

Final Plan Attachment 14.2

Network Pricing, Formulae and Efficiency

December 2016

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1. Introduction

Australian Gas Networks Limited (AGN) charges tariffs to customers connected to the Victorian and Albury natural gas distribution networks (the networks) in order to recover revenue and fund network operations. AGN is not proposing any significant change to the tariff structures that currently apply in the Networks.

This Attachment details the proposed tariffs to apply over the next (2018 to 2022) Access Arrangement (AA) period including the formula by which these tariffs may be adjusted.

2. Efficient Tariffs

We are required by the National Gas Rules (NGR) to allocate total recoverable revenue between our Reference and Other Services on an efficient basis, reflective of the allocation of costs to each service.¹ We recover this allocated revenue by charging customers who use this service a tariff.

This section outlines how our tariffs are efficient, reflective of our customer base and, as such, are consistent with the NGR. It provides:

- demonstration of efficient prices, including estimates of:
 - stand-alone and avoidable costs;
 - long-run marginal costs (LRMC);
- consideration of transaction costs; and
- consideration of a customer's ability to respond to price signals.

2.1. Stand Alone and Avoidable Costs

Rule 94(3) requires that for each tariff class, the revenue expected to be recovered should lie on or between an upper bound representing the stand alone cost of providing the reference service to customers who belong to that class and a lower bound representing the avoidable cost of not providing the reference service to those customers.

AGN has defined the stand-alone costs for each tariff class as the costs of providing a distribution network to supply only that tariff class. These costs represent the upper bound of providing reference services to each tariff class, because the costs are calculated based on the assumption that no other tariff class uses the network, thereby ignoring the economies of scale arising from sharing fixed costs with other tariff classes. The stand-alone cost for all tariff classes was determined to be the cost associated with the major transmission and high pressure distribution mains forming the core of the network plus the regulator stations.

The avoidable cost is defined as the cost that can be avoided by not providing reference services to a particular tariff class. The avoidable cost for each tariff class is defined as the costs (i.e. return on capital, depreciation and operating expenditure) associated with dedicated connection assets, such as services and meters. AGN has defined avoidable cost for each tariff class to be the cost that can be avoided by not providing reference services to that tariff class.

AGN's Cost Allocation Model (CAM, provided as Attachment 14.1) calculates the standalone and avoidable cost for each tariff class and demonstrates that the revenue expected to be recovered from each tariff class lies on or between the stand alone and avoidable cost of providing reference services. The methodology applied in the CAM is the same as that currently used by AGN for its South Australian network, which approach has been approved by the AER as satisfying Rule 94(3).²

Table 2.1 shows the outputs of the CAM regarding stand-alone and avoidable costs, excluding Goods and Services Tax. The table demonstrates that the 2018 weighted average revenue for

¹ Rule 93 of the NGR imposes requirements on AGN regarding the allocation of revenue and costs to Reference Services. Further information on the Regulatory Framework is provided in Attachment 1.1.

² AER, *Final decision Australian Gas Networks Access Arrangement – Attachment 10 – Reference Tariff Setting*, May 2016, page 10-12.

each tariff class lies above the lower bound avoidable cost and below the upper bound stand alone cost. AGN's Reference Tariffs therefore comply with Rule 94(3) of the NGR in all cases.

Table 2.1: Victoria and Albury Avoidable, Expected and Stand Alone Costs \$2017

Tariff Class	Avoidable Costs (\$ million)	Weighted Average Revenue (\$ million)	Stand Alone Costs (\$ million)	Complies
Tariff R & C: Central	\$9.45	\$165.96	\$186.63	Yes
Tariff R & C: North	\$1.28	\$20.44	\$30.29	Yes
Tariff R & C: Murray Valley (Victoria)	\$0.13	\$2.10	\$8.12	Yes
Tariff R & C: Bairnsdale	\$0.36	\$1.65	\$7.01	Yes
Tariff R & C: Albury	\$0.11	\$5.54	\$12.88	Yes
Tariff D: Central/North	\$0.00	\$4.30	\$4.93	Yes
Tariff D: Murray Valley (Victoria)	\$0.00	\$0.22	\$2.96	Yes
Tariff D: Bairnsdale	\$0.00	\$0.03	\$2.94	Yes
Tariff D: Albury	\$0.00	\$0.19	\$2.97	Yes
Meter and Gas Installation Test	\$0.00	\$0.01	\$0.01	Yes
Disconnection	\$0.00	\$0.81	\$0.81	Yes
Reconnections	\$0.00	\$0.42	\$0.42	Yes
Meter Removal	\$0.00	\$0.16	\$0.16	Yes
Meter Reinstallation	\$0.00	\$0.67	\$0.67	Yes
Special Meter Read - Metropolitan	\$0.00	\$1.34	\$1.34	Yes
Special Meter Read – Non Metropolitan	\$0.00	\$0.55	\$0.55	Yes

