Roma Brisbane Pipeline

Review of Pipeline Capacity and Tariff Adjustment Mechanisms

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CONTENTS

1 EXECUTIVE SUMMARY

This Report reviews two alternative approaches that have been proposed for adjustment of the MDQ and throughput charge applicable to a User of the RBP. The mechanisms, one proposed by APTPPL and one proposed by the ACCC, are intended to apply in the event that gas supplied into the RBP by a User has the effect of compromising the ability of the RBP to deliver gas to all Users.

On the basis of steady-state modelling of a free flow gas pipeline with operating pressures in the range applicable to the RBP, the impact of the proposed adjustment mechanisms has been quantified and compared. The following observations have been made:

i) Changes in gas composition and quality have a material impact upon the capacity of a gas pipeline to transport gas, particularly for a pipeline operating at or near capacity and accepting gas of varying qualities from multiple sources.

ii) The incorporation of gas quality related capacity and/or tariff adjustment mechanisms into access terms is fair and reasonable.

iii) The accuracy of capacity predictions prepared using the two alternative adjustment mechanisms is of the same order of magnitude.

iv) The Gross Heating Value based mechanism proposed by APTPPL appears to be slightly more accurate than the Wobbe Index based mechanism proposed by the ACCC although it also has a slightly more onerous (but still more accurate) impact for gases with a Gross Heating Value below 40 MJ/m^3.

v) The mechanism proposed by APTPPL is already in use, including on other pipelines, and is easily administered. Although a more accurate algorithm could be developed to estimate pipeline capacity as a basis for capacity or tariff adjustment, such an algorithm would be complicated and administratively burdensome.

It is recommended the capacity and tariff adjustment mechanisms as proposed by APTPPL be retained in the Access Arrangement for the RBP.

2 INTRODUCTION

This Report has been prepared for the Australian Competition and Consumer Commission (‘ACCC’). It provides a review of alternative approaches that have been proposed for adjustment of the MDQ and throughput charge applicable to a User of the RBP in the event that gas supplied into the RBP by a User has the effect of compromising the ability of the RBP to deliver gas to all Users.

The following documents were reviewed during preparation of this Report:

i) Letter dated 20 September 2006 from Venton and Associates Pty Ltd to the Australian Pipeline Trust concerning “Pipeline Capacity Variation With Gas Composition”;

ii) APTPPL Non-Revenue Related Response to ACCC RBP Draft Decision, dated 25 September 2006, pages 3 and 4;

iii) Undated extract from the ACCC RBP Draft Decision, namely paragraph 3.2.5, provided by the ACCC; and

iv) Extract from the proposed Access Arrangement, Roma Brisbane Pipeline, namely paragraph 2.3.3, dated 31 January 2006.

3 METHODOLOGY

The primary activity carried out to investigate and compare the impact of alternative capacity and tariff adjustment proposals was steady-state modelling of the impact upon the capacity of a hypothetical gas transmission pipeline of variations in the Gross Heating Value of gas to be transported. To allow ready comparison of the results of the modelling exercise with the findings of Venton (as set out in the letter dated 20 September 2006) the pipeline configuration adopted for modelling purposes was comparable to that used by Venton. Features of the pipeline as modelled were:

Length: 400 km

Diameter: 400 mm

Pressure[1]: 10.0 MPa inlet, 6.5 MPa outlet

Six different hypothetical gas compositions were investigated, four of which represented the range of compositions investigated by Venton and two of which represented hypothetical alternative gas mixes with a Gross Heating Value of 40 MJ/ m^3.

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[1] These pressure conditions are appropriate since they approximate RBP operating circumstances.

4 MODELLING EXERCISE

4.1 Inputs and Outputs

Key inputs to the modelling exercise (in terms of assumed gas composition and quality parameters) and resultant pipeline capacities, together with capacity predictions based upon the proposed alternative adjustment mechanisms are presented in Table 1.

It can be seen from a comparison of information presented for gases 'G' and 'F' in Table 1 that a gas that has a low Gross Heating Value is not as efficiently transported as a gas with a higher Gross Heating Value even if (as a consequence of having a low Relative Density) the gas with the lower heating value has a higher Wobbe Index.

4.2 Comparison of Prediction Mechanisms

The modelled and predicted pipeline capacity information set out in Table 1 is presented graphically in Figures 1 and 2 as a function of Gross Heating Value and Wobbe Index, respectively.

