Dampier Bunbury Pipeline

Review of Gas Specification For The Dampier to Bunbury Pipeline & Determination of an Appropriate Gas Composition For Design of Stage 5 Expansion

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1 EXECUTIVE SUMMARY

1.1 Background

M.J Kimber Consultants Pty. Ltd. has been asked by DBNGP (WA) Transmission Pty Ltd ("DBP") to prepare a report that will assist it in reaching a consensus view of all stakeholders in the Dampier to Bunbury Natural Gas Pipeline ("DBNGP") on the gas composition to be used by DBP and Alinta Network Services ("ANS") for the design of the capacity expansions of the DBNGP to ensure that the interests of all stakeholders are best served by those expansions. For details of the specific requirements, see Sections 1.2 and 9.1.

DBP is about to embark on detailed design of the next phase of capacity expansion (referred to as Stage 5 Expansion) and closed off applications for capacity for that phase on 31 December 2005. This is encompassed in press release of 25 November 2005 which is reproduced in Section 9.3.

Currently, the plan is to expand the capacity of the DBNGP from 640 TJ/day of T1 capacity and 45 TJ/day of other special capacity (following completion of the Stage 4 Expansion) to capacities up to 900 TJ/day or 1000 TJ/day of T1 capacity and 45 TJ/day of other special capacity. Since increases of capacity will be required to commence in late 2007 and will continue beyond Stage 5, a long term view is necessary.

Since the expansion will require extensive looping (duplication) of sections of the pipeline and additional compression, a lead time of a least two years is necessary. DBP has begun preliminary engineering design to meet this schedule.

Further, since pipeline assets have long operational lives, the design of the various phases of expansion must take into account long term (up to 30 years) expectations for all design parameters. Some design parameters are relatively easy to predict – for example, ambient temperatures and ground temperatures that affect compressor operation and pipeline dynamics can be based on long term weather observations – but others, such as gas composition, are dependent upon such matters as the variability of gas fields, and time-variable economic, legislative and commercial circumstances. These are more difficult to assess and can only be determined (albeit with considerable uncertainty) by reviewing predictions made by those directly parties directly responsible for gas supply into the pipeline, such as the Shippers and gas Producers.

It is evident that any predictions will be made in the light of current circumstances. Kimber Consultants has assembled and assessed predictions of gas compositions made by Producers and gas demand predictions made by DBP and a limited number of Shippers.

Several events have triggered the urgency of preparation for expansion of the capacity of the DBNGP:

- Requests by Shippers for additional firm capacity;
- Undertakings[1] to Australian Competition and Consumer Commission ("ACCC") and Western Australian government to increase the capacity of DBNGP when required;
- Unexpected rapid change in the composition of the gas as a result of a change to the WA Standard gas specification foreshadowed in Schedule 1 of Dampier To Bunbury Pipeline Regulations 1998 and implemented on 1 July 2005. This change affected gas supply agreements, Standard Shipper Contracts between DBP and its Shippers and other associated agreements.
- Action by the Economic Regulation Authority ("ERA") in December 2005 to assume an authority to implement a leaner gas specification with higher levels of inert gases for the DBNGP's Access Arrangement. This action could be seen by the upstream industry as a means of substantially reducing gas quality from that which has been maintained since the late 1980s with consequent loss of pipeline capacity.
- Circumstances where the DBNGP has much less spare capacity than at any time in its life which means that there is less "head room" to accommodate short term gas field and production plant upsets and to accept nominations for any services (such as interruptible and peaking) other than firm service. These circumstances are accompanied by a much greater dependence of the reliability of compressor stations.

Throughout this report, Kimber Consultants has used the concept of gas composition as the defining feature of natural gas supplied into the DBNGP at the various Receipt/Inlet Points.

Gas composition defines gas quality – such as higher heating value[2], Wobbe Index, levels of inert gases and so on – and as such, will determine whether the natural gas meets the gas specifications set out in the Standard Shipper Contract, the ERA's Access Arrangement, Gas Supply Agreements and most transactions associated with the transfer of ownership or custody of natural gas.

As a consequence, this report considers gas composition as the most appropriate method of defining the thermodynamic properties of natural gas and hence the capacity of a pipeline system.

1.2 DBP's specific requirements for this report

DBP has asked Kimber Consultants to:

1. Conduct discussions with Producers and Prospective Producers to obtain their views on gas quality projections for their respective fields; production capabilities; the likely sequencing of field development; their ability to modify gas quality through processing in order to provide a forecast of gas quality trends for up to 20 years;
2. Conduct discussions with Shippers and the ERA (including its pipeline engineering consultant, PB Associates) on their views on gas specification and future demand in order to provide a forecast of required gas quality trends;
3. In conjunction with the DBNGP Asset Manager, Alinta Network Services, examine historic gas quality trends, and consider the influence of short term variability on service reliability;
4. Assist ANS in the development of a modelling tool that can be used to predict the most appropriate gas composition;

[1] See Undertaking between ACCC and Alinta Limited, Alcoa of Australia Limited and Diversified Utility and Energy Trusts No 1 and No 2 http://www.accc.gov.au/content/index.phtml/itemId/600228 A summary of the Undertaking with ACCC is set out in Section 9.2.

[2] Throughout this report the terms "heating value" and "higher heating value" and HHV are used interchangeably and should be read as meaning "higher heating value" as defined in the conventional way.

5. Prepare a report that presents the findings suitable for issue to the key participants, DBP's banks and Owners

6. Review of submissions to the ERA, and the reports of PB Associates on matters associated with the gas quality;

7. Hold discussions with all Producers, Shippers and the ERA to develop a long term view on movements in gas quality at each of the Receipt points;

Prepare a report which addresses:

1. The range of circumstances which can potentially impact on the gas quality to be transported by the DBNGP in the long term – and hence on capacity and service reliability;

2. In aggregated form if necessary, the information provided and views expressed by particular stakeholders or stakeholder groups;

3. The supporting arguments for recommending a particular gas specification as the most appropriate basis for the design of Stage 5 and future expansions.

1.3 Kimber Consultants' responses to DBP's requirements

In order to carry out this assignment, Kimber Consultants was obliged to enter into comprehensive confidentiality agreements with most stakeholders in the DBNGP in order to gain access to detailed technical and commercial information that was essential to the preparation of this report. Kimber Consultants' believes that it has rigorously complied with the obligations under these confidentiality agreements in the preparation of this report. In specific cases Kimber Consultants has asked parties to review sections of text that refer to information provided by them.

Kimber Consultants' responses to DBP's requirements included the following:

1. *Conduct discussions with Producers and Prospective Producers*

- Kimber Consultants met with Senior representatives of North West Shelf Gas Pty Ltd and Woodside Energy Ltd. and obtained detailed domestic gas plant outlet compositions and volumes for 2006 to 2010 and more generic, but very useful data for subsequent years, on a confidential basis. Participated in detailed discussions, both at meetings and by telephone, and e-mail exchanges to address issues such as the control of inerts, the interaction between LNG and domestic markets and the likely effects of this interaction on domestic gas quality.

- Kimber Consultants met with senior representatives of Apache Energy Limited and was provided with very detailed gas plant outlet compositions and volumes for 2006 to 2030, together with Apache's views on the Western Australian gas market. Participated in detailed discussions, both at meetings and by telephone, and e-mail exchanges to address issues such as the control of inerts and Apache's views on the implications of ERA's changed specification and the economics of LPG extraction from southern Carnarvon Basin gas fields. Apache's joint venture partner in the John Brookes gas field, Santos, agreed to the provision of the information.

- Kimber Consultants met with senior representatives of BHP Billiton Petroleum Pty Ltd and was provided with comprehensive information on the decline of the Griffin and nearby gas production fields and prospects for Macedon gas field.

- Kimber Consultants met with senior Representatives of Chevron Australia Pty Ltd and was provided with background to the development of the Gorgon and Jansz gas fields (via Barrow Island[3]). Provided with a copy of the Environment Impact Statement which contained useful

[3] Recent press reports (22 February 2007) indicate that the installation of gas processing facilities on Barrow Island may be in doubt

information on gas production and intentions with respect to retention of LPGs in sales gas stream.

2. *Conduct discussions with Shippers and the ERA (including its consultant, PB Associates) on their views on gas specification and future demand in order to provide a forecast of required gas quality trends*

Kimber Consultants met with:

- Senior representatives of Alcoa to discuss future gas demands and sources of supply. Was only able to see a three year gas demand (and sources) forecast. Participated in detailed discussions, both at meetings and by telephone, and e-mail exchanges to reach an understanding that both capital and operating costs (and hence tariffs) will increase if lower quality gas is used for design of pipeline expansion.
- A senior representative of Western Power (Generation) to discuss its future gas demands and the influence of lower quality gas. Despite several reminders, Western Power has not supplied any gas demand information. However, Western Power expects that tariffs will increase as a result of the use of a lower quality gas specification for design of the expansion of DBNGP.
- Senior representatives of CSBP Limited and Australian Gold Reagents Pty Ltd to discuss gas demands and the effects of the lower gas quality. Both companies reiterated their strongly held views opposing the reduction of gas quality. Both provided details of their future gas demands.
- Senior staff of ERA and gained access to confidential versions of PB Associates' report (and the report's author) on the effect of the change in gas quality (from 37.3 MJ/m^3 to 37.0 MJ/m^3). Clarified ERA's view that reference tariffs will rise if low values of heating value are used for design of DBNGP's expansion.
- Kimber Consultants also had several telephone conferences with a representative of Alinta Power Services (in the absence of a senior representative of Alinta Sales) who had close involvement with sale of the DBNGP and various legacy contracts that deal with Alinta Sales' rights to entrained LPG for extraction by the Wesfarmers LPG plant at Kwinana.