2.2. Long-Run Marginal Costs

Rule 94(4)(a) requires AGN to take account of the LRMC for the Reference Services and for each element of each Reference Service when setting tariffs. For this purpose, AGN defines LRMC as a measure of the change in costs as output increases, when all factors of production are variable. This aligns closely with the LRMC as defined in the National Electricity Rules although AGN notes no such definition exists in the NGR.³

³ AEMC, *National Electricity Rules – Version 71*, April 2015, page 1,166.

2.2.1. AGN's Approach to Calculating LRMC

AGN's approach to calculating the LRMC was developed with regard to the methodologies adopted by AGN for the last Victoria and Albury AA review and the more recent South Australian AA review. This methodology applies the Average Incremental Cost (AIC) approach, whereby the present value of the incremental investment (both capital and operating expenditure) associated with increasing capacity in the long term is divided by the present value of the change in incremental demand. These factors are reflected in AGN's tariff classes, and as a result, AGN has attempted to calculate the LRMC for each of its tariff classes.

2.2.2. Calculation Outcomes

AGN was unable to calculate reasonable values for the LRMC at the tariff class level, by geographical region or even at a whole-of-network level for Victoria and Albury. The LRMC values calculated were either too large (relative to the actual tariffs within each tariff class) or negative. Further, AGN is not aware of any other suitable or practical approaches to quantifying the LRMC in light of the issues identified above.

Despite not being able to quantify the LRMC, AGN has still had regard for the LRMC when determining its tariffs. Consistent with AGN's approach in South Australia, AGN has designed its tariff parameters in order to effectively signal LRMC to network users, in particular to signal the impact that network users will have on the cost of providing network services. This is evidenced in AGN's tariffs by the use of:

- 1 geographic price signals – which signal the cost to the customer of connecting to a particular geographic zone;
- 2 declining block structure – which signal to the customer the declining incremental cost of additional gas consumption (reflecting the low margin cost of services); and
- 3 capacity based charges – which signal to demand customers the impact of peak demand on capital expenditure.

2.2.3. LRMC and Ancillary Reference Services

The provision of ARS is an operating expense incurred by AGN. There is no change in the long-run cost of providing the services irrespective of the quantity of these services demanded. The tariff applied to customers requiring an ARS is therefore a flat rate as there is no LRMC to signal to customers.

2.3. Response to Price Signals

Rule (94)(4)(b)(ii) of the NGR requires that a tariff, and if it consists of two or more charging parameters, each charging parameter for a tariff class, must be determined having regard to whether customers belonging to the relevant tariff class are able or likely to respond to price signals. AGN has developed its tariffs and the charging parameters that constitute each tariff in such a manner that customers are able or likely to respond to price signals.

The way in which the AGN's Residential, Commercial and Demand tariffs and their associated charging parameters, have been developed is set out below. AGN's proposed Reference Tariffs for 2018 are set out in Section 3 of this Attachment.

2.3.1. Haulage Reference Services

2.3.1.1. Domestic and Non-Domestic Tariffs

The variable nature of the volume charge for residential and commercial tariffs imply that customers are able to and can respond to price signals by adjusting their consumption of gas. Furthermore, the residential threshold that defines the step between the first, second and third tariff bands has been set with regard to the spread of appliance penetration across domestic network users in Victoria and Albury. Both these measures promote efficient use of the network and assist AGN to address the long-term decline in average consumption.

2.3.1.2. Demand Tariffs

Demand tariffs have been structured so that customers can respond to pricing signals whilst providing certainty to customers on the amount of their annual charge. This is because the demand tariffs are structured as 'declining block tariffs' based only on an agreed Maximum Hourly Quantity (MHQ), not the actual consumption of gas consumed on any given day. Consequently, the demand tariff structures motivate customers to manage their actual gas consumption within the constraints of their agreed MHQ. This promotes better capacity utilisation of AGN's network (noting that agreed MHQ will decrease if actual MHQ decreases).

2.3.1.3. Ancillary Reference Services

ARS tariffs reflect the operating expense to AGN of providing these services. Each tariff reflects the actual cost to AGN of providing each service and therefore delivers the appropriate price signal.

