NETWORK PLANNING REPORT - P001

SUNBURY (Planning)

March 2007

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Executive Summary

As indicated in VENCorp's Network Planning Report (T001) - Sunbury (Timing), March 2007, the increasing demand along the Sunbury lateral has raised the prospect of the 1,100 kPa minimum pressure obligation at Sunbury being breached within the next five years.

A recent GasNet Compressor Strategy document indicates that a new Centaur dry-seal compressor (Compressor Unit 12) will be installed at the Brooklyn Compressor Station, which is capable of compression from Melbourne to either Geelong or Ballarat. GasNet has advised that this compressor is capable of delivering flows into the Brooklyn-Ballan-Ballarat pipeline equivalent to the two existing Saturn compressors at a higher outlet pressure. Therefore, modelling assumes the use of two Saturn compressors for compression to Ballarat in conjunction with augmentation for Ballarat (300mm Mt Franklin–Ballan pipeline duplication, recommended for completion prior to 2010). With these assumptions, the augmentation to address the Sunbury constraint is required prior to winter 2012.

This report presents a network planning assessment of the available options to solve the identified constraint. Several augmentation options were considered, which include:

- duplicating a section of the Brooklyn-Ballarat pipeline;
- additional compression at the Brooklyn Compressor Station;
- extending the Wollert–Sunbury pipeline;
- installing a new compressor at the start of the Sunbury lateral; and
- duplicating the Sunbury lateral pipeline.

The modelling results conclude that partial duplication of the Sunbury lateral pipeline, from the Brooklyn–Ballarat pipeline to Line Valve 4 on the Sunbury lateral (T062-LV04), using 200 mm diameter pipe, is the preferred option. This augmentation is required prior to winter 2012.

In relation to GasNet's Compressor Strategy Document, VENCorp has undertaken some preliminary modelling of the effects of that document's recommendations on the Principal Transmission System (PTS). Further detailed modelling will be conducted to identify whether there is any scope for system optimisation. This network planning report will be updated to reflect the results.

Introduction

The increasing number of housing developments throughout the Shires of Melton and Bulla has raised the probability that shortfalls in gas deliveries will occur along the Sunbury lateral. Growth in Tariff V (residential) load for this region is approximately 4% pa, which is significantly higher than the State average of 1% pa.

The Sunbury lateral is connected to the Brooklyn-Ballarat pipeline approximately 14 km west of the Brooklyn Compressor Station. Figure 1 shows the Sunbury lateral schematic.

This report presents a:

- revision to the constraint's timing;
- discussion of the options for augmenting the system to solve the Sunbury constraint; and
- detailed assessment of the two different pipe sizes proposed for the Sunbury lateral duplication.