3. *In conjunction with the DBNGP Asset Manager (ANS) examine historic gas quality trends, and consider the influence of short term variability on service reliability; and*
4. *Assist Alinta Network Services ("ANS") in the development of a modelling tool that can be used to predict the most appropriate gas composition*

- Met on many occasions with representatives of ANS who are directly responsible for design and operation of the DBNGP. Reviewed compositional models and SCADA data. Attempted to reconcile actual short term data on composition with long term forecasts by Producers. Found that most of these effects were short term (field and plant upsets) and delays in start-up of new contracts with Producers for restoration of some LPG in the gas stream.

5. *Prepare a report that presents the findings suitable for issue to the key participants, DBP's banks and Owners*

- Kimber Consultants is of the view that this report is suitable for issue to key participants, but DBP should review it and make its own decision in this regard.

6. *Review of submissions to the ERA, and the reports of PB Associates on matters associated with the gas quality.*

- See above

7. *Hold discussions with all Producers, Shippers and the ERA to develop a long term view on movements in gas quality at each of the Receipt points*

- See above

1.4 Links between capacity and gas composition

The capacity of the DBNGP and the risks to capacity are central to the matters set out by DBP in the Terms of Reference set out in Section 9.1. Capacity risk is irrevocably linked to gas composition – if composition changes, so does capacity. Hence those stakeholders that determine gas composition also determine capacity and thus have a major influence on the operating and capital costs associated with operating and expanding the DBNGP. Producers and Shippers determine composition through their gas supply agreements; the pipeline has no part of this process and is required to accept the gas that meets a very broad specification which implies a highly variable gas composition. Hence Producers and Shippers determine capacity.

In simple terms, if the Producers and the Shippers manage capacity risk, then the transport price will be lower than if they did not; if the pipeline is required to manage capacity risk, the transport price will inevitably be higher since the pipeline has no means of managing gas composition, and has to adopt a conservative approach in choosing a design gas composition.

1.5 Alternative approaches to select appropriate gas composition

This report postulates three gas compositions which could be used for the design of the Stage 5 Expansion (which implicitly requires a review of the existing pipeline configuration) and to define capital and operating costs that will in turn determine the haulage tariffs applicable. The three approaches are:

1.5.1 Very conservative approach

A very conservative approach where the lowest quality allowable under that shown in the gas specification as defined in Item 1 in Schedule 3 in DBNGP Final Access Arrangement of 2 November 2005 – see Table 2, and referred to as the "ERA AA Specification" namely, gas with a higher heating value (HHV) of 37.0 MJ/m^3, and a Wobbe Index of 46.5 MJ/m^3. In this case, the Shippers will pay a higher tariff than in either of the following approaches for capacity certainty.

This would ensure that the capacity of the DBNGP will not be reduced below contracted capacity as a result of changes in gas composition within the ERA AA Specification and the pipeline owner is able to meet all contractual obligations to Shippers, whilesoever the gas at the inlets meets the ERA AA Specification.

1.5.2 Conservative approach

A conservative approach where the most likely, but lower end of gas composition is used for the design. The composition postulated in this approach has been derived from predictions of gas composition provided on a confidential basis by the gas Producers to Kimber Consultants. Existing contractual obligations related to the operation of the Wesfarmers LPG plant at Kwinana provide a close link between entrained LPG and available pipeline capacity, but it must be assumed that, for the purposes of the design of the Stage 5 expansion and in the light of the changes in the gas specifications that apply from 1 July 2005, no LPG will be carried in the gas stream. This assumption is just as relevant to the very conservative approach described above.

Accordingly, Kimber Consultants has developed a gas composition that does not contain any LPG, but is otherwise of a quality that represents a long term result of the blended gas streams from sources including North West Shelf, Varanus Island and, in the future, Gorgon. This approach ensures that capacity can be guaranteed for all gas that meets or exceeds the most likely lower end gas composition. For details of this composition, see Section 5.3 and Table 3.

This gas composition is referred to as the "Recommended Design Gas Composition" and has a HHV of 37.7 MJ/m^3 and a Wobbe Index of 47.9 MJ/m^3. The quality of this gas composition is within, by a small margin, the lowest quality allowable under that shown in the gas specification as defined in the ERA AA Specification (Table 2). In this case, there is a high risk that contracted capacity will not be available on any day when gas delivered into the DBNGP by Shippers does not comply with the Recommended Design Gas Composition, even though it may be within the ERA AA Specification. Shippers would logically be required to manage this risk through either contracting for more capacity than their actual daily requirement or by accepting a greater level of interruptibility than provided under the SSC T1 Service.

1.5.3 Optimised approach

Optimised or economically efficient approach where the most likely or "median" gas composition is used for the design. For details of this composition, see Table 5. This is referred to as the "Median Gas Composition". This composition has been developed by reference to predictions of gas composition provided on a confidential basis by the gas Producers to Kimber Consultants. It contains around 0.85 tonnes/TJ of LPG, has a higher heating value of 38.7 MJ/m^3 and Wobbe Index of 48.6 MJ/m^3. Use of this composition implies that capacity cannot be guaranteed by the pipeline and the pipeline cannot take any responsibility for shortfalls of capacity if gas quality falls below the median gas composition. However, Shippers get the lowest transport cost for an uncertain capacity.

This is not an altogether unusual circumstance for a long distance natural gas pipelines. The Australian Pipeline Trust's gas transportation agreements for its Queensland pipelines adjust capacity or tariff through mechanisms related to the heating value of the gas received into its pipelines.

1.6 Recommended design gas composition

Kimber Consultants recommends that approach described in Section 1.5.2 above – the Conservative Approach – is used for the design of Stage 5 Expansion, because it represents the most realistic composition available to the DBNGP while recognising contractual obligations related to the Wesfarmers LPG plant. It provides for a high, but not absolute, level of certainty for Shippers that the contracted firm capacity will be available to them. It also ensures that DBP can meet its contractual commitments for firm service to Shippers at the expected gas composition, but it does not ensure DBP can meet its contractual commitments for any service to Shippers if the gas quality is at the lowest quality permitted under the ERA AA Specification.

Kimber Consultants recommends that the SSC be amended to define contracted capacity at HHV of 37.7 MJ/m^3 and a Wobbe Index of 47.9 MJ/m^3. this is referred to as the "Recommended Design Gas Composition"

If this option is chosen, Shippers must understand that their firm capacity entitlements WILL BE REDUCED if the heating value of the gas presented for transport in the DBNGP is less than that of the Recommended Design Gas Composition, namely, 37.7 MJ/m3.

1.7 Need for cooperation between stakeholders in DBNGP

Because Producers and Shippers determine gas composition, it is essential that they play a most important and active role with DBP in defining the composition of the gas to be used as a design basis. There must be willing cooperation between the Producers, Shippers and DBP in the process of agreement on the basis of the design of Stage 5 Expansion and a retrospective review of the DBNGP's current capacity constraint in the light of the agreed basis for design.

New and amended contracts will have to be drawn up to ensure that the management of risk in the supply chain (both financial and physical) is vested in those firms in the best position to manage the risk.

If either of the conservative approaches is used for the design of Stage 5 Expansion, then Shippers will need to understand that the cost of transport will be higher than that which would apply under the optimised approach, but they will be assured that their booked capacity will be available when required unless the Producers allow the heating value to fall below the agreed contractual lower limit.

If the optimised approach is to be used for the design of Stage 5 Expansion, then Shippers will need to understand that there is some uncertainty about the available capacity if the composition of the gas offered by the Shippers for transport varies outside that defined by the Median Gas Composition. Curtailment of capacity is likely and there will be little or no flexibility to offer pipeline services such as Spot Capacity, Overrun, Excess Imbalance or Excess Peaking services.

In any case, since the ERA AA Specification differs from the Specification in the Standard Shipper Contract, some amendments to the Standard Shipper Contract (and all other Shipper contracts) are required. This assumes that the ERA AA Specification has standing under Western Australian law or under Gas Sales Agreements.

Kimber Consultants is very much aware that at present all quality risk that affects current pipeline capacity rests with DBP under the SSC with the mitigation being "negotiation or compensation" under clause 7.14, and that DBP is of the view that DBP will only proceed with the Stage 5 Expansion if there is a satisfactory outcome from the SSC negotiations with Shippers.

Kimber Consultants considers that it is essential to get sign-off on the new design approach decision from all Shippers and, if appropriate, the Producers. DBP should not make this decision in isolation and not simply rely on this report.

2 INTRODUCTION

2.1 Pipeline capacity expansion

DBP is about to embark on detailed design of the next phase of capacity expansion (referred to as Stage 5) of the DBNGP to meet future gas demands of the South West of Western Australia. Currently the plan is to expand the capacity of the DBNGP from 640 TJ/day of T1[4] capacity and 45 TJ/day of other special firm capacity (following completion of the Stage 4 expansion) to between up to approximately 1000 TJ/day of T1 capacity within the current planning horizon.

The capacity of a pipeline is determined in the main by the following factors:

- pipeline geometry consisting of length, diameter, amount of looping
- pipeline maximum allowable operating pressure
- minimum delivery pressure required by Shippers[5]
- location, number and power of compressor units
- composition of gas to be transported

The T1 capacity of the DBNGP is fully contracted and will remain fully contracted at the end of the current phase of expansion – "Stage 4 Expansion" – and into the foreseeable future while ever the current economic regulatory environment persists. Potential Shippers will require a further increase in DBNGP's capacity to meet additional demand. The current pipeline geometry, when combined with its current compressors and gas composition, is such that the pipeline cannot provide additional firm T1 transportation services.

