1 April 1999

EPIC Energy Operation and Maintenance Pty Ltd
25 Conyngham Street
GLENSIDE SA 5065

Attention: Mr. A. Kellett
Manager Business Development

Dear Sir,

Replacement Cost of Moomba to Adelaide Pipeline

GPA Engineering Pty Ltd (GPA) has been requested by EPIC to review and comment upon aspects of EPIC's "Analysis of Optimised Replacement Cost for Pipeline System and Facilities" dated September 1998 (REVISED 20 March, 1999). GPA had previously reviewed and commented on the original September document in much the same format as these comments. It is noted that EPIC's estimates are mainly based on unit cost factors which is a method commonly used in the pipeline industry to establish preliminary cost estimates prior to detail design. In reviewing the EPIC ORC valuation we have assumed that the pipeline information provided in the EPIC report is correct as we have not surveyed the lines nor sized the compressors. Nor have we considered possible costs in interfacing the 15 MPa and 10 MPa systems as we consider the cost of such controls to be absorbed within the unit costs used.

1. Pipelines

Option A

The existing pipeline was based on a design pressure of about 7.5 MPa.

It is common to use unit cost factors which express capital cost in terms of $ per inch diameter per kilometre length. We consider a factor of $18,000 / inch-km to $20,000 / inch-km reasonable for 600# pipelines depending on key variables such as

exchange rates, workload of the pipeline industry and impact of rock, terrain and location.

Option B

The cost estimate for the main line has been based upon a design pressure of a nominal 15 MPa.
The unit factor for such a system can be expected to be about 10% to 15% higher than for a 600# (up to 10 MPa) design because of the additional pipe wall thickness and its impact on material costs, handling and installation.

We therefore consider a factor of $20,000 / inch-km to $22,000 / inch-km reasonable depending on key variables such as exchange rates, workload of the pipeline industry and impact of rock, terrain and location.

The factor has been checked against the costs incurred in constructing the Ballera to Wallumbilla (756km) pipeline for which the unit cost factor has been calculated as $17,700/inch-km. The pipeline was constructed in 1995 / 1996 to similar standards as is proposed in EPIC's estimate and after allowing for Australian inflation of say 3% p.a (average) over 3 years and applying this to 50% of the project (labour) the factor becomes $18,500. Major pipeline projects need to source most of the materials from overseas and these materials are usually traded in US dollars. With the changes in exchange rates between 1995 and the present this would impact further on the unit cost factor, raising it to about $21,500 to $22,000 / inch km. The factor of $22,000 / inch-km for the 900# main line is therefore considered reasonable. This represents an increase of 10% (or more) on the estimate for a 600# pipeline. Whilst the Asian pipe mills do trade in US dollars, one might expect that with the current economic situation, prices may become more competitive and could have an impact of lowering the factor. This impact would only be determined during actual commercial negotiations.

Options C and D

It is considered that a factor of $18,000/inch-km to $20,000/inch-km is reasonable, depending on such variables as exchange rates, workload of the pipeline industry and impact of rock, terrain and location.

Laterals

(a) It is considered that a factor of $18,000 / inch-km to $20,000 / inch-km reasonable for 600# pipelines.
The unit cost used for underwater pipelines is $100,000 / inch-km. This is considered reasonable, based on our knowledge of two of the projects.

(b) 900# pipelines could be expected to be about 10% to 15% more expensive

2. Compression

EPIC uses a figure of $2,000 / kW installed for the 6,000 kW units at Moomba (CS01) and $2,500 for the 2,000 kW units at the halfway point (CS04). GPA considers that such factoring for the smaller units does not represent a true account of costs because:-

- The cost of the centrifugal compressor package ex works per kW is less for large machines and in this instance could range from $1100 / kW for the 6000 kW machine to $2200 / kW for the 2000 kW machine.

- The cost per kW for providing facilities for the larger machines is less per kW than for the smaller machines and in this instance could vary from $900 to $2,100 / kW without taking into account the differences in location between the two sites. Sites such as CS04 would be more expensive due to the need to establish temporary construction facilities and permanent operations infrastructure such as accommodation, access roads, airstrips and telecommunications. These facilities would add many hundreds of thousands of dollars to the installed cost.

On this basis GPA considers that the installed cost of the larger compressors at Moomba (CS01) would be about $2,000 per kW and at CS04 the smaller machines would be about $4,300 per kW.

We would expect the cost of 570 kW reciprocating compressors at Whyte-Yarcowie would be about $4000/kW.

3 Meter Stations

We are not familiar with EPIC's unit cost factor for estimating the capital costs of meter stations.

We have tested this method against known costs for several meter stations and have found wide variances in the unit cost factor. This is probably due to the use of different types of meters, sparing capacity, design pressures, SCADA requirements, filtration etc.

GPA has been involved in preparing detailed estimates of costs for meter stations and a review of these costs shows a range of values between $5,000 and $88,000 per TJ/day.

As the metering is attributed to less than 1.5% of the total cost estimate it is considered any variances in capital cost due to unit factor differences would be of little significance.

4. SCADA/ Communications

We are unsure of how EPIC has determined the estimated cost for the SCADA / telecommunications system. GPA has prepared a scoping estimate based on a high speed communications link which provides for one high speed data channel and up to 24 telephone / fax channels.
GPA's cost estimate for such a system is $6 million. It is therefore considered that EPIC's $7 million is reasonable.

5. Line Pack

GPA has not been provided with sufficient information to determine line pack with any accuracy. However, it is considered that the figures indicated are probably the correct figures in GJ (not TJ) and that the unit cost for gas is probably $2.75 / GJ. The extended figures seem correct and reasonable.

6. Operations and Maintenance Services

We have not considered any alternative means of configuring or estimating the pipelines other than as discussed above.

7. Pipeline Life

GPA has not been provided with any specific information on the integrity of the existing Moomba – Adelaide gas pipeline system.

Whilst experience in Australia covers only about 30 years, much longer experience in the USA can provide an excellent indication of the expected life of a gas pipeline. Some of these lines were constructed in the period 1920 to 1930 and are still in operation.

The keys to pipeline longevity are:

- Quality of design bases.
- Quality of initial pipe and coatings.
- Quality Control of Construction and Testing.
- Quality of operations and maintenance throughout the pipe life.
- Quality of Gas being transported.

In Australia, all pipelines must be licenced by statutory authorities and the licences carry specific conditions. In South Australia the licencing authority requires the licencee to operate and maintain the pipeline and to report on procedures in conformance with specified Codes and Standards.

The Moomba to Adelaide line was designed and installed by a competent US based pipeline contractor. The system has been operated and maintained in accordance with the statutory requirements. The pipeline has been inspected by “intelligent” internal devices as part of the on-going management of the line and results of these surveys have been used for determining necessary repairs to the pipeline. We therefore consider it reasonable to assume that the first four longevity items have been adequately addressed.

The Moomba processing plant provides high quality gas to the pipeline. Contaminants that may cause corrosion such as carbon dioxide and water vapour are maintained at very low levels and the gas is well suited for pipelining.

On the basis that the Moomba to Adelaide pipeline has been and will be operated in a professional manner and that adequate funds are provided for on-going inspection and maintenance, it is reasonable to expect that the pipeline life could be as stated in the EPIC report.

Yours faithfully

Glen J. Parkinson FIEAust. CPEng
Director