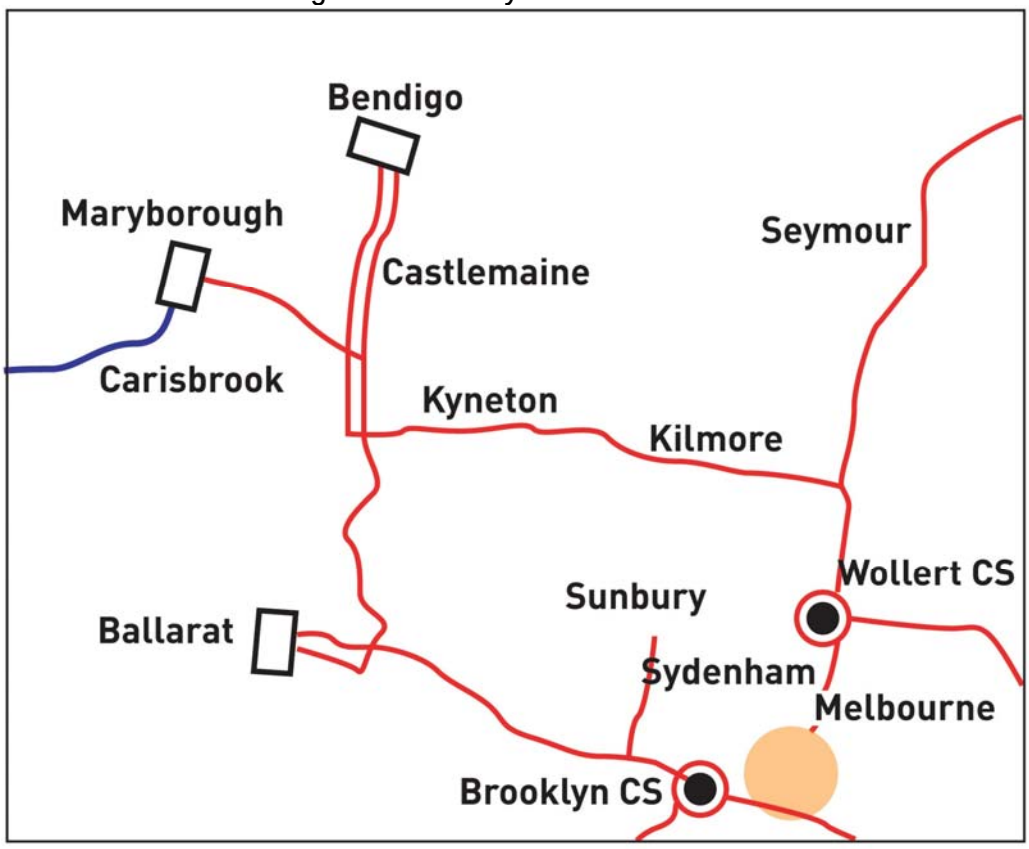
Planning Inputs

Table 1 lists the key planning inputs used in the modelling.

Table 1 - Key planning inputs

Item	Detail
Forecast demand data	Supplied by SP AusNet and 2005 [1] Gas APR
Historical data	Extracted from VENCorp's TADIS database
Modelling software	Gregg Engineering WinFlow version 4.060503.3081 Gregg Engineering WinTran version 4.060505.9089
Model of PTS used	Common Model version 2006
Network Planning Report - T001 Sunbury (Timing)	VENDocs #178590

Figure 1 - Sunbury lateral schematic



[1] The 2005 report represents the latest information available at the time of the analysis. A later review of 2006 demand found that changes in the demand forecasts were minor and have no material impact on the timing and nature of the augmentations.

Constraint Timing

As indicated in VENCorp's Network Planning Report (T001) - Sunbury (Timing), March 2007, the Sunbury constraint was first predicted to occur under 1 in 20 peak day demand within the next five years. Following GasNet's subsequent plan for added compression at Brooklyn (Compressor Unit 12), further modelling was carried out.

Table 2 lists the modelled minimum pressures at Sunbury for scenarios with:

- available compression equivalent to two Saturn compressors to Ballarat (to reflect the added compression at Brooklyn); and
- available compression equivalent to two Saturn compressors to Ballarat and pipeline duplication between Ballan and Mt. Franklin (which has been proposed to maintain minimum pressure obligations at Ballarat (see the Network Planning Report (T002) - Ballarat (Timing), March 2007, for more information).

Results indicate that minimum pressures would be breached at Sunbury in 2010 and 2012, respectively. Breaches in 2010 are addressed by the Mt Franklin-Ballan pipeline duplication. As a result, augmentation to solve the Sunbury constraint is required prior to winter 2012. If the Mt Franklin-Ballan pipeline duplication does not eventuate, this augmentation would need to occur prior to winter 2010.

Table 2 - Forecast Sunbury minimum pressure

Year	2 X 850 kW	2 X 850 kW and Mt Franklin–Ballan duplication
2008	NA	NA
2009	1,804	NA
2010	833	NA
2011		1,332
2012		939

The minimum pressure obligation at Sunbury is 1,100 kPa.

Augmentation Options

The augmentation options for solving the Sunbury constraint include:

- duplicating a section of the Brooklyn-Ballarat pipeline;
- additional compression at the Brooklyn Compressor Station;
- extending the Wollert–Sunbury pipeline;
- installing a new compressor at the start of the Sunbury lateral; and
- duplicating the Sunbury lateral pipeline (up to 24 km).

Discussion

Duplicating a section of the Brooklyn-Ballarat pipeline

This duplication will require a longer length of pipe than the duplication of the Sunbury lateral. This is because all the gas from Brooklyn to Ballarat will need to flow through this pipe, not just the gas to Sunbury.

Additional compression at the Brooklyn Compressor Station

Additional compression will carry on equivalent cost to a Sunbury lateral duplication and will incur annual maintenance and operating costs. It is not the preferred long-term option due to the increased risk of compressor failure resulting from regular starting and stopping.

Extending the Wollert–Sunbury pipeline

This extension will be approximately 30 km longer than the entire Sunbury lateral. The pipeline would be a greenfield development requiring easement acquisition, which could be an issue given urban encroachment by the time of the augmentation.

New compressor at Sunbury

A small compressor at the start of the Sunbury lateral pipeline would be highly effective in increasing the pressure to Sunbury. However, the cost of a new compressor is expected to be much higher than the cost of the Sunbury lateral duplication. In addition, finding a suitable site for such a compressor could be difficult due to the proximity to residential properties and the associated noise pollution issues.

Sunbury lateral pipeline duplication

Duplication of the Sunbury lateral would be highly cost effective in terms of increasing pressure to Sunbury. It would also add a small amount of additional linepack. This lateral pipeline could be duplicated in either 150 mm or 200 mm pipe. This option will be analysed in detail in both 150 mm and 200 mm, with varying lengths of pipeline construction over time.