The DBNGP has reached such a stage in its development life that considerable capital must be invested to provide relatively modest increases in capacity. The amount of capital required can only be determined by the construction of a thermodynamic model of the current pipeline and then adjusting lengths of pipeline looping and increases in compressor power in a number of scenarios to determine the most cost effective ways of increasing capacity. Central to the thermodynamic model is the gas composition. For the same increase in capacity, lean gas with high levels of inert gases will require considerably more investment in pipeline hardware than richer gas with low levels of inert gases.

2.2 Gas specification and gas composition

As a consequence of the above, it is important that in the context of this report that we make the distinction between "gas composition" and "gas specification".

2.2.1 Gas composition

Gas composition is a description in quantitative terms of the proportions of chemical constituents or components (flammable components such as methane, ethane, propane, heavier hydrocarbons, non flammable components such as water, oxygen, nitrogen and carbon dioxide and contaminants, such

[4] T1 Capacity is defined in Clause 3.2 of the Standard Shipper Contract generally as: T1 Service is a full haul gas transportation service that gives a Shipper a right to capacity for which the probability of supply for the next GJ of Gas to be transported in the DBNGP is 98% for each Period of a Gas Year

[5] "Shipper" means a user of the pipeline that has booked capacity for the transport of its gas from a receipt point adjacent to its source of supply to a delivery point adjacent to its load

as radioactive materials, mercury and sulphur) that make up what is generically known as natural gas.

These components combine together define the thermodynamic properties of the gas such as:

- viscosity
- compressibility characteristics
- density
- enthalpy
- decompression characteristics

These properties, in turn, determine the way in which the gas behaves as a fluid within high pressure pipelines, compressors, regulators and other components of a pipeline system.

As a result, the definition of an appropriate set of compositional data is central to the design of a natural gas transmission pipeline system.

The composition of the gas determines all the parameters that are included in the specification, whereas, except in the most general terms, the specification does not define the composition.

2.2.2 Gas specification

Gas specification is a contractual or legal construct that sets limits related to:

- the use to which the gas is put; and
- certain safety aspects

but has little relevance to gas composition.

Natural gas is used for a variety of purposes, but which can be divided into two main uses:

- As fuel – where gas is burnt in gas turbines, boilers, domestic appliances and other combustion devices
- As a petrochemical feedstock, where the components of the gas, principally carbon and hydrogen are used to manufacture more complex chemicals such as ammonia, explosives, methanol and cyanide

If gas is used a fuel, then the user is interested in the energy the gas contains (heating value), the characteristics of the flame that is generated (Wobbe Index) and the composition of waste produced during burning.

If the gas is used as a feedstock for a chemical process, then the components of the gas are important to the user, who may be concerned to get the maximum hydrogen out of a given quantity of gas or whether some of the chemicals in the gas may affect catalysts or reagents in the process.

The composition of the gas determines all the parameters that are included in the specification, whereas, except in the most general terms, the specification does not define the composition.

2.2.3 Which characteristic is important – composition or specification?

In the simplest of terms, the composition of the gas is the most important input for a pipeline design and the specification for the gas is the important parameter for commercial and contractual reasons.

However, because of their close relationship, both composition and specification must be considered in any pipeline design.

This report has adopted the approach of:

- Determine the most likely composition of the gas to be received from the currently known and planned sources into the DBNGP at the various receipt points for future years – preferably to 2025;
- Take into account the terms and conditions of any contracts that might impinge on the relationship between gas composition, including LPG content, and pipeline capacity;
- Take into account the ERA's determinations on gas quality; and
- Assess the quantities and compositions of the gas downstream of Compressor Stations 1 and Compressor Station 2 to determine the most likely composition of the blended stream in sections of the pipeline :
    - downstream of compressor Station 1 – being the blended gas from North West Shelf Gas Producers and supplies via Varanus Island (mostly from fields operated by Apache, such as John Brookes, Harriet, Wonnich, East Spar) and ultimately from the Greater Gorgon gas fields operated by Chevron
    - downstream of Compressor Station 2 – being blended gas from the above, plus small amounts of gas from the gas fields operated by BHP Billiton Petroleum, such as Griffin and Scindian
    - downstream of the Wesfarmers' Kwinana LPG stripping plant

2.3 Design capacity for unregulated and regulated pipelines

In the absence of stringent commercial and regulatory pressures that prevent risks being distributed equitably over the gas supply chain, most pipeline operators use commercially based designs – that is, they design a pipeline and its components such that a pipeline will have more capacity than currently contracted. This provides a buffer to accommodate market growth and allows the pipeline operator to sell additional innovative pipeline services to increase revenue flow and improve profits. These pipelines are best described as "entrepreneurial" pipelines. Duke's (now Alinta) Eastern Gas Pipeline was a good example of the concept of an entrepreneurial pipeline.

The entrepreneurial pipeline owner sets tariffs for firm service by the application of a financial model that takes into account:

- the needs of Shippers and uses to which the gas is to be put;
- the risk of gas quality variations from a commercially determined average that may affect capacity and result in liquidated damages;
- equipment reliability;
- risk of loss of market or loss of supply; and
- cost of capital in the light of these risks

However, as a result of recent experience with regulated pipelines or where the prospect of regulation is high, and legacy contracts impose non-commercial constraints, prudent pipeline owners design pipelines which provide just sufficient capacity to meet immediate contracted capacity and regulatory dictates. Changes in the structure of pipeline ownership which rely on debt, rather than equity, to finance pipelines, also contribute to risk aversion. Pipeline owners and developers will not risk their capital if rates of return on contracted capacity are not adequate to allow them to take any risk on short or long term unused capacity.

In the case of the DBNGP, the commercial arrangements for the expansion of pipeline capacity are contained within the Alcoa Exempt Contract and Standard Shipper Contracts – bi-lateral contracts with each Shipper that were negotiated by the Shippers and Alinta/Alcoa/DUET consortium before the sale of the DBNGP by Epic to the consortium. Clause 16 of the SSC provides for the process of capacity expansion and Clause 20.8 provides for adjustment to the Base Tariff in the event of capacity expansion.

This is further complicated by contractual obligations related to the operation of the Wesfarmers LPG plant which increase DBP's capacity obligations in line with any incremental capacity "created" by the presence of LPG in the gas stream.

It is also relevant to mention that the Base Tariff (as adjusted) reverts to one that will be determined by reference to the reference tariff set by the ERA (or its successor) in 2016. As a result of this latter requirement, DBP has to be aware that any capital and operating costs resulting from expansion must meet the ERA's criteria under the National Third Party Access Code For Natural Gas Pipeline Systems as it applies at the time. Any prediction as to the shape of Code or its mode of application by the regulator in 2016 would be courageous. However, it is reasonable to suggest that, if DBP was seen to be prudent about its engineering design and implementation of any expansion, it would be difficult for any future regulator not to endorse DBP's approach and costs.

Further, it is the view of Kimber Consultants that DBP's detailed investigation into the gas composition that it wishes to use in the design of its Stage 5 Expansion is an example of prudent approach, since gas composition has a significant bearing on both capital and operating costs of pipeline expansion.

3 DBP'S DILEMMA

In a submission[6] made by DBP to the ERA in response to a report by PB Associates[7], DBP summarised the situation that was beginning to arise on the DBNGP in respect of the linkage between pipeline capacity and gas quality:

3.3. Operator submits that:

(a) the issue of the long term quality of various fields is only one of a number of factors that will determine the quality of the gas being transported in the DBNGP;

(b) experience over the last 12 months has demonstrated that:

(i) the quality of gas in the DBNGP has changed dramatically for reasons which extend beyond the removal of the minimum LPG requirement; and

(ii) fluctuations in the quality of the gas have become more volatile;

(c) there is a significant capability within the existing operations of the Producers to manipulate the quality of the gas to be supplied to the DBNGP;

(d) it was prudent for Operator, in determining the capacity, capital and non capital costs, and resultant reference tariffs for the Access Arrangement revisions in January 2005 (based on the information that was available at the time), to have assumed an average quality of gas that lay within a smaller envelope than the envelope of the Operating Specification that currently exists under the Access Arrangement and the Standard Shipper Contracts; and

(e) it is prudent for Operator to now change that assumption for the purposes of determining the capacity, capital and non capital costs and resultant reference tariffs for the Access Arrangement revisions, so that gas is now assumed to be delivered into the pipeline at a quality that sits at the outer limit of the permitted gas quality specification. This issue is discussed in more detail later on in this Submission.

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[6] DBP *DBNGP Access Arrangement Submission #49 - Response to Gas Quality Report*, Para 3.32, September 2005

[7] PB Associates report to ERA *Dampier to Bunbury Natural Gas Pipeline Evaluation of the Impact of a Broader Gas Specification* report to ERA 2 November 2005 and

If the DBNGP was an entrepreneurial pipeline of the type described in Section 2.3 above, it is doubtful that DBP would be responding to the circumstances of changing gas specifications and compositions in the way it has indicated in its response to the PB Associates report. That is, in order to safeguard its regulated return on assets, it is of the view that it must opt to use the "*outer limit of the permitted gas quality specification*" in its designs for increased pipeline capacity.

Information provided by DBP would suggest that if DBP acts in the way described by (e) above, and uses the "outer limit of gas quality specification" instead of the current average gas composition that it has encountered post 1 July 2005, the capital cost of its Stage 5 expansion program could increase significantly above a design based on past average gas compositions. Operating costs would also be expected to increase because of the need for additional compressor fuel to transport the lower heating value gas.

