58%
Newcastle Coal Infrastructure Group Pty Ltd	BBB	USD	$638	29/09/2027	7.95	4.06%
Newcrest Finance Pty Ltd	BBB	USD	$737	15/11/2021	2.08	1.89%
Newcrest Finance Pty Ltd	BBB	USD	$491	15/11/2041	22.08	4.80%
Newcrest Finance Pty Ltd	BBB	USD	$724	01/10/2022	2.95	2.00%
Origin Energy Finance Ltd	BBB	EUR	$188	05/04/2023	3.46	3.05%
Origin Energy Finance Ltd	BBB	EUR	$968	17/09/2029	9.91	2.87%
QPH Finance Co Pty Ltd	BBB	AUD	$250	07/06/2023	3.64	1.67%
Transurban Queensland Finance Pty Ltd	BBB	AUD	$250	08/12/2021	2.14	1.50%
Transurban Queensland Finance Pty Ltd	BBB	AUD	$200	16/12/2024	5.16	2.11%
Transurban Queensland Finance Pty Ltd	BBB	AUD	$200	12/10/2023	3.98	1.76%

Issuer Name	S&P Rating	Currency	Issuance size ($m AUD)	Maturity	Term to maturity	Average yield (Semi-Annual)
Transurban Queensland Finance Pty Ltd	BBB	USD	$647	19/04/2028	8.50	3.16%
Woolworths Group Ltd	BBB	AUD	$400	23/04/2024	4.51	1.68%