INTERNATIONAL

ECONOMIC REPORT

Prepared For:

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Roma – Brisbane Pipeline: DORC Asset Valuation

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1. INTRODUCTION

Section 8.10 of the *National Third Party Access Code for Natural Gas Pipeline Systems* (the Code) requires that factors should be considered in establishing the Initial Capital Base for a covered pipeline.

Among these factors, section 8.10(b) of the Code requires that consideration be given to the:

> *value that would result from applying the "depreciated optimised replacement cost" methodology in valuing the Covered Pipeline.*

The purpose of this report is to present an estimate of the Depreciated Optimised Replacement Cost (DORC) value for the Roma to Brisbane Gas Pipeline (RBP) that is consistent with the economic principles underlying the Hypothetical New Entrant Test (HNET), as outlined in section 2.

1.1. BACKGROUND

During the review and approval process for the Moomba to Sydney Pipeline (MSP) Access Arrangement, extensive debate surrounded the approach to estimating a DORC value using the NPV cost methodology.

In December 2004, the Australian Consumer and Competition Commission (ACCC) stated that DORC represents the difference between:

> *DORC =*
>
> *PV of costs of providing a stream of services into perpetuity using the efficient optimised replacement infrastructure and subsequent replacements (with replacements made at the end of the optimised replacement asset's life),*
>
> *less*
>
> *PV of costs of providing a stream of services into perpetuity using the existing infrastructure and subsequent replacements (with replacements made at the end of the existing infrastructure's life).*[1]

However, at the time, there was significant debate regarding the treatment of taxation and the appropriate discount rate to be used in a cost based NPV DORC method.

1 ACCC Amended Submission to the Australian Competition Tribunal, 20 December 2004, paragraph A.1.3.

The Australian Pipeline Trust (APT), in its submissions to the Tribunal, advocated the use of: [2]

- A DORC methodology that estimated the value a hypothetical new entrant (HNE) would pay an incumbent to acquire the existing assets, given the HNE has the option to build a new asset to provide the same service (referred to as the HNET method herein and outlined further in section 2).

  Under this approach the DORC value should incorporate the tax depreciation allowances available to the HNE under both the 'buy' and 'build' options; and

- The weighted average cost of capital (WACC) as the appropriate discount rate, with a preference for the use of pre-tax WACC; and

In this report the approach we have adopted to estimate the DORC value is consistent with the approach used to calculate the ICB value for the MSP which was approved by the Australian Competition Tribunal.[3]

1.2. REPORT STRUCTURE

This report is structured as follows:

- Section 2 outlines the key principles underlying the HNET method of estimating DORC, precedents for the application of the model and the particular issues that arise in applying this model to the RBP;
- Section 3 explains the key modelling assumptions;
- Section 4 presents an estimate of the NPV DORC value for the preferred scenario; and
- Section 5 presents our conclusions.

In addition, Appendix A sets out the equations embedded in the NPV DORC model.

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2 APT, *Submission of East Australian Pipeline Limited in Response to the NPV DORC Submission of the Australian Competition and Consumer Commission*, submission to the Australian Competition Tribunal, 2 February 2005.

3 Australian Competition Tribunal, Application by East Australian Pipeline limited [2005] ACompT 1.

2. DORC USING THE HNET METHOD

2.1. THE HNET METHOD AND UNDERLYING PRINCIPLES

The HNET method is an analytical approach to estimating the regulatory value of an existing asset. The method proceeds by asking what maximum price a hypothetical new entrant to the market served by an existing pipeline would pay to take over that pipeline rather than construct a new pipeline instead. If there were actually two competing pipelines, the analysis would become extremely complicated and probably not very relevant to regulatory valuations (as, among other things, pipeline competition would substantially vitiate the rationale for regulation). The HNET method presumes that the entrant will capture the entire market and that only one pipeline will serve the market: either the existing pipeline or a new one that completely supplants it.

The method further presumes that neither demand, pipeline tariffs, nor pipeline capacity will be affected by the new entrant's decision to build a new pipeline or buy the existing pipeline. Thus the revenue stream flowing to the new pipeline owner is presumed to be the same in the build and buy scenarios. This presumption appears realistic given the service potential of both pipelines would be equivalent. Given that background, the method presumes that the new entrant will make its decision to build or buy based on the option that leads to the lowest net present value of costs.