If the design uses this "outer limit" but the gas carried turns out to be of higher heating value and contains less inerts than the "outer limit" then the pipeline could be said to be "over-designed" and cost per unit of increased capacity will be higher than it might need to be. This referred to in the report as being the Conservative Approach.

Since the DBNGP is a regulated pipeline, for which tariffs for reference services are based on the concept of recovery of the cost of providing a service, then, provided the regulator, or the Shippers, as the case may be, accept that the costs are reasonable, Shippers will be required to pay the higher incremental tariff referred to in the preceding paragraph even though the pipeline expansion could be said to be "over-designed".

Conversely, if DBP chooses a high quality gas specification/composition and lower quality gas is shipped, then the pipeline's increased capacity will be "under-designed" and DBP will not have the pipeline capacity to sell as a firm service and will incur penalties; and the incremental tariffs will not result in cost recovery – a double loss.

This is DBP's dilemma.

4 ECONOMIC EFFICIENCIES AND RISK SHARING

A natural gas pipeline firm can be simply described as a general purpose trucking company, in that it is generally indifferent to what it carries, provided the load "fits on the truck" (gas specification) and its transport does not disadvantage others whose loads are being carried (co-mingling). The pipeline firm must, however, be able to operate in a commercial regime that recognises that each participant in a value chain should be required to take account of, and be rewarded for, the risks it can manage and should not have to take account of risks it cannot manage and should not be penalised for its inability to manage those risks.

If a gas pipeline firm has to accept risks it cannot manage, then the process is, firstly, economically inefficient and secondly, inequitable, unless the pipeline firm is compensated for bearing the risk.

The most economically efficient, or optimised solution, will be one that should result in lowest cost to Shippers, will minimise capital and operating costs and will be such that the party best placed to manage a particular risk will take on that risk.

The most economically efficient solution – that is, one that should result in lowest cost to Shippers and minimise capital and operating costs – will recognise that:

- Shippers (and hence Producers) have control over the composition of the gas within a very broad envelope;
- The pipeline has no control over the gas composition except outside a very broad envelope and that control can only be exercised by termination of services;
- Gas composition has a direct effect on pipeline capacity;
- The Shippers want the lowest priced, most reliable and most flexible service;
- In a cost of service regulated regime with no provisions for the pipeline to take a risk in exchange for a reward, the pipeline must be assured of a predictable revenue stream to support the investment required for capital expansion (particularly where a high level of debt is required); and
- Shareholders and debt providers for the pipeline must be assured that their scarce capital is being applied efficiently.

Using the approach of "those best placed to manage the risk, take the risk", the most economically efficient result should have these hallmarks:

(a) A pipeline and its associated equipment should be designed to meet the firm capacity requirements of its Shippers based on:

(i) The most likely gas composition forecast by the Shippers for each year of the life of a gas transportation agreement

(ii) Duplication of critical components, such as compressor units, such that the ability of the pipeline to deliver firm capacity is not reduced below the contractually guaranteed firm service reliability figure in the event of the failure of some critical components

(b) Commercial conditions in a gas transportation contract that recognise that:

(i) Firm capacity is a function of gas composition and deviations from the design basis composition will result in changes to firm capacity available to Shippers;

(ii) Such changes in firm capacity are not under the control of the pipeline operator and hence should attract no commercial penalty for the operator;

(iii) Gains or losses in capacity that result from variations in gas quality should be pro-rated among all Shippers based on their contracted firm capacity or alternatively the tariff can be adjusted[8];

(iv) Any Shipper must be subject to mandatory physical curtailment of over-runs if its actions affect either other Shippers' ability to secure their contracted capacity or affect the optimum operation of the pipeline. Any curtailments must be applied at the absolute discretion of the pipeline (without acceptance of liability) provided a Shipper is given adequate notice to mend its ways; and

(v) Shippers will have to pay any costs associated with the need for the operator to install new systems and to employ more staff to be able to manage any changes in the composition of the gas.

(c) The pipeline operator is protected from changes of gas composition – that is, changes to its pipeline's capacity over which it has no control;

Unfortunately, this approach is not able to be applied to the DBNGP because:

- Shippers are of the view that capacity must always be available[9] – they are risk averse
- Management of the allocation of variable capacity is difficult technically and commercially
- Quality of gas and hence pipeline capacity is controlled by the presence or absence of LPG and legacy contracts allocate capacity that results from the presence of LPG to one Shipper.

As a result, Kimber Consultants has been limited to the detailed consideration of two conservative approaches (see Section 5) where DBP takes little or no risk in respect of capacity and Shippers are guaranteed the availability of their booked capacity if gas quality falls to minimum levels. However, for completeness, this report includes a description of an optimised approach – see Section 5.4

[8] Refer to the practices adopted by APT in its gas transportation agreements

[9] The SSC provides a requirement that DBP must provide capacity for not less than 98% of the time, or suffer financial penalty, except where it is prevented from doing so by *force majeure* events or for major works (defined by SCC).

5 SOLUTIONS

As described in Section 4, there is a need to understand the distribution of risk along a value chain from Producer to end user, and to determine which party in the value chain manages risks or delegates risk management (at its cost) to another party in the value chain. Section 4 also explains that an optimised solution to the DBP's dilemma assigns capacity risk to the Shippers is not available to DBP or its Shippers because of the provisions of legacy contracts. This Section 5 proposes two conservative solutions, which are likely to result in increased costs to Shippers (compared to the optimised solution) – that is, they pay the pipeline to manage a risk it cannot control.

There are many possible solutions to DBP's dilemma in selection of the most appropriate gas composition for the design of the Stage 5 Expansion described in Section 3, but following discussions with Producers and future Producers (NWSGJV, Apache, BHP Billiton Petroleum, Chevron), major Shippers (Alcoa, Western Power, CSBP), the Economic Regulation Authority, DBP and Alinta Network Services, and the development of an understanding of the effects that legacy contracts have on capacity, Kimber Consultants has limited the options to two, described as the Very Conservative Approach and the Conservative Approach. Nevertheless, an optimised approach has been included in this section, for completeness.

5.1 Long term gas quality

Prior to discussing the two approaches, it is worthwhile describing the generic results of the data gathering carried out by Kimber Consultants in respect of the long term quality expectations for gas supplied from the north west. Paradoxically, the results indicate that average gas quality will remain quite high and that there is a relatively low probability of receiving gas into the DBNGP with a heating value of around 37 – 38 MJ/m^3, or with up to 7% inerts, except perhaps during some short term plant or field upset. This means that both the conservative approaches will result in an over-designed pipeline for the majority of time (that is, it will have capacity in excess of firm contracted capacity). The conservative approaches will result in more reliable capacity and perhaps provide greater opportunity for interruptible capacity.

The optimised approach creates greater risk to supply security, particularly for those Shippers that have contracted for a combination of firm and interruptible capacity to meet their needs. No Shipper, other than those with legacy contracts, gains any benefit from increases of capacity due to the presence of LPG in the gas stream. LPG in the gas stream is primarily responsible for increases in heating value above 37.7 MJ/m^3.

Long term forecasts provided by several Producers and extrapolation of others (based on verbal advice) indicate that the combined gas flows in the vicinity of CS2 are likely to have the following characteristics:

Characteristic	Minimum	Maximum	Approx. Average over 10 years
Higher Heating Value (MJ/m^3)	38.0	39.5	38.5
Total Inerts (mole%)	3.5	6.5	5.0
LPG (t/TJ)	0.7	1.0	0.8

Table 1 Estimated long term characteristics of gas to be delivered into the DBNGP

Note: All evidence points to the fact that modest quantities of ethane (6 – 8 Mole%) will remain in the domestic gas sales stream from all the major sources. No Producer gave any indication that ethane extraction was contemplated. This will have the effect of enhancing the heating value without triggering the LPG capacity provisions in legacy contracts.

The Producers have provided information on predicted gas compositions to Kimber Consultants in good faith and Kimber Consultants has no reason to doubt the veracity of that information. Table 1 shows that the quality of gas supplied to the DBNGP for transport will continue to exceed the ERA AA Specification by a significant margin.

5.2 Very conservative approach

The approach uses a gas composition that has been derived to just meet the ERA AA Specification shown in Table 2.

Component		Inlet Points and Outlet Points
Maximum carbon dioxide (mol %)		4
Maximum inert gases (mol %)		7
Minimum higher heating value (MJ/m^3)		37
Maximum higher heating value (MJ/m^3)		42.3
Minimum Wobbe Index		46.5
Maximum Wobbe Index		51
Maximum total sulphur (mg/m^3)	Unodorised Gas	10
Maximum total sulphur (mg/m^3)	Odorised Gas	20
Maximum Hydrogen Sulphide (mg/m^3)		2
Maximum Oxygen (mol %)		0.2
Maximum Water (mg/m^3)		48
Hydrocarbon dewpoint over the pressure range 2.5 to 8.72 MPa absolute		Below 0°C
Maximum radioactive components (Bq/m^3)		600
Minimum Extractable LPGs (t/TJ)		0

Table 2 Gas specification as defined in Item 1 in Schedule 3 in DBNGP Final Access Arrangement of 2 November 2005 Source: Western Australian Economic Regulation Authority

Table 3 shows the derived composition.

