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2 November 2018

Dear Katelyn

**2019 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)<sup>1</sup> 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 into determining the 2019 Benchmark Reserve Capacity Price (BRCP).

AEMO requested the DRP be estimated over the 20 business days ending on and including 30 August 2018 (the First Period 2018) and 26 October 2018 (the Second Period 2018). This final memorandum provides our estimate of the DRP for both the First Period 2018 and the Second Period 2018.

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)<sup>2</sup>. 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, in estimating the DRP as per version 6 of the ERA's Market Procedure document.<sup>3</sup>

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. 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 7 August 2018 between PwC and AEMO.

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<sup>1</sup> 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.

<sup>2</sup> 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>

<sup>3</sup> <https://www.erawa.com.au/cproot/14362/2/Market%20Procedure%20-%20Maximum%20Reserve%20Capacity%20Price.pdf>

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## **Results**

As shown in Table 1 below, we have derived a DRP of 207 basis points for the First Period 2018, and 202 basis points for the Second Period 2018, applying a modified version of the ERA's 'Bond Yield Approach' to estimating a DRP.

The ERA's 'Bond Yield Approach' for regulated gas businesses applies a sample of bonds with a credit rating of between BBB- and BBB+.<sup>4</sup> Further, the ERA's 'Bond Yield Approach' uses Australian Dollar interest rate swap yields as the risk free rate.

AEMO, in contrast to WA's regulated gas businesses and in accordance with its BRCP market procedures<sup>5</sup>, can only:

- consider corporate bonds with a BBB credit rating; and
- use Commonwealth Government Security (CGS) yields as the risk free 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 risk free rate to estimate the DRP. We note that this resulted in a sample of 34 bonds for both the First Period 2018 and the Second Period 2018.

For the First Period 2018, we began with a sample of 47 bonds and removed 13 bonds with duplicate features. For the Second Period 2018, we began with a sample of 49 bonds and removed 15 bonds with duplicate features. Compared with the First Period 2018, the bond sample in the Second Period 2018 added three bonds issued by Newcrest Mining because that have had their credit ratings upgraded to BBB, but removed three bonds by three different issuers because their term to maturity are now fewer than 2 years

The ERA's 'Bond Yield Approach' required the application of three separate calculation methodologies to estimate a DRP. These are the:

- Gaussian Kernel methodology (GS);
- Nelson-Siegel methodology (NS); and
- Nelson-Siegel Svensson methodology (NSS).

The DRP values estimated by applying GS, NS and NSS methodologies are averaged to estimate the final DRP for the First Period 2018 as shown in Table 1, and the Second Period 2018 as shown in Table 2.

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<sup>4</sup> ERA, *Rate of Return Guidelines - Meeting the requirements of the National Gas Rules*, 16 December 2013

<sup>5</sup> <http://www.erawa.com.au/cproot/14362/2/Market%20Procedure%20-%20Maximum%20Reserve%20Capacity%20Price.pdf>



**Table 1 – Summary of DRP estimates using the ERA’s ‘Bond Yield Approach’, restricted to bonds with a BBB credit rating – 20 business days to 30 August 2018 (basis points)**

Methodology	DRP	Average DRP	Difference
<b>Gaussian Kernel</b>	216	207	9
<b>Nelson-Siegel</b>	189		-18
<b>Nelson-Siegel Svensson</b>	215		9