3. Network Pricing

AGN recovers its regulated revenue by charging Reference Tariffs to customers for Haulage Reference Services (HRS) and Ancillary Reference Services (ARS). As we have shown, the proposed tariffs are modelled to be revenue neutral and fall between the stand alone and avoidable costs of providing reference services to these zones. The tariff structures are efficient, contain no cross-subsidy and have taken into account factors such as transaction costs, LRMC and the ability for consumers to respond to price changes.

The proposed tariffs to take effect as at 1 January 2018 are detailed in Tables 3.1 through 3.4.

Table 3.1: Tariff R – Residential Haulage Service Tariffs 2018

Charges (excluding Goods and Services Tax \$nominal)	
Tariff R – Residential (Central)	
Base Charge (\$ per day)	0.1775
Charge for the first 0.0274 gigajoules of gas delivered (\$ per gigajoule)	10.2238
Charge for the next 0.0219 gigajoules of gas delivered (\$ per gigajoule)	6.2858
Charge for additional gas delivered (\$ per gigajoule)	3.4508
Tariff R – Residential (Northern)	
Base Charge (\$ per day)	0.1775
Charge for the first 0.0274 gigajoules of gas delivered (\$ per gigajoule)	8.9953
Charge for the next 0.0219 gigajoules of gas delivered (\$ per gigajoule)	5.6307
Charge for additional gas delivered (\$ per gigajoule)	3.0914
Tariff R – Residential (Murray Valley)	
Base Charge (\$ per day)	0.2259
Charge for the first 0.0274 gigajoules of gas delivered (\$ per gigajoule)	7.8315
Charge for the next 0.0219 gigajoules of gas delivered (\$ per gigajoule)	5.0662
Charge for additional gas delivered (\$ per gigajoule)	3.1691
Tariff R – Residential (Bairnsdale)	
Base Charge (\$ per day)	0.2921
Charge for the first 0.0274 gigajoules of gas delivered (\$ per gigajoule)	16.6920
Charge for the next 0.0219 gigajoules of gas delivered (\$ per gigajoule)	10.3817
Charge for additional gas delivered (\$ per gigajoule)	5.6994
Tariff R – Residential (Albury)	
Base Charge (\$ per day)	0.2310
Charge for the first 0.0274 gigajoules of gas delivered (\$ per gigajoule)	7.4036
Charge for the next 0.0219 gigajoules of gas delivered (\$ per gigajoule)	4.7321
Charge for additional gas delivered (\$ per gigajoule)	2.5986

Table 3.2: Tariff C Non-Residential Haulage Service Tariffs 2018

Charges (excluding Goods and Services Tax \$nominal)	
Tariff C – Non-Residential (Central)	
Base Charge (\$ per day)	0.1775
Charge for the first 0.05 gigajoules of gas delivered (\$ per gigajoule)	7.3671
Charge for the next 0.50 gigajoules of gas delivered (\$ per gigajoule)	3.6207
Charge for the next 0.82 gigajoules of gas delivered (\$ per gigajoule)	2.7058
Charge for additional gas delivered (\$ per gigajoule)	1.0972
Tariff C – Non-Residential (Northern)	
Base Charge (\$ per day)	0.1775
Charge for the first 0.05 gigajoules of gas delivered (\$ per gigajoule)	6.6083
Charge for the next 0.50 gigajoules of gas delivered (\$ per gigajoule)	3.2722
Charge for the next 0.82 gigajoules of gas delivered (\$ per gigajoule)	2.4452
Charge for additional gas delivered (\$ per gigajoule)	0.9916
Tariff C – Non-Residential (Murray Valley)	
Base Charge (\$ per day)	0.2259
Charge for the first 0.05 gigajoules of gas delivered (\$ per gigajoule)	5.9086
Charge for the next 0.50 gigajoules of gas delivered (\$ per gigajoule)	3.6339
Charge for the next 0.82 gigajoules of gas delivered (\$ per gigajoule)	2.7173
Charge for additional gas delivered (\$ per gigajoule)	1.2350
Tariff C – Non-Residential (Bairnsdale)	
Base Charge (\$ per day)	0.2921
Charge for the first 0.05 gigajoules of gas delivered (\$ per gigajoule)	12.1143
Charge for the next 0.50 gigajoules of gas delivered (\$ per gigajoule)	6.1500
Charge for the next 0.82 gigajoules of gas delivered (\$ per gigajoule)	4.5943
Charge for additional gas delivered (\$ per gigajoule)	1.8630
Tariff C – Non-Residential (Albury)	
Base Charge (\$ per day)	0.2310
Charge for the first 0.05 gigajoules of gas delivered (\$ per gigajoule)	5.5468
Charge for the next 0.50 gigajoules of gas delivered (\$ per gigajoule)	2.8520
Charge for the next 0.82 gigajoules of gas delivered (\$ per gigajoule)	2.0293
Charge for additional gas delivered (\$ per gigajoule)	0.8226