Component	ERA AA Composition
Methane	87.850
Ethane	5.756
Propane	0.000
Iso-Butane	0.000
N-Butane	0.000
Iso-Pentane	0.000
N-Pentane	0.000
Hexane	0.000
Heptane	0.000
Octane	0.000
N_2	2.394
CO_2	4.000
Total	100.000
Derived Values	
HHV (MJ/m^3)	37.0
WI (MJ/m^3)	46.5
LPG (t/TJ)	0
Inerts (%)	6.39%

Table 3 Typical gas composition that just meets broadest specification referred to in Table 2

The quality of the gas chosen for this approach will ensure that the expanded DBNGP will be able to provide T1 capacity at all times, (except in plant or field upset conditions when the heating value of the entire gas stream passing CS2 has a heating value of less than 37 MJ/m^3 and where DBP opts to accept gas that does not meet the minimum requirements set by the ERA AA Specification (Table 2), or where the ERA subsequently amends the AA Specification to an even broader specification). Hence the term "very conservative approach" is used in the light of evidence collected by Kimber Consultants and summarised in Section 5.1 that indicates that there is a small probability of receipt of gas of this quality, and, indeed, if such lower quality gas is supplied to the pipeline, then its supply should be terminated.

It is also doubtful whether any gas supplier will run its gas processing plant such that there is no margin for error in controlling the heating value (or level of inerts) of its processed gas. So one might expect that if the aim is to produce gas with a heating value of >37.0 MJ/m^3, the controlling point would be at around 37.5 MJ/m^3. In addition, given that the raw gas contains significant quantities of ethane, and there are no plans to remove it, the heating value of the processed gas (nett of any LPGs) will continue to exceed 37.7 MJ/m^3.

The Very Conservative Approach is DBP's preferred approach, on the basis that it allows DBP to ensure that no Shipper will suffer a shortfall of firm contracted capacity even when the gas is at the minimum quality level. As a result, Shippers will be required to pay a premium (i.e. a higher tariff than that which would apply if a more probable gas composition was used) to have DBP manage their risk of gas quality.

5.3 Conservative approach

The gas composition used in the Conservative Approach has been derived from as much information as the Producers are prepared to release to Kimber Consultants (see Section 6) in respect of the development of gas fields and the operation of processing plants and adjusted to reflect an understanding of the legacy, contractual[10], commercial and technical drivers that lead to a conclusion that ;

(a) most or all LPG will be removed from the gas by the Producers as is permitted by the specification described in the ERA AA Specification (See Table 2), but levels of inerts (carbon dioxide and nitrogen) do not approach the levels permitted by that specification;

(b) modest amounts of ethane (6 – 8 Mole%) will remain in the gas and enhance the heating value; and

(c) any additional capacity that results from LPG in the gas will only be available to Shippers whose delivery points are north of Kwinana Junction (about 90%? of the South West WA gas market is south of the Kwinana Junction).

The characteristics of the gas for the Conservative Approach for the design of Stage 5 Expansion are set out in Table 4. It has been assumed that all LPG has been removed and the inert levels are set at around 5%. This composition has been nominated the "Recommended Design Gas Composition"

[10] Existing contractual obligations related to the operation of the Wesfarmers LPG plant at Kwinana result in any capacity resulting from the presence of LPG in the DBNGP gas stream causing a corresponding increase in DBP's capacity obligations.

Component	Mole%
Methane	88.396
Ethane	6.554
Propane	0.000
Iso-Butane	0.000
N-Butane	0.000
Iso-Pentane	0.000
N-Pentane	0.000
Hexane	0.000
Heptane	0.000
Octane	0.000
N2	3.190
CO2	1.860
Total	100.000
Derived Values	
HHV (MJ/m^3)	37.7
WI (MJ/m^3)	47.9
LPG (t/TJ)	0.00
Inerts (%)	5.05%

Table 4 Recommended Design Gas Composition for Stage 5 Expansion Design

5.3.1 Application of conservative approach

Kimber Consultants recommends that DBP should adopt a pipeline design that is based on a gas composition implied in the Recommended Design Gas Composition as shown in Table 4, which has a combination of the lowest expected heating value, a low Wobbe index, no LPG and modest levels of inerts.

This approach implies that the pipeline manages the risk of reduced capacity when low quality gas is presented to the pipeline by Shippers by having a design capacity that will always exceed the contracted capacity except when the gas quality reaches a heating value less than 37.7 MJ/m^3. The gas quality requirements of the current SSC will require alteration from the current value for inlet gas of a minimum heating value of 37.3 MJ/m^3 to 37.7 MJ/m^3.

If this option is chosen, Shippers must understand that their firm capacity entitlements WILL BE REDUCED if the heating value of the gas presented for transport in the DBNGP is less than that of the Recommended Design Gas Composition, namely, 37.7 MJ/m^3.

This method will allocate all the risk of availability of capacity to the pipeline, but the Shippers will pay the pipeline for this service to manage risk. That is, the cost per unit of gas transported will be higher that the Optimised price described in Section 5.4 below. However, this may be counter-balanced by a “reward’ in the form of interruptible capacity for some of the Shippers, if they present gas of better quality than the Recommended Design Gas Composition to the pipeline. This design will result in higher capital and operating costs than the optimised design referred to in Section 5.4 and will have these characteristics:

(a) The pipeline and its associated equipment should be designed to meet the firm capacity requirements of its Shippers based on:

(i) The gas composition (“Recommended Design Gas Composition”) as determined by a composition - Table 4 – that just exceeds the ERA AA Specification as shown in Table 2; and

(ii) Duplication of critical components, such as compressor units, and based on DBP's established probabilistic approach, such that the ability of the pipeline to deliver firm capacity is not reduced below the contractually guaranteed firm service reliability figure in the event of the failure of critical components,

(b) Commercial conditions in a gas transportation contract that recognise that the pipeline takes the risk on the availability of contracted capacity provided the gas presented by the Shippers meets at least the Recommended Design Gas Composition and will be penalised if capacity is unavailable, after taking into account force majeure events and events caused by the Shipper and Major Works (i.e. as per the current SSC);

(c) The pipeline operator is protected from reductions in gas quality beyond the Recommended Design Gas Composition – that is, it has already invested in capital equipment that guarantee the availability of capacity at that composition (leaving aside the temperature effects that are already in place)

(d) If any Shipper behaves irresponsibly in the use of either its Firm Service or the As Available capacity, then that Shipper must be subject to mandatory physical curtailment of over-runs if its actions affect either other Shippers' ability to secure their contracted capacity or affect the optimum operation of the pipeline. Any curtailments must be applied at the absolute discretion of the pipeline (without acceptance of liability) provided a Shipper is given adequate notice to mend its ways.

5.4 Optimised approach – median composition

If the owner of a pipeline and the stakeholders in the pipeline are able to agree on a gas composition (referred to as a "Median Composition"), then DBP could base a design for the Stage 5 Expansion and develop what might be termed "Median Composition Tariffs" for each of its services, but more specifically for T1 service. If the actual composition in any period (as short as a day, depending upon the performance of compositional analysis and capacity modelling) deviates from this Median Composition, then adjustments can be made to the capacity held by Shippers.

The most economically efficient, or optimised solution, will be one that should result in lowest cost to Shippers, will minimise capital and operating costs and will be such that the party best placed to manage a particular risk will take on that risk.

This approach relies upon stakeholders agreeing to a Median Gas Composition – one that best represents the medium to long term characteristics of the gas to be produced by the Producers on the North West Shelf and presented by the Shippers to the DBNGP for transport to end users. The Median Gas Composition could be used to design the Stage 5 Expansion and retrospectively review the current pipeline design. This would result in a definition of capital and operating costs that, when combined with capacity bookings will result in an optimised transport tariff.

Capacity is to be defined by a particular gas composition and since the Shippers (Producers) define gas composition, any variations in capacity are to the account of the Shippers. If the gas presented by Shippers on a day to day basis is "better" than the Median Gas Composition then their available firm capacity is increased at no extra cost for such time as the higher quality gas is presented. However, if the gas is "worse" than the Median Gas Composition, then capacity is forfeited for such time as the low quality gas is presented for transport.

This process is not without precedent. Other pipeline owners in Australia adjust contracted capacity or tariffs based on heating value. For example, the Access Arrangement for APT's Carpentaria Pipeline (Ballera to Mt Isa) contains a provision that adjusts the pipeline's capacity and hence Shippers' contracted capacity in response to changes to heating value. Gas transportation contracts for APT's Roma to Brisbane Pipeline contain a formula that adjusts the tariff according to the heating value of the Shipper's gas.

This approach may well be very beneficial to those Shippers that can forecast their requirements of additional capacity, which can then be secured for no additional transport cost by improving the quality of the gas they present for transport.

However, Kimber Consultants has become aware of certain legacy contractual arrangements that attribute capacity increases that result from the presence of LPG in the gas stream to one Shipper. The benefits of higher capacity downstream of Kwinana Junction (the majority of the gas market) resulting from richer gas streams submitted to the pipeline by Shippers, other than the one for whom special arrangements apply, do not provide those Shippers with any increases in capacity. Thus the concept of the use of a Median Gas Composition does not distribute benefits equitably and could result in capacity shortfalls for most Shippers if the gas quality approaches the ERA AA Specification.

As a result of this anomaly, Kimber Consultants is of the view that the use of the Median Gas Composition approach would be inappropriate for most Shippers and DBP and recommends the conservative approach described in Section 5.3 that uses the Recommended Design Gas Composition.

5.4.1 Median gas composition at CS1

Kimber Consultants has examined the data provided by gas Producers and estimates of quantities from each supplier (including back haul) and has arrived at an arbitrary composition that Kimber Consultants has assessed as being typical of the gas in the pipeline downstream of CS1 in future years. It is not representative of any one year, but should provide the basis for a pipeline design the results in an ability for the pipeline to deliver contracted capacity if the gas in the pipeline meets this Median Gas Composition. The proposed Median Gas Composition is set out in Table 5.