It is apparent that the comparison of NPV costs depends critically on the price for which the new entrant could buy the existing pipeline. If the second-hand price is sufficiently high then the entrant will prefer to build a new pipeline instead. If the second-hand price is sufficiently low then the entrant will prefer the "buy" option. In most practical pipeline situations there is a unique second-hand price at which the new entrant would be indifferent between buying the existing "second-hand" pipeline and building a new one. This indifference price is the NPV DORC valuation.

The value that makes the HNE indifferent between buying or building depends on the following:

- Total cost of building and commissioning the new asset;
- Costs of operating the existing and new assets, and how these costs may vary as the asset ages;
- The technical life of new assets and the remaining life of the existing assets; and
- The impact of technology and productivity developments on the ongoing capital and operational costs of replacement assets over time.

As a result the NPV DORC value is given by the following equation:

$$DORC = [NPV(Capex_{New}) - NPV(Capex_{Old}) + NPV(O\&M\ Costs_{New}) - NPV(O\&M\ Costs_{Old})]$$

This equation reflects the final position advocated by APT in its submission to the application by EAPL to the Tribunal on the MSP[4] and was reflected in the initial capital base which was approved.

Unlike the MSP, the RBP currently operates at, or close to, capacity with demand forecast to increasing significantly over the next decade. The impact on the DORC valuation of the need for capacity augmentation is considered in detail in section 2.2 (below).

2.2. GROWTH ISSUES SPECIFIC TO RBP

The spreadsheet model used to apply the standard NPV DORC method to the MSP requires minor modification when applying it to a pipeline which has insufficient capacity to satisfy long-term forecast growth in demand. This is the situation faced by the RBP.

We consider two possible approaches to estimating the DORC value of a pipeline that requires capacity augmentation:

1. Estimate the DORC value with the build/ buy options evaluated based on the present day capacity of the existing pipeline—assuming, in essence, that the demand forecasts for growth do not materialise.

   The optimised replacement infrastructure would be designed and costs determined based on the assumption that it provide an identical stream of service (and capacity) as that provided by the existing pipeline.

2. Estimate the DORC value based on the assumption the build/ buy pipeline options satisfy identical future demand expectations with capacity augmentation.

   Under this approach the design of the efficient optimised replacement infrastructure would take account of 'reasonable' future demand expectations[5]. The present value of costs in the 'build' option would consider the optimal decision regarding the initial size of the pipeline and timing of any future expansion requirements. Depending on the particulars, it may be the most efficient approach to build the initial pipeline with the capacity to satisfy 'reasonable' future demand.

4 APT, *Submission of East Australian Pipeline Limited in Response to the NPV DORC Submission of the Australian Competition and Consumer Commission*, submission to the Australian Competition Tribunal, 2 February 2005, Section G.

5 The term 'reasonable' future demand expectations has been used to identify that a firm can only be expected to provide 'realistic' estimates of future for reasonable number of years. Beyond a 15 – 20 year timeframe any estimates are likely to be based on and incorporate extreme uncertainty. A 'reasonable' assumption might therefore be to adopt the final year of a 'reasonable' estimate as the future demand expectation into perpetuity.

The present value of costs of the existing pipeline would need to reflect the costs of the future expansion required to satisfy the 'reasonable' demand forecast.

Under this approach additional formulae would be required to incorporate the present value of the costs of expansion infrastructure[6] for both the build/ buy infrastructure options.

While Approach 1 (above) would likely provide a higher DORC value,[7] we believe 'Approach 2' best reflects the business evaluation method an efficient HNE would adopt when faced with the build/ buy decision. Therefore, we only perform a quantitative evaluation of Approach 2.

In section 3, we outline our assumptions to estimate a DORC value based on Approach 2.

2.3. THE MODEL

The HNET model we have developed for the RBP reflects the position advocated by the APT in its submission to the Tribunal regarding the DORC methodology for the MSP[8] and was reflected in the initial capital base which was approved.

The formulae underpinning our model are provided in Appendix A of this report.

6 By the term "expansion infrastructure" we refer to future investments in capacity augmentation. These may consist of additional compressors or future looping of sections of the pipeline.

7 The present value of the costs associated with the existing pipeline would be expected to be lower in a static demand situation than in a demand growth situation because capacity expansion requirements are likely to bring forward the dates on which existing assets must be replaced. With higher costs for the existing pipeline, Approach 2 would provide a lower DORC value than Approach 1.