Table 3.3: Tariff D Demand Haulage Service Tariffs 2018 (\$nominal)

Tariff D	North and Central	Murray Valley	Bairnsdale	Albury
10 gigajoules or less	1,317.3162	1,535.4903	2,179.0177	1,132.8925
Next 40 gigajoules (\$ per gigajoule)	805.3228	947.4944	1,349.9106	703.6303
Additional gigajoules (\$ per gigajoule)	147.0685	161.3749	246.1930	170.0242

Table 3.4: Ancillary Reference Services Tariffs 2018 (\$nominal)

Ancillary Reference Service	\$ nominal
Disconnection	71.00
Reconnections	82.00
Meter Gas and Installation Test	214.00
Meter Removal	100.00
Meter Reinstallation	100.00
Special Meter Read - Metropolitan	9.00
Special Meter Read – Non Metropolitan	12.30

4. Tariff Variation Mechanisms

Consistent with rule 97(1), clause 2.6.4.1(a) of the Regulatory Information Notice (RIN) issued by the Australian Energy Regulator (AER) requires AGN to:

"Outline the proposed reference tariff variation mechanism and the basis for any parameters used in the mechanism".

AGN proposes to maintain the current annual tariff variation mechanism in the form of a weighted average price cap (WAPC) formula for the next AA period. The WAPC is a form of tariff basket control, and as such, is allowed for under Rule 97(2)(b) of the NGR. A WAPC constrains the overall movement in Reference Tariffs (as opposed to the movement in individual tariffs) within the AA period.

The proposed WAPC formula, which is consistent with the form of control used in the past three AA periods, is shown in Box 3.1. The left hand side of the WAPC formula calculates the weighted average of the notional revenues determined for the current year (year t), and the previous year (year t-1), which revenues are determined by applying the actual quantities of gas delivered two years prior (year t-2) to the:

- 1 tariffs proposed to apply in year t (which is the year where the adjusted tariffs will apply); divided by
- 2 tariffs applied to customers in year t-1 (which refers to the tariffs currently applying).

The weighted average of these notional revenues is constrained by the left hand side of the WAPC formula, which allows tariffs to increase by no more than the Consumer Price Index (CPI) less the X factor (as determined in Chapter 12 of the AAI) plus a licence fee factor, which allows for tariffs to change in accordance with changes in the actual licence fee paid by AGN.

The proposed tariff control formula is consistent with the formula applied in the current (2013 to 2017) AA period, other than the updated values of X and the application of the WAPC formula to the overall revenue from all Reference Tariffs. The WAPC currently applies to each tariff class individually.

The tariff control formula forms part of Annexure D of the Reference Tariff Policy of the AA Document.

Box 3.1: Formula 1 – Tariff Control Formula

The following formula applies separately to each of Tariff R, C and D:

$$\frac{\sum_{i=1}^n \sum_{j=1}^m p_t^{ij} \cdot q_{t-2}^{ij}}{\sum_{i=1}^n \sum_{j=1}^m p_{t-1}^{ij} \cdot q_{t-2}^{ij}} \leq (1 + \Delta CPI_t)(1 - X_t)(1 + A_t)$$

where:

ΔCPI_t is the annual percentage change in the CPI from the September quarter in year $t-2$ to the September quarter in year $t-1$, calculated using the following method:

The CPI for the September quarter in financial year $t-1$

divided by

The CPI for the September quarter in financial year $t-2$

minus one;

X_t is the X factor for each calendar year of the 2018-2022 access arrangement period as determined in the PTRM as approved in the AER's final decision, and annually revised for the return on debt update calculated for the relevant financial year during the access arrangement period in accordance with Box 3.4;

n is the number of different Haulage Reference Tariffs;

m is the different components, elements or variables ("components") comprised within Haulage Reference Tariff i ;

p_t^{ij} is the proposed component j of Haulage Reference Tariff i in Calendar Year t ;

p_{t-1}^{ij} is the prevailing component j of Haulage Reference Tariff i in Calendar Year $t-1$;

q_{t-2}^{ij} is the verified annual quantity of component of Haulage Reference Tariff i sold in Calendar Year $t-2$ (expressed in the units in which that component is expressed (e.g., GJ)); and

A_t is the adjustments factor as defined in Victoria and Albury Box 3.2.