Component	%mole
Methane	88.39
Ethane	5.52
Propane	1.22
Iso-Butane	0.11
N-Butane	0.19
Iso-Pentane	0.06
N-Pentane	0.02
Hexane	0.01
Heptane	0.00
Octane	0.00
N2	1.95
CO2	2.53
Total	100.00
Derived Values	
HHV (MJ/kg)	49.95
SG	0.63
HHV (MJ/m3)	38.70
Wobbe (MJ/m3)	48.61
LPG (t/TJ)	0.85
Inerts (%)	4.5%
CO2 (%)	2.5%

Table 5 Proposed Median Gas Composition downstream of CS1

5.4.2 Median composition downstream of CS2

Based on information provided, Kimber Consultants had not taken into account any gas supplies received into the DBNGP at CS2 because of the small and declining quantities of sales quality gas available from the current fields and the unacceptable quality of gas from the Macedon field[11] (HHV 35.7 MJ/m^3). As a result, Kimber Consultants has not used gas from the Tubridgi Pipeline in deriving the Median composition.

5.5 Summary of proposed compositions and their derivation

Alinta Network Services has carried out an analysis of characteristics of recent gas flows and the Kimber Consultants' proposed approaches – Very Conservative, Conservative and Optimised – and compared them in a blending model. The results are shown in Table 6.

Component	Stg4 2008 Forecast Gas	Nov 2005 Actual Blended Gas with LPG	Resulting Blended Gas without LPG (Note 2)	Median Gas (Note 3)	ERA AA Spec. (Note 1)
Methane	86.570	86.890	88.396	88.390	87.850
Ethane	7.069	6.453	6.554	5.520	5.756
Propane	1.295	1.370	0.000	1.220	0.000
Iso-Butane	0.185	0.102	0.000	0.110	0.000
N-Butane	0.272	0.148	0.000	0.190	0.000
Iso-Pentane	0.048	0.025	0.000	0.060	0.000
N-Pentane	0.036	0.023	0.000	0.020	0.000
Hexane	0.010	0.017	0.000	0.010	0.000
Heptane	0.000	0.000	0.000	0.000	0.000
Octane	0.000	0.000	0.000	0.000	0.000
N2	2.281	3.154	3.190	1.950	2.394
CO2	2.234	1.818	1.860	2.530	4.000
Total		100.000	100.000	100.000	100.000
Compositions in Mole%					
DERIVED VALUES					
HHV (MJ/m3)	39.315	38.802	37.734	38.700	37.000
WI (MJ/m3)	49.015	48.615	47.940	48.610	46.500
LPG (t/TJ)	0.98	0.87	0.00	0.85	0.00
Inerts (%)	4.51%	4.97%	5.05%	4.50%	6.39%

Note 1: Approximates ERA AA Specification and represents the "Very Conservative Approach"

Note 2: Recommended Gas Composition and represents the "Conservative Approach"

Note 3: Median Gas Composition and represents the "Optimised Approach"

Table 6 Gas Compositions of the three approaches described in Section 5

[11] BHP Billiton Petroleum made a public submission on 28 October 2005 to the NCC on the revocation of coverage of the Tubridgi Pipeline in which it stated: *The Macedon Gas Field is situated in the Exmouth sub-basin and is held in joint venture by BHP Billiton Petroleum (Australia) Pty Ltd (71.43%) and Apache Northwest Pty Ltd (28.57%). The field contains dry gas which does not meet the current DBNGP specification. In the event that the ERA widens the DBNGP gas specification to the specification contained in its draft decision, Macedon Gas will still not meet* [Kimber Consultants underline] *the minimum Heating Value requirement and will just meet the minimum Wobbe Index requirement. The minimum Heating Value would need to be widened further to enable Macedon Gas to be commercialised.*

5.6 ERA view of link between low spec. gas and higher tariffs

During meetings between ERA and Kimber Consultants, a senior ERA representative made it quite clear that ERA recognised that if the gas quality falls to the ERA AA specification and the DBNGP's capacity and tariffs have been based on a higher quality gas, then Shippers with reference services will be required to pay a higher tariff because of the need for additional capital expenditure and higher operating costs to transport Shippers' contracted capacity.

However, the ERA senior representative agreed with the Producers' submissions on the matter of gas specification in so far as the lower quality specification would result in additional gas being made available to market which would force gas prices lower and thus more than make up for the higher transport costs.

Based on its discussions with the stakeholders, Kimber Consultants cannot accept this latter reasoning, since

(a) there is little competitive tension for domestic gas sales from the North West Shelf;

(b) the current Producers are price-makers;

(c) for the large Producers and potential Producers the high netback price and a robust international market for LNG strongly influences the domestic price;

(d) there is a high degree of cross-ownership in the existing and planned gas producing fields;

(e) there is a concentration of ownership in gas processing facilities; and

(f) the high per unit cost of development of small off-shore fields makes them uneconomic to be developed by small independent operators, which, for onshore gas fields, such as coal seam gas in Queensland, provide sources of low priced gas in competition with the major Producers.

As a result of ERA's decision to broaden the gas specification, pipeline tariffs will increase and hence delivered gas prices are likely to rise in the South West of Western Australia.

6 INFORMATION GATHERING – GAS SUPPLIES

In respect of gas supplies into the DBNGP, Kimber Consultants has been given access (on a confidential basis) to the following:

(a) North West Shelf Gas's (NWSG) planned domestic gas production data for the period from 2005 to 2010 expressed in total tonnes per day with compositional data also expressed in tonnes per day for C_1, C_2, C_3, C_4, C_5+, CO_2 and N_2. This information has been converted to TJ/day and mole% and entered into a gas blending model provided to Kimber Consultants by Alinta Network Services via DBP. The model blends NWSG input with other gas supplies entering the DBNGP at CS1 and CS2 to produce a compositional data of the blended gas streams downstream of CS1 and CS2. In this way, the data provided by NWSG (and other Producers) can remain confidential.

(b) Apache's planned gas production from gas fields such as John Brookes, Wonich, East Spar, Harriet to supply southwest customers and for backhaul to customers on the Burrup Peninsula and to other pipelines that originate in the vicinity of Dampier. Apache's gas is received in the DBNGP at the downstream side of CS1.

(c) BHP-Billiton Petroleum's planned production from its Griffin and adjacent gas fields which is received into the DBNGP at the downstream side of CS2. The prospects for supply from its Macedon field were also addressed.

(d) Chevron's planned development of the Greater Gorgon gas fields (particularly Gorgon and Jansz) for domestic gas production which will be received into the DBNGP in about 2012 – most information was derived from the *Draft Environmental Impact Statement/ Environmental Review and Management Programme for the Proposed Gorgon Development*, dated September 2005

Figure 1 shows the locations of the gas (and oil) fields mentioned above in Western Australia's North West Shelf hydrocarbon province.

All Producers agreed that the commercially rational approach for them was to:

- Minimise processing cost with a potential to increase the level of inerts
- Minimise the amount of LPG in the gas stream if an alternative market for the LPG was available and it was economical to remove the LPG

These actions have to be consistent with the gas field well-head compositions and sales gas specifications.

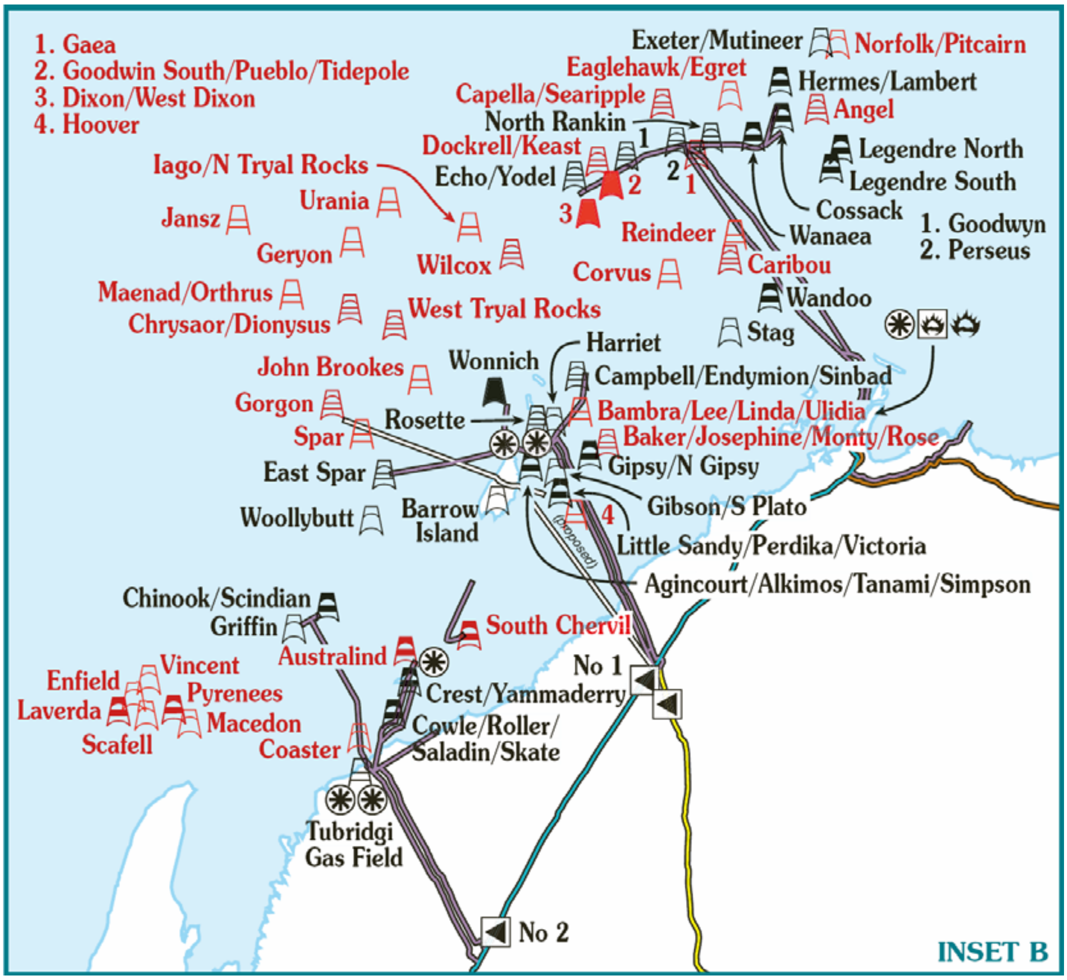

Figure 1 Locations of the various gas fields that supply sales gas into the DBNGP

Source: Western Australian Office of Energy Resources & Gas Infrastructure Map 2004

6.1 North West Shelf Gas

The information supplied by North West Shelf Gas (NWSG) is confidential and cannot be separately shown in this report. NWSG provided information on predicted gas compositions to 2010 and postulated a typical range of compositions for subsequent years, but advised that there was some uncertainty associated with the figures for later years.

