GasNet Principal Transmission System
Review of Proposed New Facilities Investments

19 September 2007

Sleeman Consulting

Contents

1 Executive Summary

This Report has been prepared to assist the Australian Competition and Consumer Commission in its assessment of actual and forecast New Facilities Investments that GasNet proposes be taken into account in setting Reference Tariffs to apply to the Victorian Principal Transmission System ('PTS') from 2008 to 2012.

The New Facilities Investment ('NFI') amounts as proposed by GasNet have, with the exceptions tabulated below, been found to be reasonable, prudent and consistent with good industry practice.

Summary Table: Recommended Changes to NFI

Item	GasNet Proposal	Recommended [note]
Investments During Second Access Arrangement Period		
Safety and Security	$0.79m	$0.95m [$0.31m]
Iona Cooler Upgrade	$0.79m	$0.60m
Corporate Restructuring	$8.84m	none
Investments During Third Access Arrangement Period		
Northern Zone Augmentation	$79.03m	$77.3m
Sunbury Loop	$12.46m	none
Ballarat Loop	$29.03m	none
Stonehaven Compressor	$26.17m	none
Carisbrook Loop	$24.05m	none
Brooklyn - Wollert Easements	$5.37m	none
Gas Heating Facilities	$9.21m	$7.25m
City Gate Works	$6.68m	$6.18m
Pipeline Upgrades	$9.65m	$7.21m [$2.44m]
Safety and Security Systems	$4.25m	$2.93m [$1.32m]
Wollert Compressor Station	$1.58m	$0.05
Other Compressor Station Work	$2.96m	$1.29m
Other New Facilities	$4.30m	none

Note to Table: The amounts shown in square brackets relate to provisions for expenditure, details of which have not yet been specifically identified. A determination is required regarding inclusion of these amounts as part of New Facilities Investments.

An explanation of the major recommended changes in NFI is provided below.

- Corporate Restructuring

  Corporate restructuring cannot be considered to represent a New Facility and therefore corporate restructuring costs are not a New Facilities Investment.

- Northern Zone Augmentation

  The capital and ongoing operating and maintenance costs of augmenting the capacity of the Northern Zone can be significantly reduced through use of additional 450 mm diameter looping rather than installation of a compressor station at Euroa. This alternative augmentation arrangement has ben confirmed by modelling carried out by VENCorp.

- Sunbury and Ballarat Loops

  The anticipated need for installation of the Sunbury and Ballarat loops was based upon the present configuration of the Brooklyn compressor station. However, upgrading of the Brooklyn compressor station is proposed and is supported. Having regard for the additional compressor power that will be available following the upgrade, installation of the Sunbury and Ballarat loops can be delayed beyond the next Access Arrangement Period. This observation has been confirmed by VENCorp.

- Stonehaven Compressor

  Installation of the Stonehaven Compressor Station is not supported since:

  - issues regarding the performance of the Geelong region of the Principal Transmission System have not yet been identified or quantified; and
  - if performance issues exist, all practical options for addressing resolving them need to be investigated.

- Carisbrook Loop

  Based upon advice from VENCorp, GasNet's perceived need for the Carisbrook loop is based upon system modelling that does not take proper account of the configuration pipeline facilities (which give rise to unusual gas flow and pressure observations).

- Brooklyn - Wollert Easements

  While there may be merit in procuring easements now for possible future system upgrades, the costs of such work do not satisfy conditions, at least one of which must be met in order for a NFI to be taken into account in tariff setting.

2 Introduction

This Report has been prepared to assist the Australian Competition and Consumer Commission in its assessment of forecast New Facilities Investments that GasNet proposes be taken into account in setting Reference Tariffs to apply to the Victorian Principal Transmission System ('PTS') from 2008 to 2012.

3 Approach Adopted in Reviewing NFI's

Each of the New Facilities Investments included in GasNet's draft Access Arrangement documentation falls within one of three categories, as set out in Table 1. For each category, review work carried out for the purpose of this report was as follows[1]:

3.1 Actual Investments Envisaged Prior to Concluding Period

A number of New Facilities Investments made during the Second Access Arrangement Period were envisaged in advance of that period and were taken into account in setting Reference Tariffs.

For investments in this category the expenditure as incurred by GasNet was reviewed to ensure it is consistent with the amount that would have been invested by a prudent Service Provider acting efficiently, in accordance with accepted good industry practice, and to achieve the lowest sustainable cost of providing Services.