Source: PwC’s analysis applying the ERA’s ‘Bond Yield Approach’, Bloomberg

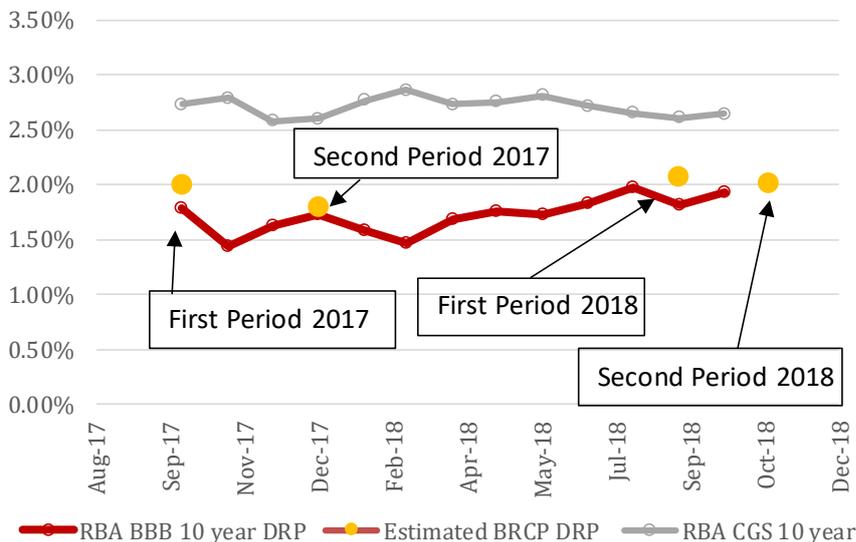
**Table 2 – Summary of DRP estimates using the ERA’s ‘Bond Yield Approach’, restricted to bonds with a BBB credit rating – 20 business days to 26 October 2018 (basis points)**

Methodology	DRP	Average DRP	Difference
<b>Gaussian Kernel</b>	209	202	8
<b>Nelson-Siegel</b>	186		-15
<b>Nelson-Siegel Svensson</b>	209		7

Source: PwC’s analysis applying the ERA’s ‘Bond Yield Approach’, Bloomberg

The DRP for BBB rated bonds have been following a slight upward trajectory the past 12 months, as shown below in Figure 1.

**Figure 1 - Comparison of RBA BBB 10 year DRP with BRCP DRP and RBA 10 year CGS over the last 12 months**



Source: PwC’s analysis applying the ERA’s ‘Bond Yield Approach’, Bloomberg, RBA



The estimated monthly DRP for 10 year BBB bonds by the RBA was 173 basis points for the month of the 2017 BRCP averaging period, rising to 182 basis points for the First Period 2018 and again to 193 basis points for the month immediately prior to the Second Period 2018. The general upward trajectory is consistent with the estimated DRP for the First Period 2018 and Second Period 2018 both being higher compared with the DRP PwC estimated for the 2017 BRCP.<sup>6</sup>

A further observation is that overall yields for 10 year BBB corporate bonds are unlikely to have changed in the past year. As observed in Figure 1 the increase in DRP is likely to be offset by the observed slight decrease CGS yields as reported by the RBA.

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,

A handwritten signature in black ink, appearing to read 'Craig Fenton', with a stylized, cursive script.

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<sup>6</sup> The DRP for the 2017 BRCP was 180 basis points.



## 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).<sup>7</sup> 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 Svensson 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 risk free rate, 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 3, though only restricted to bonds with an S&P rating of BBB.<sup>8</sup>

**Table 3 – Debt risk premium key statistics for 20 business days to 30 August 2018**

Issuer Name	S&P Rating	Currency	Issuance size (\$m AUD)	Maturity	Term to maturity	Average yield (Semi-Annual)
<b>Amcor Finance USA Inc</b>	BBB	USD	787	28/04/2026	7.70	4.25%
<b>Amcor Finance USA Inc</b>	BBB	USD	669	15/05/2028	9.74	4.47%
<b>Amcor Ltd/Australia</b>	BBB	EUR	373	22/03/2023	4.59	3.19%
<b>APT Pipelines Ltd</b>	BBB	EUR	974	22/03/2022	3.59	3.20%
<b>APT Pipelines Ltd</b>	BBB	USD	731	11/10/2022	4.15	3.51%
<b>APT Pipelines Ltd</b>	BBB	AUD	200	20/10/2023	5.17	3.50%
<b>APT Pipelines Ltd</b>	BBB	GBP	536	26/11/2024	6.28	4.07%
<b>APT Pipelines Ltd</b>	BBB	USD	1,396	23/03/2025	6.60	4.06%
<b>APT Pipelines Ltd</b>	BBB	EUR	905	22/03/2027	8.59	4.34%