8 APT, *Submission of East Australian Pipeline Limited in Response to the NPV DORC Submission of the Australian Competition and Consumer Commission*, submission to the Australian Competition Tribunal, 2 February 2005.

3. RBP MODELLING ASSUMPTIONS

Where the assumptions and inputs required were specific to the RBP existing pipeline assets, they were based on advice provided by Australian Pipeline Trust staff with specific knowledge of the RBP operations. The inputs and assumptions are outlined in the remainder of this section.

3.1. OPTIMISED REPLACEMENT COST

We have taken our estimate of the ORC valuation of the RBP from the January 2006 report prepared by Venton & Associates.[9] The Venton & Associates report estimates the value (including the interest costs during construction) at approximately 1 October 2006, based on volume forecasts developed for the Access Arrangement.

Before adopting Venton's ORC value, we considered it necessary to make two minor adjustments to the ORC value to be used in the DORC modelling. The adjustments we made in adopting the ORC are defined as follows:

1. As a commissioning cost the Venton report makes allowance for the cost of the quantity of gas required to fill the pipeline to a minimum level required to maintain maximum demand in 2005 (referred to as 'linepack'). The report allows for 227 TJ of gas at an assumed cost of $3.00/GJ, totalling $681,000. However, advice from APT indicates that the pipeline operator provides only 60TJ gas with the remainder to be provided by pipeline users.

   For the purpose of estimating the DORC value on the basis of a similar stream of services for the build/ buy options, we have adjusted the Venton ORC to reflect the provision of 60TJ, rather than the full 227TJ. The Venton ORC has been reduced to reflect the allowance of $180,000 linepack, rather than $681,000 (Venton's assumption that gas costs $3.00/GJ was maintained). The $0.5m reduction was deducted from the "pipeline" asset category of the ORC value.

2. The Venton RBP ORC valuation makes no allowance for equity raising costs. There is precedent for the ACCC factoring such costs into the ICB.[10]

   > *Where a depreciated optimised replacement cost (DORC) methodology is used, the primary goal is to generate an opening regulatory asset value that replicates the cost structure of a hypothetical efficient new entrant. As such a new entrant would have to raise equity to finance the hypothetical network, in principle, an allowance for the transaction cost of raising that finance would appear appropriate.*

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9 Venton & Associates, *Roma – Brisbane Pipeline Network Optimised Replacement Cost Study*, Document No: 167-R-01, 4 January 2006.

10 ACG, Debt and Equity Raising Transaction Costs – Report to the ACCC, December 2004, p. ix.

Further, the ACCC-commissioned report recommends that the median transaction cost of 3.83% be applied.[11]

Further:[12]

In the case of existing assets where an RAV has not been established, this means that the cost of raising the initial equity should be treated as part of the ORC value and depreciated along with other assets to the DORC value.

As a result, we have adjusted the Venton ORC to incorporate an allowance of 3.83% of equity to account for raising costs faced by a HNE. The equity raising requirement was estimated based on the benchmark gearing assumption of 60% commonly adopted by Australian regulators.

Total equity raising costs of $6.57m were then applied across the various aggregated ORC valuation asset categories (outlined in Venton Table 12-3) on the basis of weighting by cost.

The ORC valuation of the RBP provided by Venton and our adjusted estimates are shown in Table 1 below.

Table 1: RBP ORC Valuation (Raw and adjusted)

Cost Item	Raw Venton ORC (Oct 05 $m)	Adjusted Venton ORC (Oct 05 $m)
Pipeline (linepack adjusted)	$368.202	$373.000
Receipt & Delivery Stations	$13.729	$13.927
Buildings	$2.090	$2.120
Land/ Easements	$13.341	$13.533
Compressor stations	$53.980	$54.758
Communications	$4.803	$4.872
Other plant & equipment	$ -	$ -
TOTAL	**$456.145**	**$462.210**

In addition to the above initial ORC, Venton also identifies the requirement for the installation of a booster compressor in 2008 to meet demand future demand expectations. Venton estimates the additional expansion capital required for this compressor is $38.2m.

11 Ibid, p. xi.

12 Ibid, p. xi.

3.2. ASSET CATEGORIES

In performing the DORC analysis, we have separately treated the different types of asset components of the RBP. However, in an effort to minimise the complexity of the analysis we have aggregated some components into categories (below).