3.2 Actual Investments Not Envisaged Prior to Concluding Period

Some New Facilities Investments made during the Second Access Arrangement Period were not explicitly envisaged in advance of that period and were not taken into account in setting Reference Tariffs. Such amounts may be added to the Capital Base used in establishing tariffs for the Third Access Arrangement Period provided the requirements set out in Section 8.16 of the Code are satisfied.

For investments in this category the expenditure as incurred by GasNet was reviewed to determine whether or, if appropriate, the extent to which it meets the requirements of Section 8.16 of the Code. In essence, this involved consideration of:

- whether development of each New Facility was both necessary and represented the most appropriate course of action; and

[1] The terminology should be interpreted as follows. The 'Concluding Period' is the Second Access Arrangement Period which commenced on 1 January 2003 and ends on 31 December 2007. The 'Forthcoming Period' is the Third Access Arrangement Period that will commence on 1 January 2008.

- whether the amount invested was consistent with accepted good industry practice and achievement of lowest sustainable costs.

3.3 Investments Forecast to be Required in Forthcoming Period

For New Facilities Investments that GasNet proposes to carry out during the Third Access Arrangement Period and seeks to have taken into account in establishing Reference Tariffs for that period, the following four factors were investigated:

- whether there is a bona fide need for development of the New Facility;

- whether the proposed New Facility represents the most appropriate approach to addressing the need in question;

- when does the development need to be undertaken; and

- whether the cost as predicted by GasNet for development of the proposed New Facility is both efficient and consistent with accepted good industry practice.

Table 1: New Facilities Investments by Category

New Facility	Forecast Investment	Actual Investment
Actual Investments Envisaged Prior to Concluding Period		
Refurbish Gooding Compressor	$22.77m	$16.03m
Refurbish Lurgi Pipeline	$5.72m	$2.82m
City Gate Upgrades and Heaters	$9.36m	$5.38m
Automate Wollert Compressor	$2.89m	$2.76m
Gas Chromatographs	$0.92m	$0.46m
Other Maintenance Capex	$6.06m	$4.70m
Actual Investments Not Envisaged Prior to Concluding Period		
Redevelop Brooklyn Compressor	-	$17.46m
South Melbourne Cut In	-	$2.98m
Wollert Compressor Miscellaneous	-	$2.15m
Pig Traps	-	$0.72m
Safety and Security	-	$0.79m
Iona Cooler Upgrade	-	$0.70m
Regulators Work	-	$0.42m
Maximo	-	$1.37m
Corporate Restructuring	-	$8.84m
Investments Forecast to be Required in Forthcoming Period		
Northern Zone Augmentation	$79.03m	-
Sunbury Loop	$12.46m	-
Ballarat Loop	$29.03m	-
Warragul Loop	$4.84m	-
Pakenham Loop	$1.22m	-
Stonehaven Compressor	$26.17m	-
Carisbrook Loop	$24.05m	-
Brooklyn Lara (Corio) Pipeline	$63.71m	-
Brooklyn - Wollert Easements	$5.37m	-
Gas Heating Facilities	$9.21m	-
City Gate Works	$6.68m	-
Pipeline Upgrades	$9.65m	-
Safety and Security Systems	$4.25m	-
Brooklyn Compressor Station	$44.57m	-
Wollert Compressor Station	$1.58m	-
Other Compressor Station Work	$2.96m	-
Other New Facilities	$4.30m	-

4 Actual Investments Envisaged Prior to Concluding Period

4.1 Refurbish Gooding Compressor

The Gooding Compressor Station was constructed in 1977 and, at that time, comprised four Solar Centaur T4002-C307 compressors. At the commencement of the Second Access Arrangement Period the drivers of units 1, 2 and 4 had been overhauled (in 1992, 1997 and 1998 respectively) while the driver of unit 3 had not been overhauled.

Refurbishment of the Gooding Compressor Station was undertaken during the Second Access Arrangement Period. Refurbishment work included:

- installation of a new fuel gas heater system;
- replacement of the back-up electricity generator; and
- replacement of other obsolescent or dilapidated equipment.

Completion of the refurbishment programme was both necessary and appropriate, particularly recognising the ongoing role of the compressor station as an integral part of the PTS.

In addition to the work outlined above, the refurbishment programme included change-out of the C307 compressors, which have wet-seals, for C402 compressors with dry-seals. The conversion to dry-seal compressors, although planned as part of the refurbishment programme, also ensured compliance with a directive from Energy Safe Victoria[2]. Regardless of the directive, conversion to dry-seal technology is consistent with industry best practice[3]. In addition to resolving problems with liquids carry-over, the use of dry seals leads to improved reliability, lower operating costs and material reductions in greenhouse gas emissions.