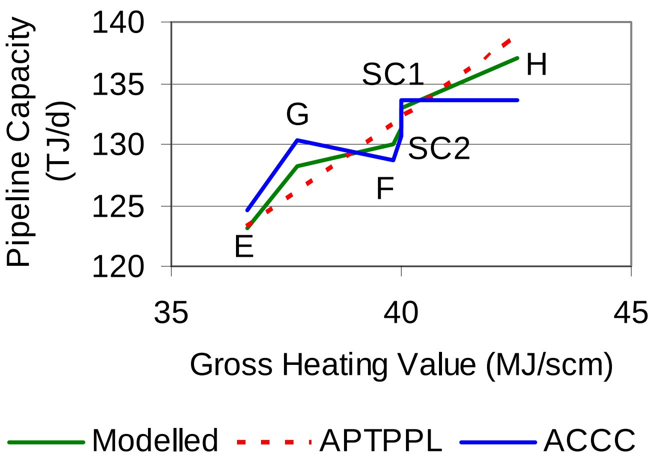

Figure 1: Modelled and Predicted Capacities V's GHV

In Figure 1, pipeline capacity predictions developed using the APTPPL adjustment mechanism appear as a straight line. This is because the APTPPL mechanism is a linear function of Gross Heating Value.

In Figure 2, pipeline capacity predictions developed using the ACCC adjustment mechanism appear as a straight line. This is because the ACCC mechanism is a linear function of Wobbe Index[2].

[2] Wobbe Index is equal to the Gross Heating Value divided by the square root of Relative Density, which is the ratio inherent in the ACCC Mechanism.

Gas Ref.	Gas Composition and Characteristics								Modelled Pipeline Capacity TJ/d	'Predicted Capacity'	
	C1 %	C2 %	C3 %	CO_2 %	N_2 %	GHV MJ/m^3	Relative Density	Wobbe MJ/m^3		APTPPL formula TJ/d	ACCC formula TJ/d
E	Compositions as per Venton study					36.654	.573	48.428	123.1	123.2	124.5
F						39.809	.633	50.052	129.9	131.6	128.7
G						37.752	.555	50.670	128.1	126.1	130.3
H						42.540	.670	51.970	137.1	138.8	133.6
SC1	94.09	4.00	1.91	0.00	0.00	40.000	.523	51.946	132.9	132.1	133.6
SC2	90.26	5.00	2.74	1.00	1.00	40.000	.620	50.812	131.2	132.1	130.6

Table 1: Model Inputs and Outputs

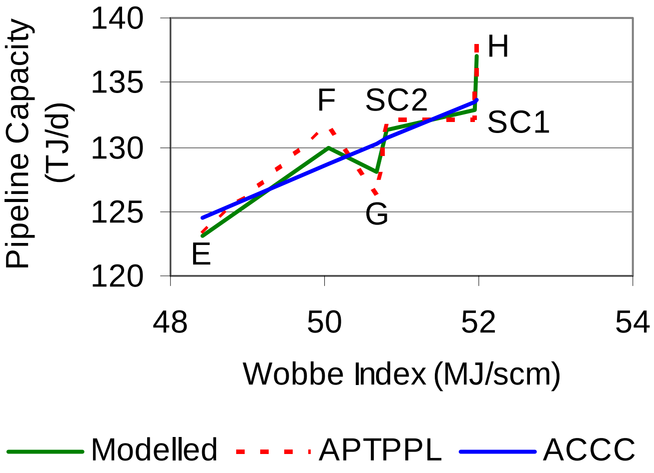

Figure 2: Modelled and Predicted Capacities V's Wobbe Index

Figures 1 and 2 show:

- by inspection of the green (as modelled) lines, there is nor simple relationship between the capacity of a gas pipeline and either Gross Heating Value of Wobbe Index;

- as the gas quality declines (whether measured in terms of Gross Heating Value or Wobbe Index) so too will the transportation capacity of a given pipeline; and

- both the APTPPL and the ACCC adjustment mechanisms are indicative of the impact upon pipeline capacity of changes in gas quality.

To assist in comparison of the APTPPL and the ACCC adjustment mechanisms, the average deviations of predicted pipeline capacities from actual pipeline capacities for each of the two proposed adjustment mechanisms have been investigated for. The average deviations between predicted and actual capacities are:

APTPPL mechanism:	0.91%
ACCC mechanism:	1.22%

On average, for the data points set out in Table 1 the APTPPL mechanism tends to provide a more accurate prediction of pipeline capacity variations than the ACCC mechanism.