The basis for consolidating assets categories from those outlined in the Venton report (shown in Table 1 above), was to group assets of similar asset lives and, where these are similar, taking note of differences in depreciation characteristics. For example receipt and delivery stations largely consist of valves and piping with similar characteristics to the main transmission pipeline itself. In addition, given the relatively long technical life commonly assumed for buildings (often greater than 50 years) and the relatively minor ORC value assigned to the asset class, this asset class was assigned to the general "pipeline" asset category.

The resulting categories are as follows:

- Pipeline (aggregates the ORC for the Venton categories of: pipeline; receipt & delivery stations; and building);
- Easements;
- Compressors; and
- Communications.

We have treated easements as a separate asset category, given their distinctive value profile over time. Easements are not commonly considered to have a finite life and as a result do not need to be replaced. The ongoing capital costs of easements for the existing pipeline are therefore zero. There are operating and maintenance costs associated with easements pertaining to vegetation control, maintenance of warning signs, etc, but these are included in operating costs.

3.3. ASSET LIFE

APT provided information on the estimated served and remaining lives of the existing RBP assets based on available information regarding installation dates, and the expectations of APT's experienced operational personnel. In addition, APT provided information with regard to assumptions about the expected technical lives of replacement assets.

The asset life assumptions adopted in our modelling of the DORC value are shown in the table below. The served and remaining lives are estimated as at the mid-point of the financial year 2005/06.

Table 2: Existing and Replacement asset lives (years)

Asset Type	Replacement Assets	Existing Assets	
	Technical Life	Served Life	Remaining Life
Pipeline	80	17	58
Easements	1000	37	963
Compressor stations	35	22	13
Communications	15	5[13]	10

The served and remaining lives of the existing pipeline asset were based on a weighted average age estimate of the various sections of the RBP. The original piping (commissioned before 1970) was assumed to have a technical life of 60 years, while all subsequent looping is assumed to have a technical life of 80 years. This approach reflects technology advances in piping, and also the manner in which the original pipeline was constructed. Parts of the original pipeline, notably those in the metropolitan Brisbane area, were double- coated and may have an 80 year life. Other parts were not double-coated, and are therefore assumed to have a 60 year life. In our calculations we have conservatively assumed that the entire original pipeline has a 60 year life. In fact, though, when the 60 year life has expired it is possible that the metropolitan sections of the pipe would not need to be replaced for a further 20 years.

3.4. EXISTING PIPELINE – EXPANSION REQUIRED FOR FUTURE DEMAND

The forecast demand used by Venton & Associates to estimate the ORC of the new pipeline (which included $38.2m compressor expansion in 2008) exceeds the capacity of the existing pipeline. In order to meet that level of demand, capacity expansions would be needed for the existing pipeline. The costs associated with those expansions have been included in the NPV DORC calculation as additional costs associated with the existing pipeline option.

APT provided information regarding the type, timing and magnitude of future expansion that would be required on the existing pipeline to meet the same demand scenario as that adopted for the optimised new pipeline. These estimates of future expansion are outlined in the table below.[14]

13 APT asked us to adopt a conservative 5 year weighted average served life of communications assets.

14 The figures in this table represent potential future costs based on certain assumptions about demand and asset prices. They should not be construed as indicative of APT's intended forward capital program.

Table 3: Existing RBP future expansion assumptions to meet forecast demand

	Year required	Year required	Estimated Capital Cost (05/06 $m)
Expansion 1	1 x Compressor unit + additional piping	2007	35
Expansion 2	2 x Compressor units	2011	50
Expansion 3	Looping	2011	30

3.5. EXISTING PIPELINE OPERATING COSTS

The operations and maintenance costs of the existing pipeline in year 0, financial year 2005/06, are important for estimating the present value of future costs of both the build/ buy options.

In the DORC valuation we adopted the 2005/06 operations and maintenance costs as outlined in Table 4. A brief description of the types of costs included in the 'Agility management' and 'Stay-in-business capex' operating costs follows Table 4.

Table 4: Assumed RBP 2005/06 Operations Costs impacted by age and technology advances

Cost Item	$m (2005/06)
Agility fee	$5.5
Other operations (spare parts & additional services)	$0.2
'Stay-in-business' Capex (annual average of forecasts 2005/06 – 2009/10)	$2.3
TOTAL	**$8.0**

Some types of non-capital costs would essentially be the same for an old or new pipeline, such as the costs of: administration; corporate overheads; license fees; government charges; security; and insurance. On the assumption that these costs are not impacted by the new entrant's decision to build or buy, they will have no impact on the NPV DORC calculation. For this reason, we have ignored these particular types of operating cost here.