4.1. Adjustments Factor

The proposed adjustment factor set out in both the tariff control formula and rebalancing control formula is a new formula for the next AA period (see Box 3.2).

This factor allows for the following pass through adjustment amounts are recovered from customers:

- a the annual licence fees charged to AGN by the Victorian government and the New South Wales government;
- b the Energy Safety Victoria (ESV) levy charged to AGN by the Victorian government;
- c any pass through amount approved by the regulator;
- d any costs incurred by AGN in connection with a carbon emissions scheme (such as the carbon safeguard mechanism under the National Greenhouse and Energy Reporting Act 2007 (Cwlth)); and
- e any network innovation allowance expenditure approved by the regulator.

The adjustments factor also forms part of Annexure D of the Reference Tariff Policy of the AA Document.

Box 3.2: Adjustments Factor Formula

A_t is the pass through adjustment factor to the Tariff Control Formula in Calendar Year t , calculated as follows:

$$A_t = \left(\frac{(1 + A'_t)}{(1 + A'_{t-1})} - 1 \right)$$

$$\text{where: } A'_t = \frac{(ap_{t-1} + L_{t-1} + E_{t-1} + C_{t-1} + NIS_{t-1})}{(1 + \Delta CPI_t)(1 - X_t) \sum_{i=1}^n \sum_{j=1}^m p_{t-1}^{ij} q_{t-2}^{ij}}$$

A'_{t-1} is the value of A'_t determined in the Calendar Year $t-1$

ap_{t-1} is the amount of any cost pass through approved by the regulator for the Calendar Year $t-1$,

Adjusted for financing costs by multiplying by: $(1 + pretaxWACG) (1 + \Delta CPI_t)$

L_{t-1} is the sum of the licence fees paid by the Service Provider for the Financial Year ending in June of the Calendar Year $t-1$ in respect of the Networks. Independent Pricing and Regulatory Tribunal (IPART) invoices the licence fee payable in respect of AGN's regulated New South Wales business as a whole and AGN then apportions the licence fee applicable to Albury according to customer numbers;

Adjusted for financing costs by multiplying by: $(1 + pretaxWACG)^{3/2} (1 + \Delta CPI_t)^{3/2}$

ΔCPI_t is the annual percentage change in the CPI from the September quarter in year $t-2$ to the September quarter in year $t-1$, calculated using the following method:

The CPI for the September quarter in financial year $t-1$
divided by
The CPI for the September quarter in financial year $t-2$
minus one;

X_t is the X factor for each calendar year of the 2018-2022 access arrangement period as determined in the PTRM as approved in the AER's final decision, and annually revised for the return on debt update calculated for the relevant financial year during the access arrangement period in accordance with Box 3.4;

C_{t-1} is the carbon emissions costs paid by AGN for the Financial Year ending in June of the Calendar Year $t-1$ where "carbon emissions costs" means costs incurred under or as a result of the "carbon safeguard mechanism" applying under the National Greenhouse and Energy Reporting Act 2007 (Cwlth) and any other costs incurred under, or as a result of, any regulatory instrument relating to carbon emissions (including, but without limitation, the cost of Australian carbon credit units purchased to offset emissions and remain below an emissions baseline);

Adjusted for financing costs by multiplying by: $(1 + pretaxWACG)^{3/2}(1 + \Delta CPI_t)^{3/2}$

E_{t-1} is the value of the Energy Safety Victoria (ESV) levy pass through adjustment which is comprised of a flat fee and a charge per retail customer for the Financial Year ending in June of the Calendar Year t ;

Adjusted for financing costs by multiplying by: $(1 + pretaxWACG)^{3/2}(1 + \Delta CPI_t)^{3/2}$

NIS_{t-1} is the allowable network innovation allowance expenditure approved by the Regulator for the Calendar Year $t-1$;

Adjusted for financing costs by multiplying by:

$(1 + pretaxWACG)(1 + \Delta CPI_t)$

$pretaxWACG$ is the value calculated for the relevant year in the PTRM as approved in the AER's final decision;

p_{t-1}^j is the prevailing component j of Haulage Reference Tariff i in Calendar Year $t-1$; and

q_{t-2}^j is the verified annual quantity of component j of Haulage Reference Tariff i sold in Calendar Year $t-2$ (expressed in the units in which that component is expressed (e.g. GJ)).