<sup>7</sup> 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>

<sup>8</sup> We have removed duplicate bonds that were issued in different financial markets, but otherwise had identical features, in accordance with advice from the ERA

<b>Issuer Name</b>	<b>S&amp;P Rating</b>	<b>Currency</b>	<b>Issuance size (\$m AUD)</b>	<b>Maturity</b>	<b>Term to maturity</b>	<b>Average yield (Semi-Annual)</b>
<b>APT Pipelines Ltd</b>	BBB	USD	1,114	15/07/2027	8.91	4.42%
<b>APT Pipelines Ltd</b>	BBB	GBP	1,154	22/03/2030	11.60	4.73%
<b>APT Pipelines Ltd</b>	BBB	USD	381	23/03/2035	16.60	5.07%
<b>Ausgrid Finance Pty Ltd</b>	BBB	USD	668	1/05/2023	4.70	3.53%
<b>Ausgrid Finance Pty Ltd</b>	BBB	EUR	1,042	30/07/2025	6.95	3.93%
<b>Ausgrid Finance Pty Ltd</b>	BBB	USD	668	1/08/2028	9.96	4.36%
<b>AusNet Services Holdings Pty Ltd</b>	BBB	USD	490	17/03/2076	57.58	3.85%
<b>Boral Finance Pty Ltd</b>	BBB	USD	586	1/11/2022	4.21	3.51%
<b>Boral Finance Pty Ltd</b>	BBB	USD	651	1/05/2028	9.71	4.45%
<b>Brisbane Airport Corp Pty Ltd</b>	BBB	AUD	350	21/10/2020	2.18	3.06%
<b>Brisbane Airport Corp Pty Ltd</b>	BBB	AUD	350	24/04/2025	6.69	3.65%
<b>DBNGP Finance Co Pty Ltd</b>	BBB	AUD	100	1/10/2020	2.12	3.57%
<b>DBNGP Finance Co Pty Ltd</b>	BBB	AUD	350	28/05/2025	6.78	3.98%
<b>DBNGP Finance Co Pty Ltd</b>	BBB	AUD	125	28/09/2023	5.11	3.85%
<b>Incitec Pivot Finance LLC</b>	BBB	USD	503	3/08/2027	8.96	4.76%
<b>Newcastle Coal Infrastructure Group Pty Ltd</b>	BBB	USD	638	29/09/2027	9.12	5.38%
<b>Perth Airport Pty Ltd</b>	BBB	AUD	400	25/03/2021	2.60	3.18%
<b>QPH Finance Co Pty Ltd</b>	BBB	AUD	200	7/07/2021	2.89	3.20%
<b>QPH Finance Co Pty Ltd</b>	BBB	AUD	250	7/06/2023	4.81	3.38%
<b>Transurban Queensland Finance Pty Ltd</b>	BBB	AUD	250	8/12/2021	3.31	3.32%
<b>Transurban Queensland Finance Pty Ltd</b>	BBB	AUD	200	12/10/2023	5.15	3.61%



Issuer Name	S&P Rating	Currency	Issuance size (\$m AUD)	Maturity	Term to maturity	Average yield (Semi-Annual)
<b>Transurban Queensland Finance Pty Ltd</b>	BBB	USD	647	19/04/2028	9.67	4.95%
<b>Transurban Queensland Finance Pty Ltd</b>	BBB	AUD	200	16/12/2024	6.33	4.28%
<b>Woolworths Group Ltd</b>	BBB	USD	784	22/09/2020	2.10	3.12%
<b>Woolworths Group Ltd</b>	BBB	USD	527	12/04/2021	2.65	3.26%