Assessment

Analysis of the available options suggests duplication of the Sunbury lateral is the most suitable option for solving the Sunbury constraint.

Modelling Methodology

The latest Gregg Engineering model was used, incorporating all the proposed new connection points including the proposed Brooklyn-Lara (Corio) pipeline.

The 1 in 2 and 1 in 20 winter peak day demands for 2007–2018 were established using forecast data provided by SP AusNet together with the system demand forecasts included in the 2005 Gas APR.

Table 3 lists the peak day demands.

Table 3 - 1 in 20 forecast winter peak day demands (TJ)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Sunbury lateral demand	13.4	14.0	14.5	15.0	15.5	16.1	16.6	17.1	17.6	18.2	18.7	19.2

A Sunbury lateral duplication can be installed between line valves or at off-take points (such as at Sydenham). On this basis, there are seven possible sections that can be duplicated. Table 4 lists the sections, ranging in length from approximately 2.2 km to 4.2 km.

Table 4 - Description of Sunbury Lateral loops

Loop	Description	Incremental length (km)
1	Start - LV02	4.106
2	LV02 - LV03	4.215
3	LV03 - Sydenham	3.389
4	Sydenham - LV04	3.208
5	LV04 - LV05	2.228
6	LV05 - Diggers Rest	3.620
7	Diggers Rest - Sunbury	3.256
	Total	24.022

The analysis has determined the most cost effective sequence of duplication. Both 150 mm and 200 mm diameter pipeline has been considered. The modelling also assumes the use of one Saturn compressor at Brooklyn for the purpose of the analysis.

Modelling Assumptions

The modelling assumptions include the following:

- The modelling uses the 1 in 20 peak day demands from the 2005 Gas APR peak day forecast.
- Forecast demand for Sunbury, Diggers Rest and Sydenham is based on hourly peak loads provided by SP AusNet.
- Load at Rockbank is based on SP AusNet's estimates of the load shift from Sydenham due to the connection to the Rockbank City Gate (CG).
- Load at the proposed Plumpton CG is based on SP AusNet's estimates of the load shifted from Sydenham due to this new CG connection.
- Loads as per the VENCorp customer transfer meter (CTM) peak day forecast.
- Hourly demand profiles for Sunbury, Diggers Rest, and Sydenham are based on the actual demands recorded during 10 August, the peak day for 2005 (see Appendix 1).
- Demand profiles are assumed to be the same for Rockbank, Plumpton, and Sydenham.
- Compressor efficiency is assumed to be 67% (Brooklyn) and 70% (Wollert).
- Injection profiles are assumed to be flat.
- Liquefied natural gas (LNG) is used as required to maintain Dandenong CG inlet pressure.
- Full availability of transmission assets is assumed, with no forced outages.
- The maximum compressor power to Ballarat (at the Brooklyn CS) is equivalent to 850 kW.

Results

Table 5 and Table 6 show that:

- 7 loops of 150 mm diameter pipe will provide capacity for winter 2017; and
- 4 loops of 200 mm diameter pipe will provide equivalent capacity.

The optimal solution would be to install 200 mm pipe.

Table 5 - Sunbury minimum pressure with 150 mm duplication (with one Saturn at Brooklyn)

Year	Loops	Minimum Pressure (kPa)	Loops	Minimum Pressure (kPa)
2008	0	484	1	1,281
2009	1	876	2	1,619
2010	1	462	2	1,429
2011	2	1,075	3	1,716
2012	2	633	3	1,495
2013	2	0	3	1,276
2014	3	967	4	1,255
2015	4	963	5	1,180
2016	5	889	6	1,281
2017	6	1,001	7	1,322
2018	6	667	7	1,108

Table 6 - Sunbury minimum pressure with 200 mm duplication (with one Saturn at Brooklyn)

Year	Loops	Minimum Pressure (kPa)	Loops	Minimum Pressure (kPa)
2008	0	501	1	1,440
2009	1	1,086	2	1,904
2010	1	743	2	1,742
2011	1	0	2	1,490
2012	1	0	2	1,200
2013	2	884	3	1,824
2014	2	414	3	1,660
2015	2	0	3	1,480
2016	2	0	3	1,258
2017	3	997	4	1,376
2018	3	676	4	1,162

Conclusion

The GasNet compressor strategy has been considered and analysis shows that the timing for the Sunbury lateral duplication, originally proposed for 2009, can be deferred to 2010. When the Mt

Franklin-Ballan pipeline duplication is taken into account, the partial duplication of 14.9 km of the Sunbury lateral pipeline can be deferred until 2012.

Assessment also shows that it is more efficient to duplicate the Sunbury lateral in 200 mm pipe rather than 150 mm pipe.