The costs of individual components of the refurbishment work have been reviewed and confirmed to be appropriate. A summary of the component costs is provided in Confidential[4] Attachment 1. The largest single cost item (an order of magnitude larger than other components of cost) was the cost of replacement compressors.

It was originally envisaged that the compressor packages would be completely replaced by new units. Ultimately however, replacement

[2] The directive has been sighted. It required action to be taken to prevent ingress of liquids into the gas pipeline system.
[3] For example, see "Lessons Learned – Replacing Wet Seals with Dry Seals in Centrifugal Compressors", November 2003, published by US Environmental Protection Agency.
[4] Attachment 1 incorporates an itemised list of activities provided by GasNet for verification purposes.

of the turbines was determined to be unnecessary and refurbished rather than new dry-seal compressors were used. This is why the actual cost of the Gooding Compressor Station refurbishment is considerably below the cost prediction made for the purpose of the Second Access Arrangement Period.

The installation of refurbished compressors rather than the installation of complete packages was prudent. The capital cost savings realised are far greater than the costs that will be associated with overhaul of gas turbine drivers[5]. The estimated[6] saving associated with using refurbished rather than new compressors and retaining the four existing turbine drivers is around $9m. In comparison, the cost of overhauling a compressor package will, when required, be of the order of $0.5m.

The Gooding Compressor Station refurbishment cost is reasonable, prudent and consistent with good industry practice.

4.2 Refurbish Lurgi Pipeline

Intelligent pigging of the Lurgi pipeline (to assess its mechanical integrity) has not historically been possible since valving on the pipeline was not configured to allow the passage of pigs. Given the age of the pipeline (which was constructed in 1956) it would have been imprudent not to identify and implement a mechanism to allow the integrity of the pipeline to be assessed and its continued safe operation ensured.

While extensive dig-ups and inspections could arguably have been carried out, these would not (without major cost and interference with normal operations) have provided information regarding the internal condition of the pipeline or about conditions between dig-ups. The preferred means for whole-of-length condition assessment is the use of intelligent pigging with selective dig-ups to verify findings.

To allow use of intelligent pigs on the Lurgi pipeline, GasNet undertook a refurbishment programme to install pig launching and receival facilities and to modify pipeline valving. Six main line valves were replaced with full-bore valves (through which internal pipeline inspection equipment can pass) and a further nine valves were removed altogether. The total cost of the refurbishment was $2.82m.

[5] In effect, retention of the existing gas turbine drivers advances the overhaul programme relative to what would be required if complete new compressor packages were installed. The existing drivers will require overhaul sooner that new units since they already have operating hours accrued. See Section 6.16 of this Report regarding overhaul of a Gooding compressor.
[6] Estimated by Sleeman Consulting on the basis of actual refurbished compressor costs compared to the cost of new turbine and compressor packages (both exclusive of installation).

In order of magnitude terms, the estimated greenfields cost[7] (ie, not including allowances for cut-out of old equipment or for live-line work) of a 450 mm diameter main line valve is $290,000 per valve and the estimated cost of pig launching and receival facilities is $390,000 (each). On this basis the refurbishment programme carried out by GasNet was well aligned with industry expectations.

The Lurgi pipeline refurbishment cost is reasonable, prudent and consistent with good industry practice.

4.3 City Gate Upgrades and Heaters

Prior to the Second Access Arrangement Period it was envisaged the work outlined below would be carried out.

- Upgrade of Dandenong, Wollert and Morwell city gate stations and the Tyers pressure limiting facility, at an overall cost converted to 2007 dollars of $6.1m. The upgrade work involved replacement of equipment at the end of its working life, with consequent improvements in operational flexibility[8], system reliability and safety[9]. Liquids removal facilities have also been installed.

- Installation of heaters at the Dandenong, Tyers and Wollert regulator stations at an overall cost converted to 2007 dollars of $3.3m. Gas heating is required at locations where, as a result of pressure reductions, gas temperatures may fall below acceptable levels.

GasNet subsequently determined that:

- the installation of a gas heater at Tyers was not necessary[10]; but

- the size of the gas heater installed on the Morwell back-up pressure regulation system at Dandenong, needed to be increased.

With the exception of Dandenong (which has been delayed due to limited availability of valves[11]) the gas station upgrading and heater

[7] Derived by Sleeman Consulting using power factor scaling of indicative costs for a range of alternative sizes.
[8] The new regulator control systems allow automatic set point changes, rather than requiring operator attendance.
[9] The new regulators are slum-shut, fail-safe design.
[10] GasNet's Access Arrangement Submission notes (page 26) that the need for a gas heater at the Tyers pressure limiter facility was driven by the anticipated connection of a large customer between Tyers and Morwell. System modelling carried out by Sleeman Consulting indicates that under present operating conditions pressure cuts at Tyers will be minimal and gas temperatures will not fall below acceptable levels.
[11] While specific details of GasNet's valve requirements and orders have not been audited, the reported availability constraints are consistent with experience elsewhere and reflect high levels of world demand.

installation work has been completed. The Dandenong city gate station work will be completed during 2008 and is now included as proposed expenditure for the Third Access Arrangement Period (see Sections 6.10 and 6.11 of this Report).