4.3 Observations

On the basis of the capacity modelling exercise the following observations are made:

i) It is evident from Figures 1 and 2 that changes in gas composition and quality have a material impact upon the capacity of a gas pipeline to transport gas. Impacts of this nature will be particularly important for a gas pipeline that operating at or near capacity, particularly if it accepts gas of varying qualities from multiple sources.

ii) In view of the impact described above, the incorporation of a gas quality related capacity and/or tariff adjustment mechanism into access terms is fair and reasonable.

iii) The effect of capacity and/or tariff adjustment mechanisms will be to increase the average cost (in $/GJ) of transporting gas as the quality of the gas declines.

iv) The accuracy of capacity predictions prepared using the two alternative (APTPPL and ACCC) adjustment mechanisms is of the same order of magnitude.

v) The Gross Heating Value based mechanism appears to be slightly more accurate than the Wobbe Index based mechanism. However, since only a small number of data points (ie, hypothetical gas qualities) have been examined for one illustrative set of pipeline operating conditions, it cannot be concluded that either adjustment mechanism is generally preferable to the other.

vi) There is no indication that the mechanism as originally proposed by APTPPL is inappropriate for application to the RBP. Nor is there any indication that the mechanism proposed by the ACCC is superior.

5 OTHER CONSIDERATIONS

5.1 Impact Upon Users

The adjustment mechanism can have a twofold impact upon a User that delivers gas with a Gross Heating Value below 40 MJ/m^3. First, the entitlement to have gas transported through the RBP will be reduced. Second, the throughput tariff applicable to gas transported for that User will be increased. The individual and combined effects of these changes will be an increase in the average cost per Gigajoule of having gas transported through the RBP. This is the reason why the adjustment mechanism has been scrutinised.

Venton has indicated[3] that the adjustment mechanism proposed by APTPPL is more favourable (ie, leads to a smaller increase in gas transportation costs) than the mechanism proposed by the ACCC.

For Venton's suggestion to be correct, the APTPPL adjustment mechanism will (for gases with a Gross Heating Value below 40 MJ/m^3) need to overestimate capacity relative to the ACCC adjustment mechanism.

On the contrary, information presented by Venton (reproduced below as Figure 3) and calculations performed during preparation of this Report (the results of which are presented in Table 2) show that the opposite applies.

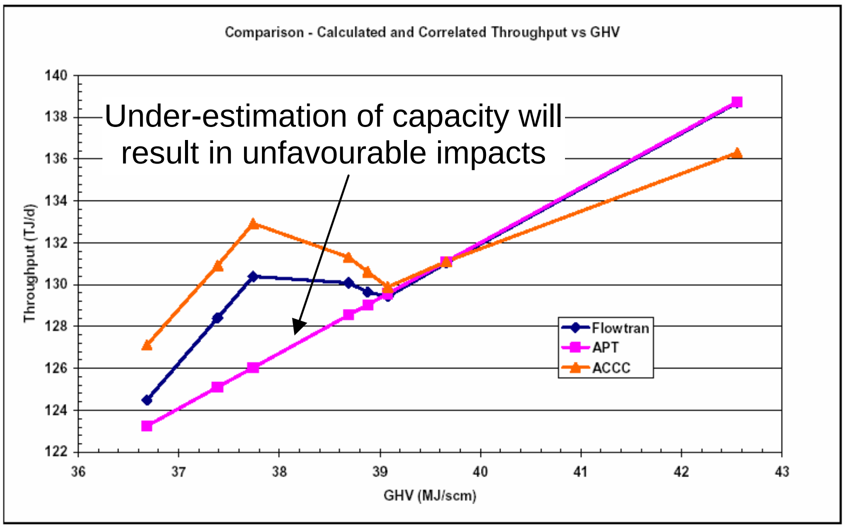

Figure 3: Reproduced from Venton Letter of 20 September 2006

Gas	Impact on Throughput Charge		Impact on Capacity Entitlement	
	APTPPL	ACCC	APTPPL	ACCC
E	**+6.7%**	+6.1%	**-6.7%**	-5.7%
F	+0.4%	**+2.6%**	-0.4%	**-2.6%**
G	**+4.5%**	+1.4%	**-4.5%**	-1.4%

Table 2: Impact of Adjustment Mechanisms
(Bold font indicates the more unfavourable impact)

Table 2 includes only those gases with a Gross Heating Value below 40 MJ/m^3, this being the circumstance for which the proposed adjustment mechanism applies.

[3] See second last paragraph on page 3 of Venton letter dated 20 September 2006.

The impact of the APTPPL adjustment mechanism is marginally more unfavourable that the impact of the proposed ACCC adjustment mechanism. However, the APTPPL mechanism:

- provides a more accurate approximation of the actual impact that gas with a reduced heating value will have upon pipeline operations (as demonstrated in section 4); and
- in any case, has limited application (to circumstances where gas supplied by a User has a Gross Heating Value below 40 MJ/m^3 and the ability to service all Users' requirements is compromised), which makes for ease of administration.

5.2 Coal Seam Gas Industry

The purpose of this subsection is to give specific consideration of the potential impact of the proposed adjustment mechanism upon transporters of coal seam gas.