Recommendations

It is recommended that the Sunbury lateral pipeline, from the Brooklyn-Ballarat pipeline to Line Valve 4 on the Sunbury lateral (T062-LV04), be duplicated with approximately 14.9 km of 200 mm diameter pipe prior to winter 2012.

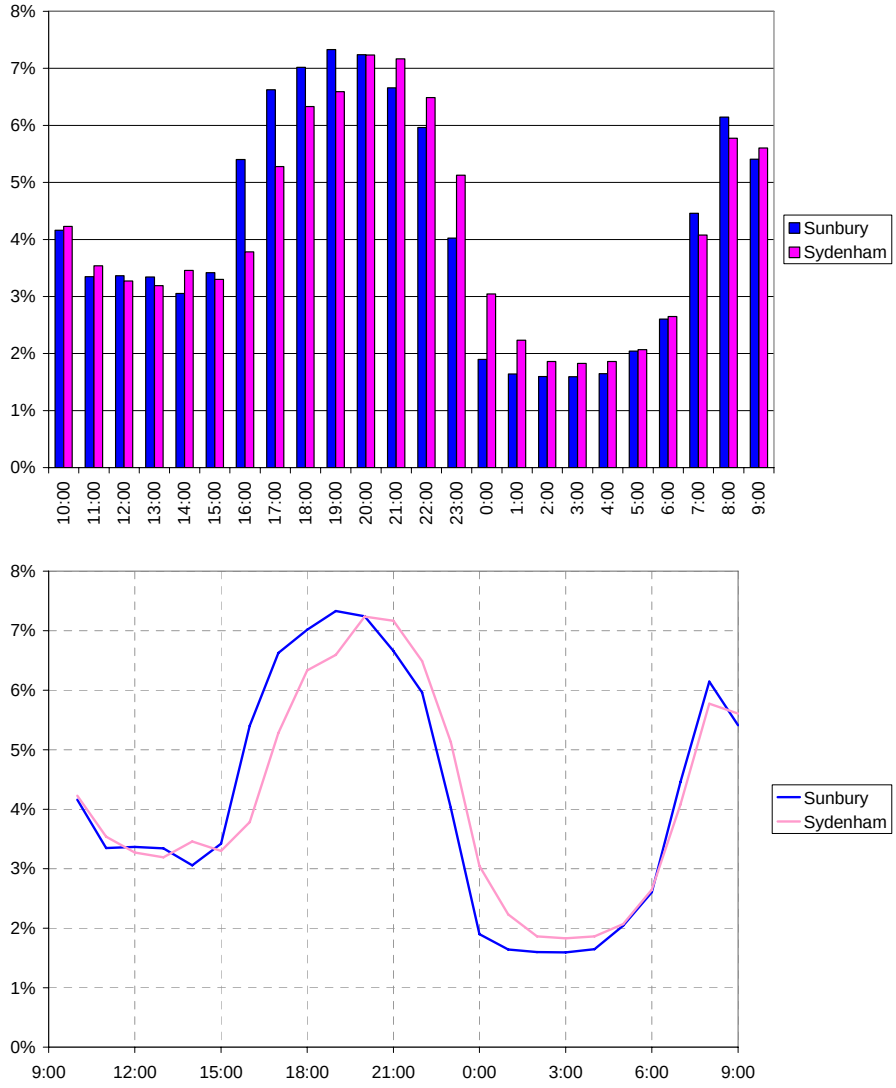
Definitions

Ballan bifurcation	The location (near Ballan) where the Brooklyn-Ballarat pipeline splits to feed Ballarat and Bendigo.
CG	City Gate.
DB	Distribution Business; a distribution pipeline network operator.
DB Connection Deed	An Agreement between VENCorp and a Distribution Business.
Gas APR	Gas Annual Planning Report, published by VENCorp by 30 November each year.
GasNet's Compressor Strategy	GasNet's document dated September 2006, which sets out the compressor strategy to support GasNet's Corporate Plan. The document provides details about the current and proposed operations at existing compressor stations, and details the facilities and proposed augmentations.
Minimum Pressure Obligation	The minimum pressure obligation stipulated in the System Security Guidelines and/or Distribution Business Connection Deeds that VENCorp must operate the system to maintain.
PTS	The Principal Transmission System, serving Gippsland, Melbourne, Central and Northern Victoria, Albury, the Murray Valley region, Geelong, and the western region of Victoria. The PTS is owned by GasNet and operated by VENCorp.
SSG	System Security Guidelines, developed and maintained by VENCorp, for the operation and security of the PTS.
SWZ	System withdrawal zone.

APPENDIX 1

Figure 2 shows the hourly demand profiles (expressed as a percentage of the daily total) for Sunbury and Sydenham on 10 August 2005, as used for the modelling.

Figure 2 - Sunbury and Sydenham demand profiles



Although the morning peaks occur at the same time, the evening peak occurs an hour later at Sydenham.