4.2. Rebalancing Control Mechanism

The proposed rebalancing control formula is also consistent with that used in the current AA period, other than the X factor for the return on debt update calculation and the licence fee factor is now included in the adjustment factor formula. The rebalancing control is intended to provide price certainty to customers as it limits the movement in each tariff class to CPI plus X plus 5%. The rebalancing control formula forms part of Annexure D of the Reference Tariff Policy of the AA Document.

Box 3.3: Rebalancing Control Formula

The following formula applies separately to each Tariff Class:

$$\frac{\sum_{j=1}^m p_t^{ij} \cdot q_{t-2}^{ij}}{\sum_{j=1}^m p_{t-1}^{ij} \cdot q_{t-2}^{ij}} \leq (1 + \Delta CPI_t)(1 - X_t)(1 + A_t)(1 + Y_t)$$

where:

ΔCPI_t is the annual percentage change in the CPI from the September quarter in year $t-2$ to the September quarter in year $t-1$, calculated using the following method:

The CPI for the September quarter in financial year $t-1$

divided by

The CPI for the September quarter in financial year $t-2$

minus one;

X_t is the X factor for each calendar year of the 2018-2022 access arrangement period as determined in the PTRM as approved in the AER's final decision, and annually revised for the return on debt update calculated for the relevant financial year during the access arrangement period in accordance with Box 3.4;

Y_t is 0.05;

m is the components comprised within Haulage Reference Tariff i ;

p_t^j is the proposed component j of Haulage Reference Tariff i in Calendar Year t ;

p_{t-1}^j is the prevailing component j of Haulage Reference Tariff i in Calendar Year $t-1$;

q_{t-2}^j is the verified annual quantity of component j of Haulage Reference Tariff i sold in Calendar Year $t-2$ (expressed in the units in which that component is expressed (e.g., GJ)); and

A_t is the adjustment factor as defined in Victoria and Albury Box 3.2.

The intent of the rebalancing control formula is to provide price certainty to customers. The formula therefore places a constraint on the movement in individual reference tariffs, where each reference tariff can increase by 5% over and above the increase permitted by the left hand side of the tariff control formula. The rebalancing control formula forms part of Annexure D of the Reference Tariff Policy of the AA Document.

4.3. Annual Update of Return on Debt Formula

The proposed annual update of return on debt formula implements the annual update to the return on debt building block required as a result of the adoption of a trailing average approach to determining the cost of debt. The proposed formula is based on the formula 3 approved by the AER

in our recent decision for the South Australian network. The annual update of return on debt formula forms part of Annexure D of the Reference Tariff Policy of the AA Document.

Box 3.4: Annual Update of Return on Debt Formula

The annual update of the return on debt component of the rate of return in each regulatory year, starting from 1 January 2018, of the Access Arrangement Period is to be calculated as follows:

For calendar year 2018:	$kd_{2018} = R_{2018}$
For calendar year 2019:	$kd_{2019} = (0.9 \times R_{2018}) + (0.1 \times R_{2019})$
For calendar year 2020:	$kd_{2020} = (0.8 \times R_{2018}) + (0.1 \times R_{2019}) + (0.1 \times R_{2020})$
For calendar year 2021:	$kd_{2021} = (0.7 \times R_{2018}) + (0.1 \times R_{2019}) + (0.1 \times R_{2020}) + (0.1 \times R_{2021})$
For calendar year 2022:	$kd_{2022} = (0.6 \times R_{2018}) + (0.1 \times R_{2019}) + (0.1 \times R_{2020}) + (0.1 \times R_{2021}) + (0.1 \times R_{2022})$

where:

- kd_t is the annual return on debt for calendar year t of this Access Arrangement Period; and
- R_t is the annual return on debt observation for each calendar year t of this Access Arrangement Period (other than calendar year 2018) calculated in accordance with steps 1 to 17 below. For calendar year 2018, $R_{2018} = 4.42$ per cent.

Calculation of the annual return on debt observation

The return on debt observation for each financial year will be calculated by automatic application of the following formula. This requires three stages:

- calculation of the adjusted RBA estimate;
- calculation of the adjusted BVAL estimate;
- calculation of the final estimate—where the AER combines its implementations of the RBA estimate and the BVAL estimate;

These formula steps relate to the approach specified in the AER's Final Decision. In the event that data availability changes during the access arrangement period, the formulas below will change to reflect the contingencies set out in the AER's Final Decision.