Agility fee

APT has a long term agreement in place with Agility, under which Agility provides the asset management, operations and maintenance services required to operate the RBP in a safe, efficient and compliant manner. The services provided by Agility include: direct operations; operations support; engineering support; pipeline maintenance; and easement management.[15] The 'Agility fee' includes the costs of providing these services.

'Stay-in-business capex'

In the *Access Arrangement Information*, APT provides forecasts of the minor capital expenditures and stay in business capital it expects to incur each year on the RBP. APT advised that the types of costs in minor capital expenditure and stay in business (referred to herein as the 'stay-in-business capex') include: [16]

- pigging;
- coating defect assessment;
- compressor overhauls;
- minor capital;
- Access Arrangement costs; and
- IT system upgrade.

Given the annual nature of the 'stay-in-business capex', for the purpose of estimating a DORC value, we considered it appropriate to treat these costs in the same manner as operating and maintenance costs.

Information provided by APT indicated the 'stay-in-business capex' is forecast to fluctuate over the next 5 years, with the lowest cost occurring in the financial year 2005/06. To be conservative (a lower 'stay-in-business capex' value leads to a higher DORC estimate), we have adopted the average annual 'stay-in-business capex' forecast over the next 5 years, rather than adopt the lower current year expected cost. [17]

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15 APT, *Access Arrangement Information for Roma Brisbane Pipeline*, lodged with the ACCC, 31 January 2006, p.20.

16 Ibid, Table 4, p.13.

17 APT's 'stay in business capex' estimate for 2005/06 was considerably lower than the five year annual average that we have adopted. Using the 2005/06 'stay in business capex' only in the valuation would have the impact of increasing the DORC estimate.

3.6. DISCOUNT RATE

We have applied a discount rate in the net present value calculations which is equal to the real pre-tax WACC of 6.90%.[18] The ICB for the MSP that was approved by the Australian Competition Tribunal was also calculated on the basis of a discount rate derived from the pipeline's regulatory WACC.

3.7. TAXATION

In our model we have treated the effect of taxation, including tax deductions for operating costs and tax depreciation concessions on capital, implicitly by adopting a pre-tax WACC discount rate in the formulae outlined in Appendix A.[19] APT calculated the pre-tax WACC using the corporate tax rate of 30%.[20]

As a result, the model makes no further allowance for the effect of taxation (that is, separate formulae for tax are not required).[21]

3.8. TECH, PROD AND AGE FACTOR

The NPV DORC method relies on estimates for the following parameters, which are difficult to observe directly:

- Percentage decline in the capital cost of replacing assets over time (Tech);
- Percentage decline of operating costs associated with new assets due to technology advances (Prod); and
- Percentage increase in operating costs as the assets age (g).

In order to avoid unnecessary controversy, we have adopted parameter values similar to those used to estimate the DORC value for the MSP. The parameters we have assumed in our analysis are outlined in the table below:

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18 APT, *Access Arrangement Information for Roma Brisbane Pipeline*, lodged with the ACCC, 31 January 2006, p.18.

19 There is a view that any asymmetry in the taxation treatment between a new pipeline and a second-hand one would affect the NPV DORC valuation. We believe these asymmetries are not so material as to warrant inclusion in the calculation. Our evaluations are performed on the pre-tax basis.

20 Ibid, p.17.

21 In the spreadsheet model provided to support this report, the term 'Tax (Tc)' is set to zero to reflect that the impact of taxation is implicitly treated in pre-tax WACC, rather than explicitly calculated in the cash flows. However, the spreadsheet allows the user to adopt a post-tax WACC and then input T_C = 30% to explicitly calculate the tax benefits in the cash flows.

Table 5: Tech, Prod and Age Parameter Assumptions

Tech factor	0.48%
Prod factor	0.50%
Age factor (g)	2.15%

'Tech' and 'Prod' reflect technological trends across the industry and are not specific to any one pipeline. The age factor, 'g', is also likely to reflect the ageing process generally for pipelines, meaning that it would not be expected to be pipeline-specific. The values used in the MSP NPV DORC calculation have been retained for the RBP in the absence of any new information that might lead to a revision of the industry-wide trend values encapsulated in 'tech', 'prod', and 'g'.

Additionally, we have assumed the age factor applicable to easements would be 0.0%, as we do not expect the maintenance and operation costs for easements would increase in real terms with age.