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

**Table 4 – Debt risk premium key statistics for 20 business days to 26 October 2018**

Issuer Name	S&P Rating	Currency	Issuance size (\$m AUD)	Maturity	Term to maturity	Average yield (Semi-Annual)
<b>Amcor Finance USA Inc</b>	BBB	USD	787	28/04/2026	7.53	4.24%
<b>Amcor Finance USA Inc</b>	BBB	USD	669	15/05/2028	9.58	4.51%
<b>Amcor Ltd/Australia</b>	BBB	EUR	373	22/03/2023	4.43	3.23%
<b>APT Pipelines Ltd</b>	BBB	USD	1114	15/07/2027	8.75	4.44%
<b>APT Pipelines Ltd</b>	BBB	EUR	974	22/03/2022	3.43	3.17%
<b>APT Pipelines Ltd</b>	BBB	USD	731	11/10/2022	3.99	3.45%
<b>APT Pipelines Ltd</b>	BBB	AUD	200	20/10/2023	5.01	3.52%
<b>APT Pipelines Ltd</b>	BBB	GBP	536	26/11/2024	6.12	3.96%
<b>APT Pipelines Ltd</b>	BBB	USD	1396	23/03/2025	6.44	4.08%
<b>APT Pipelines Ltd</b>	BBB	EUR	905	22/03/2027	8.43	4.45%
<b>APT Pipelines Ltd</b>	BBB	GBP	1154	22/03/2030	11.43	4.71%
<b>APT Pipelines Ltd</b>	BBB	USD	381	23/03/2035	16.44	5.12%
<b>Ausgrid Finance Pty Ltd</b>	BBB	USD	668	1/05/2023	4.54	3.48%
<b>Ausgrid Finance Pty Ltd</b>	BBB	EUR	1042	30/07/2025	6.79	4.03%
<b>Ausgrid Finance Pty Ltd</b>	BBB	USD	668	1/08/2028	9.80	4.38%



Issuer Name	S&P Rating	Currency	Issuance size (\$m AUD)	Maturity	Term to maturity	Average yield (Semi-Annual)
<b>AusNet Services Holdings Pty Ltd</b>	BBB	USD	490	17/03/2076	57.42	3.62%
<b>Boral Finance Pty Ltd</b>	BBB	USD	651	1/05/2028	9.54	4.48%
<b>Boral Finance Pty Ltd</b>	BBB	USD	586	1/11/2022	4.05	3.43%
<b>Brisbane Airport Corp Pty Ltd</b>	BBB	AUD	350	24/04/2025	6.52	3.80%
<b>DBNGP Finance Co Pty Ltd</b>	BBB	AUD	350	28/05/2025	6.62	3.98%
<b>DBNGP Finance Co Pty Ltd</b>	BBB	AUD	125	28/09/2023	4.95	3.73%
<b>Incitec Pivot Finance LLC</b>	BBB	USD	503	3/08/2027	8.80	4.79%
<b>Newcastle Coal Infrastructure Group Pty Ltd</b>	BBB	USD	638	29/09/2027	8.96	5.45%
<b>Newcrest Finance Pty Ltd</b>	BBB	USD	724	1/10/2022	3.96	3.56%
<b>Newcrest Finance Pty Ltd</b>	BBB	USD	491	15/11/2041	23.09	5.74%
<b>Newcrest Finance Pty Ltd</b>	BBB	USD	737	15/11/2021	3.09	3.34%
<b>Perth Airport Pty Ltd</b>	BBB	AUD	400	25/03/2021	2.44	2.99%
<b>QPH Finance Co Pty Ltd</b>	BBB	AUD	250	7/06/2023	4.64	3.38%
<b>QPH Finance Co Pty Ltd</b>	BBB	AUD	200	7/07/2021	2.73	3.09%
<b>Transurban Queensland Finance Pty Ltd</b>	BBB	USD	647	19/04/2028	9.51	4.94%
<b>Transurban Queensland Finance Pty Ltd</b>	BBB	AUD	200	12/10/2023	4.99	3.59%
<b>Transurban Queensland Finance Pty Ltd</b>	BBB	AUD	200	16/12/2024	6.17	4.12%
<b>Transurban Queensland Finance Pty Ltd</b>	BBB	AUD	250	8/12/2021	3.15	3.27%
<b>Woolworths Group Ltd</b>	BBB	USD	527	12/04/2021	2.49	3.14%

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