6.2 Gorgon

Information received from Chevron, the developers and operators of the Gorgon project was limited to that which was contained in the Draft Public Environmental Impact Statement[12] (EIS) and the WA Government's *Barrow Island Act 2003*.

The EIS provided the raw gas specification for the two main gas fields to be developed for the Gorgon project (See Draft EIS, Table 6.1 Feed Gas and Product Gas Compositions). These are summarised in Table 7.

[12] Chevron Australia, *Draft Environmental Impact Statement/ Environmental Review and Management Programme for the Proposed Gorgon Development*, September 2005

Component	Gorgon	Jansz
CO2	14–15 volume%	0.28 volume%
N2	2–3 volume%	2.35 volume%
Methane	76.71	91.48
Ethane	3.23	3.75
Propane	0.89	1.06
Butane	0.3	0.41
Pentane +	0.13	0.63

Table 7 Gorgon development – raw gas composition

The Barrow Island Act requires the Gorgon developers to provide up to 300 TJ/day of gas to the domestic market from the beginning of 2013, but the customers for that gas have not been defined – they may be in the Pilbara or the South West, so it is not known whether the gas will be shipped by the DBNGP and in what manner. For the purposes of this report, Kimber Consultants has assumed that the gas will be used in the South West. Kimber Consultants used the Alinta Network Services compositional model to derive an assumed gas composition for domestic gas sales from the Gorgon development with gas derived from both the Gorgon and Jansz gas fields. This is shown in Table 8.

Component	Gorgon Raw Gas	Gorgon Domgas	Jansz Raw Gas	Jansz Domgas
	%mole	%mole	%mole	%mole
Methane	77.450	87.929	91.500	91.500
Ethane	3.230	3.667	3.750	3.750
Propane	0.890	1.010	1.060	1.060
Iso-Butane	0.100	0.114	0.200	0.200
N-Butane	0.200	0.227	0.210	0.210
Iso-Pentane	0.130	0.148	0.630	0.630
N-Pentane	0.000	0.000	0.000	0.000
Hexane +	0.000	0.000	0.000	0.000
N_2	3.000	3.406	0.300	0.300
CO_2	15.000	3.500	2.350	2.350
Total	100.000	100.000	100.000	100.000
Derived Values				
SG	0.744	0.638	0.626	0.626
HHV (MJ/m^3)	32.804	37.237	39.501	39.501
Wobbe (MJ/m^3)	37.982	46.544	49.865	49.865
LPG (t/TJ)	0.85	0.85	1.25	1.25
Inerts (%)	18.00%	6.91%	2.65%	2.65%
CO2 (%)	15.00%	3.50%	2.35%	2.35%

Table 8 Gorgon Gas – Derived compositional data

The Gorgon EIS, page 109, states that the developers of the Gorgon and adjacent fields do not propose the extraction and sale of LPGs as a separate product stream:

Heavier hydrocarbons (i.e. those heavier than methane) known as liquefied petroleum gas (LPG) (primarily ethane and propane) will be recovered from the gas for use as refrigerant in the liquefaction process for the LNG system.

and

There will be insufficient quantity of LPG in the Gorgon reservoirs to be commercially produced for export. However, an alternative to returning the excess ethane, propane and butanes (collectively referred to as natural gas liquids) to the main process, on a continuous basis, is to store these liquids for blending into a limited number of LNG cargoes to meet the heating value requirements of specific LNG customers.

This alternative requires additional pressurised storage for approximately 6000 m3 of natural gas liquids. This situation is factored into the public risk assessment included in Chapter 14, to be conservative at this early stage of the design.

Kimber Consultants expects that the Jansz field will be exploited early in the development process and that this will enhance the heating value of gas delivered into the DBNGP.

Based on public information available to it, Kimber Consultants concludes that it likely that LPGs will be left in the domestic gas stream from the Gorgon development, which is to enter the DBNGP at CS1.

6.3 BHP Billiton Petroleum – Griffin and Macedon

BHP Billiton Petroleum is the owner of the on-shore pipelines to CS2 on the DBNGP (Tubridgi Pipeline and Griffin Pipeline) and has recently asked the National Competition Council to revoke coverage on those pipelines. Its request for revocation provides useful information as to the future plans for closure of the Griffin field and development of other fields in the area. Briefly, it would seem that the Griffin field will probably cease production within the next 6 – 8 years and that Macedon gas is of such a low quality (see Table 9), that it could only enter the market if blending services were available.

Component	Mole%
Methane	93.85
Ethane	0.41
Propane	0.01
Octanes plus	0.01
Nitrogen	5.34
Carbon Dioxide	0.38
Total Inerts	5.72
Derived Values	
Heating Value (MJ/m^3)	35.68
Wobbe Index (MJ/m^3)	46.77
LPG Content (t/TJ)	0.012

Table 9 Macedon – Raw gas composition[13]

6.4 Apache

Apache, with the assistance of its joint venture partner, Santos, provided very detailed information on a confidential basis. This information took the form of the most likely sales gas composition and quantities of gas to be delivered in the DBNGP at CS1 on an annual basis for the next 25 years.

Kimber Consultants has concluded that, at this time, there appears to be insufficient LPG in the gas fields to make it economic for the operators to extract as a separate sales stream for export or local use. This would suggest that some LPGs will remain in the sales gas stream in the medium to long term. Note that this is Kimber Consultants' view and it was not endorsed by Apache nor any of the other Producers or potential Producers.

[13] Source: BHP Billiton Petroleum, *Request to NCC for revocation of coverage on Tubridgi and Griffin pipelines* 28 October 2005

7 INFORMATION GATHERING – GAS DEMANDS

In respect of gas demands on the DBNGP, Kimber Consultants has been given access (mostly on a confidential basis) to the following:

(a) Alcoa's gas demand forecasts, including gas supply sources and delivery points for the years 2006 to 2008 inclusive

(b) CSBP & AGR gas demand forecasts, including gas supply sources and delivery points

Unfortunately, and despite agreement to respect confidentiality, Kimber Consultants was unable to get gas demand information from:

(a) Western Power

(b) Alinta

7.1 Alcoa

Cannot be disclosed in this report

7.2 Western Power

No information received

7.3 Alinta

Kimber Consultants had several telephone conferences with a representative of Alinta Power Services (in the absence of a senior representative of Alinta Sales) and discussed Alinta Sales' rights in respect of entrained LPG, which is then extracted by the Wesfarmers LPG plant at Kwinana.

Kimber Consultants gained some useful insights to the operation of these legacy contracts in respect of their influence on contractual access to pipeline capacity.

7.4 CSBP and AGR

Information received, but cannot be included in this report, except to mention that both CSBP and AGR will both suffer losses of production efficiency and excess use of reagents in circumstances where their gas feedstock contains higher proportions of carbon dioxide and nitrogen. These aspects were referred to in submissions made to ERA.[14] In which it said:

CSBP reiterates its position outlined in its submissions to the ERA dated 14 March 2005 and 26 May 2005 that draft amendment 15 should be withdrawn as it does not take sufficient account of the legitimate interests of all stakeholders, in particular Shippers and users of the gas (who may be Shippers or Shippers' customers), and could potentially cause CSBP's existing commercial contracts to be overridden or breached.

In its submission on 14 March 2005, CSBP stated, *inter alia*:

CSBP uses natural gas as the major process feedstock in the production of ammonia, an important input to downstream fertiliser and chemical processing in Western Australia. The introduction of lower quality gas into the DBNGP would have the potential to adversely impact the quality of gas delivered to CSBP at its DBNGP Delivery Point (outlet point) which would have a negative impact on the production capacity and energy efficiency of CSBP's ammonia plant, and which in turn would increase CSBP's ammonia production cost.

[14] CSBP, submission to ERA entitled "Report on capacity impact of broader gas specification" Dated 2 November 2005

This would have the potential to cause consequent cost increases to downstream users, most of which compete in export markets.

CSBP, appointed by Australian Gold Reagents (“AGR”)2 as the operator of AGR’s sodium cyanide production facilities, uses natural gas as a critical process feedstock in the production of sodium cyanide, an important reagent used by the gold industry. The introduction of lower quality gas into the DBNGP would have the potential to adversely impact the quality of gas delivered to AGR at its DBNGP Delivery Point (outlet point) which would add significant costs to the manufacture of sodium cyanide which could in turn have negative impacts on the costs of the domestic gold industry. AGR is also a significant exporter of sodium cyanide and any such increased costs could have a major negative impact on AGR’s ability to compete in a highly competitive international market.