Natural gas is a naturally occurring, combustible mixture of gases the primary component of which is methane but which may also contain smaller quantities of higher hydrocarbons (such as ethane, propane and butane), inert gases (carbon dioxide and nitrogen) and sometimes small quantities of gases such as helium. Coal seam gas is a natural gas that tends to be comprised of methane, carbon dioxide and nitrogen.

While the composition of coal seam gas can vary significantly from location to location, a reported[4] composition for coal seam gas produced commercially in Queensland is:

Methane:	96.6%
Carbon dioxide:	0.06%
Nitrogen:	3.3%

Gas with the composition set out above has a Gross Heating Value of 36.5 MJ/m^3 and a Wobbe Index of 48.4 MJ/m^3 and is essentially identical to reference gas 'E', being (as used for pipeline capacity modelling both by Venton and in this Report).

As demonstrated in Table 1, gas of this indicative composition will, if transported through the RBP in significant quantities, lead to a reduction in the capacity (expressed in energy terms) of the RBP relative to that historically available.

[4] Composition reported on the website of Queensland Gas Company for coal seam gas from the Berwyndale South gas field.

If the APTPPL adjustment mechanism is adopted then any resulting adjustments will be an accurate reflection of the impact upon capacity of the RBP[5].

If the ACCC adjustment mechanism is adopted then any resulting adjustments will be based upon an understatement of the actual impact upon pipeline performance.

If no adjustment mechanism is adopted then the impact of any reduction in the capacity of the RBP to service all Users' requirements will be inequitably shared by all Users (ie, including those Users transporting gas that does not compromise the capacity of the pipeline).

5.3 Requirement for Improved Accuracy

A more accurate pipeline capacity estimation algorithm could potentially be developed for the RBP. As noted by Venton, it is likely such an algorithm would need to take into account actual compositional data. A more accurate mechanism might also need routine revision to reflect actual pipeline configuration and operating conditions. An algorithm of this nature would be unwieldy.

In view of the good level of accuracy achieved by both of the proposed adjustment mechanisms and the ready availability of data upon which calculations can be based and audited, there would be little, if any, benefit realisable through implementation of a more complicated regime.

Alternatively, the basis upon which capacity in the RBP is contracted and priced could be expressed on a volumetric (rather than energy) basis. While this would have the effect of assigning gas quality related impacts and risks to Users, the adoption of an approach of this nature would necessitate adjustment of delivered gas quantities (relative to received gas quantities) in order that the volume of gas received by each User contains an equivalent amount of energy to that contained in gas delivered by User. Again, this introduces complications that, although not insurmountable, are not consistent with Australian practices.

5.4 Practice Elsewhere

Since gas pipelines transport volumes of gas rather than quantities of energy, the heating value of gas to be transported (and heating value changes that may occur with time) is fundamental to both the design of a gas pipeline and to determination of the amount of capacity (in energy terms) that can be contracted.

[5] This is evident in Table 1

Evidence of the significance of this relationship may be found in Western Australia. Recent, and possible future, changes in the composition of gas to be transported through the Dampier to Bunbury Gas Pipeline (which needs to be expanded) have stimulated debate regarding a trade-off between certainty of availability of pipeline capacity and the cost of that capacity. In essence, if likely average gas compositions (rather than possible worst case compositions) are adopted as a design basis for capacity expansion activities, the expansion requirement and cost will be reduced but there will be a material risk that capacity constraints could arise from time to time. This could necessitate user-specific reductions in capacity.

The gas composition – pipeline capacity trade-off has been addressed for a small number of Australian gas pipelines. In particular, heating value related adjustment mechanisms are in place for the RBP, the Carpentaria Gas Pipeline (Ballera to Mt Isa) and the Amadeus Basin to Darwin Gas Pipeline. Similar capacity adjustment formulae are used for each of these pipelines.

While research into international precedent has not been undertaken for this Report, it is understood that a number of overseas gas pipeline operators (eg, the TransCanada Alberta system and the UK-Europe Interconnector) allocate capacity on a volumetric basis, with adjustments for the heat content of gas received and delivered.

6 RECOMMENDATION

It is recommended the capacity and tariff adjustment mechanisms as proposed by APTPPL be retained in the Access Arrangement for the RBP.

This recommendation is based upon the following key considerations:

- The dependence of pipeline capacity upon the composition and quality of gas to be transported it is unquestionable. It is fair and reasonable that this dependence be reflected in pipeline access terms, particularly for the RBP (which is operating near capacity and accepting deliveries of gas from multiple sources).
- The capacity and tariff adjustment mechanisms proposed by APTPPL and the ACCC both provide a reasonable representation of actual gas quality related variations in the capacity of the RBP. APTPPL's proposed mechanism appears to be slightly more accurate that the mechanism proposed by the ACCC.
- The mechanism proposed by APTPPL is already in use, including on other pipelines, is applied only in specific circumstances and is easily administered.