Calculation of the adjusted RBA estimate

To calculate the adjusted RBA estimate:

- Download RBA table F3—'Aggregate measures of Australian corporate bond yields' from the RBA website.
- From this file, download the 7 and 10 year 'Non-financial corporate BBB-rated bonds—Yield' entries for dates:
 - from the most recent published RBA date prior to the commencement of the nominated averaging period for debt
 - to the first published RBA date following the conclusion of the nominated averaging period for debt
 - all published dates between a. and b.

3) Download, from RBA table F16—'Indicative Mid Rates of Australian Government Securities', daily yields on CGSs for dates within the Service Provider's averaging period.

4) Linearly interpolate between the two nearest bonds straddling 7 years remaining term to maturity, and the two nearest CGS bonds straddling 10 years remaining term to maturity. This should be done using the following formula:

$$\text{yield}_{\text{interpolated}} = \text{yield}_{\text{lower straddle bond}} + (\text{yield}_{\text{upper straddle bond}} - \text{yield}_{\text{lower straddle bond}}) * (\text{date}_{10 \text{ years from interpolation date}} - \text{maturity date}_{\text{lower straddle bond}}) / (\text{maturity date}_{\text{upper straddle bond}} - \text{maturity date}_{\text{lower straddle bond}}).$$

5) Linearly extrapolate the published RBA 10 year yield (from step 2) from its published effective term to an effective term of 10 years using the formula below:

$$\text{yield}_{10} = \text{yield}_{10 \text{ year published}} + [(\text{spread-to-swap}_{10 \text{ year published}} - \text{spread-to-swap}_{7 \text{ year published}}) / (\text{effective term}_{10 \text{ year published}} - \text{effective term}_{7 \text{ year published}})] * (10 - \text{effective term}_{10 \text{ year published}}).$$

6) Linearly extrapolate the published RBA 7 year yield (from step 2) from its published effective term to an effective term of 7 years using the formula below:

$$\text{yield}_7 = \text{yield}_{7 \text{ year published}} + [(\text{spread-to-swap}_{10 \text{ year published}} - \text{spread-to-swap}_{7 \text{ year published}}) / (\text{effective term}_{10 \text{ year published}} - \text{effective term}_{7 \text{ year published}})] * (7 - \text{effective term}_{7 \text{ year published}}).$$

7) Subtract from the extrapolated 10 year RBA yield on each publication date the interpolated CGS yield on that date. For the 10 year term, use the RBA series as adjusted in step 5. These are the adjusted RBA 10 year spreads.

8) Obtain daily RBA spread estimates by linear interpolation of the adjusted RBA spreads (from steps 5 and 6) for both 7 and 10 year terms between the published dates identified in step 2. Use the adjusted RBA spread estimates as calculated in step 6. This should be done using the following formula:

$$\text{spread}_{\text{interpolated}} = \text{spread}_{\text{first straddling publication date}} + (\text{date}_{\text{interpolation}} - \text{date}_{\text{first straddling publication date}}) * (\text{spread}_{\text{second straddling publication date}} - \text{spread}_{\text{first straddling publication date}}) / (\text{date}_{\text{second straddling publication date}} - \text{date}_{\text{first straddling publication date}})$$

Note: If the annual return on debt estimate must be finalised before a final published RBA month-end estimate is available, hold the last observed RBA spread constant to the end of the averaging period.

9) Add to these daily spreads (from step 8), daily interpolated estimates of the CGS (from step 4) for all business days in the service providers averaging period. Specifically:

- add the 7 year interpolated CGS estimates to the 7 year interpolated RBA spreads. These are the interpolated RBA daily 7-year yield estimates.
- add the 10 year interpolated CGS estimate to the 10 year interpolated RBA spread. These are the interpolated RBA daily 10-year yield estimates.

10) Convert the interpolated daily yield estimates (from step 9) to effective annual rates, using the formula:

$$\text{effective annual rate} = ((1 + \text{yield} / 200)^2 - 1) * 100$$

11) Average the yield estimate for the 10 year RBA yield estimate over all business days in the service provider's averaging period. This is our adjusted RBA estimate.

Calculation of the adjusted BVAL estimate

To calculate the adjusted BVAL estimate:

12) For dates after 14 April 2015, download the 10 year Corporate BBB rated Australian BVAL curve (BVCSAB10). For dates before 14 April 2015, download from Bloomberg the 7

year Corporate BBB rated Australian BVAL curve (BVCSAB07 index) for all business days in the service provider's averaging period.