3.9. OPEX

We were advised by APT that the ratio of operating costs to capital costs ('opex' parameter) is not likely to be materially different between the MSP and the RBP. Therefore we have used the opex parameters employed in the MSP NPV DORC calculation.

The 'opex' parameters we have used are outlined in the table below:

Table 6: Benchmark Opex ratios

Pipelines	1.5%^^
Easements	1.5%##
Compressor stations	5.0%
Communications	0.0%

^^ For large pipelines. The new optimised RBP pipe appears to be of similar size to sections of the MSP pipe that were considered large.

Assumed to be the same as for pipelines, based on advice from APT.

4. KEY RESULTS

We have estimated a DORC value for the RBP based on a HNE evaluation of the build/ buy options taking into account future demand expectations, and the consequent need for capacity augmentation of the pipeline to meet these expectations.

Under this approach, the model outlined in Appendix A provides the following DORC estimate:

Table 7: RBP estimated DORC value adopting Approach 2

NPV Cost Item	$m (2005/06)
Pipeline	$348.02
Easements	$13.17
Compressor stations	$59.37
Communications	$3.78
Expansion 1 (on new & existing pipe)	$0.85
Expansion 2 (existing pipe only)	($57.22)
Expansion 3 (existing pipe only)	($24.93)
TOTAL	**$343.05**

The total RBP DORC valuation under this approach is $343.05m.

We note that this value differs slightly from the $342.6m NPV DORC estimate contained in the Access Arrangement submitted by APT on 31 January 2006. The reason for this slight difference is that the formula for the present value of operation and maintenance costs on an expansion asset has changed slightly. The revised formula employed here includes consideration of the impact of productivity improvements over the number of years between the present and the date on which the expansion asset is commissioned. The effect of this formula change is to increase DORC by $0.55m, or 0.14%.

5. CONCLUSIONS

In this paper we have considered two scenarios to estimate the NPV DORC using the HNET model for the RBP:

- Approach 1 – Based on the current capacity of the existing pipeline (future demand growth ignored); and
- Approach 2 – Taking into account future demand expectations.

Approach 1 is expected to provide a higher NPV DORC value than Approach 2. The intuition behind this difference is that with systematic demand growth (Approach 2), the existing pipeline is somewhat less valuable because its components must be replaced (because of the need to increase capacity) sooner than they would in a no-growth situation. For this reason we have only performed a quantitative evaluation of the more conservative Approach 2.

In our view, given the significant expected growth in future demand on the RBP, a rational hypothetical new entrant would undertake the valuation in accordance with Approach 2. Therefore, based on the assumptions outlined in section 3 of this report, we believe the HNE DORC value for the RBP is $343.05m.

APPENDIX A: NPV DORC HNET MODEL

The equations embedded in the model we developed to estimate the NPV DORC using the HNET method are outlined in this appendix. This approach follows that applied in the judgement of the Australian Competition Tribunal in EAPL's application for the MSP and reflects the position advocated by APT at that time.[22]

In deriving the HNET equations defined below several key assumptions have been made. These include:

- The pipeline assets are assumed to be replaced in perpetuity, to reflect assumption that the stream of services are provided in perpetuity (as referred in section 1.1);
- Asset lives remain constant as the assets are replaced. This assumption is applied to reduce complexity for modelling purposes. In reality, it is possible that technology advances would increase asset lives across asset generations;
- The discount rate remains constant over time. This assumption is also adopted to reduce complexity of the model.
- Capital and initial operating costs decline as assets are replaced, reflecting an assumption that generational advancements in technology will reduce costs associated with new assets;
- Operating costs on a given pipeline are assumed to increase as it ages.

While there remains some controversy regarding the magnitude of some of these assumptions, the basic principles appear to have been agreed by APT and the ACCC in their final submissions, of late 2004, to the Tribunal on the MSP application by EAPL.[23]

An explanation of each of the parameters in the formulae below is provided as the end of this appendix.

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22 The Tribunal noted in its judgment on the MSP that its decision regarding the HNET method in that case did not necessarily establish a precedent for other cases (Australian Competition Tribunal, Application by East Australian Pipeline limited [2005] ACompT 1, p.5.

23 APT, *Submission of East Australian Pipeline Limited in Response to the NPV DORC Submission of the Australian Competition and Consumer Commission*, submission to the Australian Competition Tribunal, 2 February 2005.