CSBP and AGR reiterated their concerns about the lower gas quality to Kimber Consultants during our meetings.

8 INFORMATION GATHERING REGULATORY & GOVERNMENT

ERA provided access for Kimber Consultants to discuss with PB Associates its report on the effect of the implementation of a broader gas specification[15] and its response[16] to comments made on its report, but not specific access to the gas production data on which PB Associates based its conclusions. Some of the views expressed by staff members of ERA at meetings and telephone conversations are reported elsewhere in this report.

[15] PB Associates (Venton), *Dampier to Bunbury natural gas pipeline – Evaluation of the impact of a broader gas specification*, 22 August 2005

[16] PB Associates (Venton), *Dampier to Bunbury natural gas pipeline – Evaluation of the impact of a broader gas specification Response to Comments made on PB's Report*, 2 November 2005

9 APPENDICES

9.1 Terms of reference from DBP

DBNGP (WA) Transmission Pty Ltd (DBP), the Operator of the DBNGP, is leading an initiative to consult and reach a consensus view with key Industry participants - Shippers, Producers and the Regulator (the ERA) - on the most appropriate gas composition to use in the determination of DBNGP capacity and services to be delivered from the DBNGP.

9.1.1 The key imperatives for this initiative are:

- The declining HHV and Wobbe Index and greater variability in gas specification generally experienced since July 2005 is impacting on DBNGP capacity and DBP's ability to meet existing contractual commitments;
- Pressure from Producers and the ERA to lower the range of permissible gas quality to make the DBNGP accessible to a greater range of potential gas field developments;
- Standard Shipper Contract provisions which allow Shippers to propose the delivery of lower quality gas than the Contractual Specification subject to DBP receiving adequate compensation;
- Demand from Shippers and Prospective Shippers for significant new capacity (Stage 5) for delivery between late 2007 and early 2009;
- The need for DBP to be confident that the Stage 5 Expansion Project will be viable and will meet the reasonable requirements of Shippers over the long term;
- The need to carry out FEED work for the Stage 5 Expansion Project over the next 2 to 3 months, with the design gas composition being a key assumption;
- DBP's desire to ensure adequate capital investment to meet contractual obligations without over-investing;
- A need to obtain a long term commitment from the ERA for an appropriate gas specification for use in designing DBNGP facilities, Reference Services and Reference Tariffs – and for the costs associated with Stage 5;
- A need to develop a compensation package (as envisaged by Clause 7.14 of the Standard Shipper Contracts) if a material broadening of gas quality is generally anticipated by industry stakeholders.

Early resolution of the gas specification to be used as the basis of design for future expansions of the DBNGP is a key requirement before DBP can be in a position to commit to the Stage 5 (and future) Expansion Project(s).

9.1.2 Activities required

9.1.2.1 <u>Generally:</u>

- Conduct discussions with Producers and Prospective Producers to obtain their views on gas quality projections for their respective fields; production capabilities; the likely sequencing of field development; their ability to modify gas quality through processing in order to provide a forecast of gas quality trends for up to 20 years;
- Conduct discussions with Shippers and the ERA (including consultant, PB Associates) on their views on gas specification and future demand in order to provide a forecast of required gas quality trends;

- In conjunction with the DBNGP Asset Manager (ANS) examine historic gas quality trends, and consider the influence of short term variability on service reliability;
- Assist Alinta Network Services (“ANS”) in the development of a modelling tool that can be used to predict the most appropriate gas composition;
- Prepare a report that presents the findings suitable for issue to the key participants, DBP’s banks and Owners

9.1.2.2 More specifically:

- Review of submissions to the ERA, and the reports of PB Associates on matters associated with the gas quality;
- Hold discussions with all Producers, Shippers and the ERA to develop a long term view on movements in gas quality at each of the Receipt points;

9.1.2.3 Prepare a report which addresses:

- The range of circumstances which can potentially impact on the gas quality to be transported by the DBNGP in the long term – and hence on capacity and service reliability;
- In aggregated form if necessary, the information provided and views expressed by particular stakeholders or stakeholder groups;
- The supporting arguments for recommending a particular gas specification as the most appropriate basis for the design of Stage 5 and future expansions.

The scope is limited to the technical issues associated with reaching a resolution on gas specification. Technical support will be available from ANS as required, particularly with respect to technical modelling tools.

9.1.3 Timetables

The parties should target for the Consultant providing its preliminary view by 9 December 2005, and a draft report by 16 December 2005, although it is acknowledged that the ability of the Consultant to comply with this timetable will be dependent on other stakeholders providing relevant information to the Consultant.

9.1.4 Confidentiality

It is likely that some of the information sourced from other stakeholders (than DBP and ANS) will be confidential. In relation to the information that is provided or sourced from DBP or ANS, the Consultant will be governed by the confidentiality provisions of the consultancy agreement to be entered into.

In relation to information that is sourced from other interested parties, if the interested party advises the consultant or DBP that the information is confidential, the Consultant must not disclose it to DBP or ANS unless it is sufficiently aggregated with other information that no reasonable person could identify the source of the information.

9.2 Undertaking between DBNGP owners and ACCC

The ACCC summarised the Undertaking between the Owners of the DBNGP and ACCC as follows:

The Consortium (Alinta Limited, Alcoa of Australia Limited and Diversified Utility and Energy Trusts No 1 and No 2) proposed to acquire the Dampier to Bunbury natural gas pipeline (DBNGP). The ACCC expressed concerns at the competitive effects of the proposed acquisition, particularly in electricity generation and gas retailing in Western Australia. The Consortium members and other relevant organisations have offered undertakings which, amongst other things, require:

- settlement of the proceedings before the Gas Review Board within 5 business days of the completion of the acquisition;
- that no person who is a director or secretary or a member of the staff of Alinta or any of its related bodies corporate (other than Alinta Network Services (ANS)) will be involved in commercial negotiations between DBNGP Holdings and other Shippers relating to gas transportation on the DBNGP;
- that Alinta ring fence its activities in relation to ANS so that no member of the marketing staff of Alinta has access to ring fenced information;
- that ANS not discriminate between Shippers in performing its functions as a service provider to EEWAT;
- that the standard Shipper contract includes confidentiality and non-discrimination obligations which are no less favourable to the Shipper than those contained in Schedule 1 to the undertaking;
- that EEWAT comply with the ring fencing obligations imposed on it by section 4 of the Gas Access Code as if Alinta and its related bodies corporate (other than ANS) are Associates of EEWAT;
- that ANS comply with the ring fencing obligations in section 4 of the Gas Access Code, other than the obligations in sections 4.1 (c), (d) and (e), as if it were a Service Provider and as if Alinta and its other related bodies corporate were Associates;
- that EEWAT offers to all prospective Shippers who require a T1 Service, a Standard Shipper Contract that contains capacity expansion rights that are not materially less favourable than the capacity expansion rights contained in any other Shipper contract for a T1 Service;
- that capacity on the DBNGP be expanded between the DOMGAS Dampier Plant Inlet Point and CS10 by not less than 100TJ/d within 5 years of completion of the acquisition;
- that $400 million be invested in connection with the above expansion;
- that the Shippers are dealt with on a fair and non-discriminatory basis; and
- that independent audits on compliance with the undertaking are completed

9.3 Press release by DBP

Media Statement

24 November 2005

DBP Pursuing Early Commitment to Stage 5 Expansion

The Dampier Bunbury Pipeline (DBP) board has authorised expenditure of nearly $1 million for Front End Engineering and Design (FEED) for the proposed Stage 5 expansion of the Dampier to Bunbury Natural Gas Pipeline.

DBP Executive Chairman Stuart Hohnen said the consortium of owners – comprising DUET, Alcoa and Alinta – is pursuing an early commitment to the Stage 5 expansion.

“The Stage 4 expansion has met DBP’s obligation to spend at least $400m on expansion within five years and DBP is very keen to continue to expand the pipeline on commercial terms,“ Mr Hohnen said. “DBP is conscious of the importance of pipeline expansion to the economic development of the south west.”

Mr Hohnen said DBP was currently in discussion with prospective Shippers for significant new demand which would support a further expansion of the pipeline. This new capacity is expected to be required between late 2007 and early 2009, nearly two years ahead of previous expectations.

Initial estimates indicate that costs for the Stage 5 expansion could be up to $1 billion, more than twice that of the current $430 million Stage 4 expansion.

The proposed Stage 5 expansion would provide a significant boost to the Western Australian economy as a substantial construction project as well as providing means of enabling other parts of the WA economy to continue to grow.

Mr Hohnen said that key milestones for a commitment to Stage 5 were to:

- reach agreement with stakeholders on design parameters relating to gas quality;
- finalise the engineering design and costing for the expansion;
- reach agreement with Shippers on potential modifications to contractual terms to ensure adequate compensation;
- obtain support from its bankers for the necessary funding; and
- obtain approval from the Regulator for the additional costs of the expansion, particularly those required to accommodate the changes to gas specifications.

“DBP will be taking a proactive approach to the expansion, working with Shippers, Producers, the Regulator and Government to expedite Stage 5 for the benefit of all,” Mr Hohnen said.

* Dampier Bunbury Pipeline is the trading name of the DBNGP group of companies, ultimately owned by the consortium that purchased the Dampier to Bunbury Natural Gas Pipeline in October 2004. DBP is majority owned by DUET – Diversified Utility and Energy Trusts - with Alcoa and Alinta being minority owners.

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