13) For dates before 14 April 2015, add to the 7 year yield the difference between the 7 and 10 year daily RBA adjusted yields (as calculated in step 8) of the RBA process). This is the extrapolated daily estimate of the BVAL 10 year yield.

14) For all dates, convert the 10 year yields into effective annual rates, using the formula: $\text{effective annual rate} = ((1 + \text{yield} / 200)^2 - 1) * 100$

15) Average the extrapolated daily estimates of the BVAL 10 year yield over all business days in the service provider's averaging period. This is our adjusted BVAL estimate.

Final estimate

16) Take the simple average of the adjusted RBA estimate (from step 11 in the RBA data section) and the adjusted BVAL estimate (from step 15 in the BVAL data section). This is the annual estimate of the return on debt.

17) A business day means a day other than a Saturday, Sunday or a day recognised as a national public holiday or a public holiday in Victoria or New South Wales.

Annual return on debt observation where relevant data not available

For any calendar year of this Access Arrangement Period, with the exception of the calendar year 2018, for which an annual return on debt observation cannot be calculated in accordance the formula above, due to changes in data availability, adjust the approach in accordance with the contingencies set out in the AER's final decision for AGN.

Averaging periods

The averaging periods specified in the AER's Final Decision must be used for the purposes of calculating the annual return on debt observation for each calendar year of this Access Arrangement Period.

Notification and AER determination of the annual return on debt observation

In the 'PTRM input' sheet of AGN's final decision PTRM, update the relevant cell to reflect the updated return on debt estimate (Kd_t). This is:

- a) Kd₂₀₁₈: Cell G222
- b) Kd₂₀₁₉: Cell H222
- c) Kd₂₀₂₀: Cell I222
- d) Kd₂₀₂₁: Cell J222
- e) Kd₂₀₂₂: Cell K222

On the 'X factors' sheet of the final decision PTRM, update the relevant X factor as follows:

- a) Kd₂₀₁₈: 'Set X2 (price cap)'
- b) Kd₂₀₁₉: 'Set X3 (price cap)'
- c) Kd₂₀₂₀: 'Set X4 (price cap)'
- d) Kd₂₀₂₁: 'Set X5 (price cap)'

The AER will notify AGN of the updated Return on Debt and X factor within 15 business days after the end of AGN's averaging period.

4.4. Ancillary Reference Tariff Variation Mechanism

Subject to the approval of the AER, AGN will vary the Reference Tariffs for Ancillary Reference Services on the basis of the tariff control formula set out in Box 3.1.

The ancillary reference tariff control formula for the Calendar Years 2018 to 2022 is shown in Box 3.5.

Box 3.5: Ancillary Reference Tariff Variation Mechanism

$$ART_t = ART_{t-1} \times (1 + CPI_t)$$

where:

- ART_t is the ancillary reference tariff that applies in Calendar Year t ;
- ART_{t-1} is the ancillary reference tariff that applies in Calendar Year $t-1$;
- CPI_t is the annual percentage change in the CPI from the September quarter in year $t-2$ to the September quarter in year $t-1$, calculated using the following method:

The CPI for the September quarter in financial year $t-1$

Divided by

The CPI for the September quarter in financial year $t-2$

minus one.

4.5. Cost Pass Through Events

In accordance with Rule 97(1)(c), AGN has proposed certain Cost-Pass-Through Events for the next AA period. In defining Cost Pass Through Events, AGN has given consideration to events:

- for which it is unreasonable or unable to provide cost forecasts for the purposes of determining the total revenue requirement (whether it be due to the uncertainty of timing/occurrence or magnitude of the event); and
- that are not included in the capital or operating cost forecasts, or for which AGN might already be compensated for through the rate of return.

The proposed Cost Pass Through Events are generally consistent with those that applied in the current AA period and are defined in Section 4.5 of the AA Document and Chapter 14 of the Final Plan.

The formula by which tariffs are adjusted to account for Cost-Pass-Through Events is detailed in Box 3.2 Adjustments Factor Formula.

5. Summary

AGN recovers its regulated revenue by charging Reference Tariffs to customers for Pipeline Services. As described in this Attachment, the proposed tariffs are modelled to be revenue neutral and fall between the stand alone and avoidable costs of providing reference services to these zones. The tariff structures are efficient, contain no cross-subsidy and have taken into account factors such as transaction costs, LRMC and the ability for consumers to respond to price changes.