A.1 NEW PIPE NPV COST FORMULAE

$$NPV(CAPEX_{NEW}) = \frac{ORC}{\left[1 - \left(\frac{1-TECH}{1+r}\right)^{L}\right]}$$

$$NPV(COSTS_{NEW}) = \left(\frac{C}{r-g}\right) \times \left\{ \frac{(1+r)^{(L+1)} \times \left[1 - \left(\frac{1+g}{1+r}\right)^{L}\right]}{(1+r)^{L} - (1-PROD)^{L}} \right\}$$

$$C = OPEX_{(Asset\,Type)} \times ORC_{(Asset\,Type)}$$

A.2 EXISTING PIPE NPV COST FORMULAE

Pipeline, Easement and Communications Assets

$$NPV(CAPEX_{OLD}) = \left(\frac{1-TECH}{1+r}\right)^{T} \times \left\{ \frac{ORC}{\left[1 - \left(\frac{1-TECH}{1+r}\right)^{L}\right]} \right\}$$

$$NPV(COSTS_{OLD}) = \left(\frac{C}{r-g}\right) \times \left\{ \frac{(1+r)}{(1-PROD)^{SL}} \times \left[(1+g)^{SL} - \frac{(1+g)^{L}}{(1+r)^{T}}\right] + (1-PROD)^{T} \times (1+r)^{SL+1} \times \frac{\left(1 - \left(\frac{1+g}{1+r}\right)^{L}\right)}{(1+r)^{L} - (1-PROD)^{L}} \right\}$$

Compressor Station Assets

APT advised that beyond 2017 the pipeline could satisfy anticipated demand without the need to replace the existing compressors. However, APT also advised that each of the existing compressors would need to be overhauled after 30 years served life in order that they remain operational until 2018.

The formulae that reflect the present value of the costs to overhaul the existing compressors are shown below.

$$NPV\left(CAPEX_{ExistingCompressor}\right)=\left(\frac{1-TECH}{1+r}\right)^{a}\times OVERHAUL\ \ CAPEX_{(\$2005/06)}$$

$$NPV\left(COSTS\right)_{ExistingCompressors}=\left(\frac{C}{r-g}\right)\times\left\{\frac{(1+r)}{(1-PROD)^{SL}}\times\left[(1+g)^{SL}-\frac{(1+g)^{L}}{(1+r)^{T}}\right]\right\}$$

A.3 EXPANSION REQUIREMENTS FOR FUTURE DEMAND - NPV COST FORMULA

We have derived the following formulae to account for the present value of future expansion. These formulae are consistent with the formulae used to derive the present value of costs of the optimised replacement infrastructure (or the new 'build' option), except for the allowance of a reduction in the present value of costs to reflect the fact that expansion costs may not be initiated until some time in the future. As a result, the present value formulae need to reflect the potential for the 'time value of money' and potential reductions in costs as a result of technology advances.

The formulae to derive the present value of costs of future capacity expansion are identical for both the new optimised asset and the existing pipeline, with the difference resulting from the timing requirement and magnitude of costs of the expansion specific to each.

$$NPV\left(CAPEX_{Expansion}\right)=\left(\frac{1-TECH}{1+r}\right)^{a}\times\left\{\frac{ORC}{\left[1-\left(\frac{1-TECH}{1+r}\right)^{L}\right]}\right\}$$

$$NPV\left(COSTS_{Expansion}\right)=\left(\frac{1-PROD}{1+r}\right)^{a}\times\left(\frac{C_{Expansion}}{r-g}\right)\times\left\{\frac{(1+r)^{L+1}\times\left[1-\left(\frac{1+g}{1+r}\right)^{L}\right]}{(1+r)^{L}-(1-PROD)^{L}}\right\}$$

$$C_{Expansion}=OPEX_{Assettype}\times CAPEX_{Expansion}$$

Where:

Tech =	rate of decline in the capital cost of replacing the asset;
Prod =	rate of decline in operating and maintenance costs associated with new assets due to technological advances;
g =	rate of growth in costs as the assets ages;
C =	maintenance and operating costs associated with new assets purchased today;

Opex = ratio of asset operating costs to capital cost of a new asset;

ORC = optimised replacement cost for an asset that is replaced today;

r = real discount rate;

C_{exp} = maintenance and operating costs associated with expansion assets purchased today;

L = life of the expansion asset;

T = remaining life of the existing assets;

a = number of years from today until expansion is required.