The cost of work completed during the Second Access Arrangement Period (that is, upgrades to Wollert and Morwell gate stations and Tyers pressure limiter and installation of gas heating at Wollert) is $5.38m in 2007 dollars, or $4.68m in 2002 dollars. Table 2 provides a comparison of the original and updated cost estimates.

Table 2: Comparison of Cost Estimates

Item	Original Estimate[12] (2002 dollars)	Final Cost (2002 dollars)
Dandenong G.S. upgrade	$5.60m	Delayed ($2.06m)
Wollert G.S. upgrade		$2.33m*
Morwell G.S. upgrade		$2.06m#
Tyers upgrade		$0.29m
Dandenong heater	$3.04m	Delayed (3.09m)
Tyers heater		Not required
Wollert heater		*Included above
Morwell back-up heater	not provided for	#Included above

The scope of work completed at each site (other than Dandenong) is outlined in Table 3 together with an industry indicative cost estimate of the cost (in 2007 dollars). The industry indicative cost is based upon indicative information provided to Sleeman Consulting by independent equipment suppliers and fabricators.

Table 3: Scope of Upgrade and Heater Work

Location	Scope of Work	Industry Indicative Cost[13] (greenfields basis)
Wollert	4 regulator runs with controls; 2 MW heater	$180k per Regulator run $1.1m heater installed EPC @ 10% $180k Total $2.0m
Morwell	2 regulators and controls	Component costs as above. Total $1.6m
Dandenong (Morwell back-up)	2 MW heater	
Tyers	1 regulator with control	$200k incl. EPC

The cost estimates set out in Table 3 do not include provision for overheads incurred as a consequence of work being carried out on existing operational infrastructure (ie, brownfield basis) rather than

[12] A break up of cost estimates by facility is not available.

[13] Sleeman Consulting acknowledges the kind assistance of Lightning Fabrications, which provided information of the indicative uninstalled costs of gas heaters.

on a greenfields basis. Such overheads will be dependent upon factors such as access constraints, need for traffic management and reinstatement requirements and could conceivably double the cost of a project.

The costs as incurred by GasNet:

- are of comparable magnitude to the industry indicative costs set out in Table 3 with a brownfields allowance of 16% for the Wollert project and 45% for the Morwell and Tyers projects; and

- are in any case reflective of prevailing market conditions since equipment used in upgrading and heater installation work was sourced by GasNet through competitive tendering arrangements.

The costs incurred by GasNet for city gate upgrades and installation of a heater at Wollert are reasonable, prudent and consistent with good industry practice.

4.4 Automate Wollert Compressor

By the commencement of the Second Access Arrangement Period the Wollert Compressor Station control system had reached the end of its useful life[14]. The system was suffering reliability problems that compromised remote operability of the station and spare parts were increasingly difficult to source. Industry accepted best practice is that compressor stations be unmanned and therefore remotely operable. This ensures the compressor station can be optimally operated to meet system requirements.

Upgrading of the Wollert Compressor Station control system was planned for and completed during the Second Access Arrangement Period at a cost of $2.76m.

There is no strict precedence regarding the cost of automating a compressor station. Costs will be dependent, among other things, upon the extent of automation, the nature of existing systems and the number of units to be automated. The cost of automating the Wollert Compressor Station is consistent with previous experience, as summarised below, all of which was based upon competitive tendering:

- Automation in 1999 of the Gooding Compressor Station (four compressor units) at a cost of around $3m in 2007 dollar terms; and

- Automation in 2000 of the Brooklyn Compressor Station (station automation plus 2 compressor units) at a cost of around $4.8m in 2007 dollar terms.

[14] The relay based control systems originally fitted to Solar 10 units are antiquated and parts required for servicing are frequently unavailable.

The cost incurred for automation of the Wollert Compressor Station is reasonable, prudent and consistent with good industry practice.

4.5 Gas Chromatographs

Gas chromatographs are used to measure gas composition data as an input to determination of the heating value of the gas for billing purposes. With the introduction over recent years of gas from a number of new sources, the potential now exists for the heating value of gas supplied from the PTS to vary markedly from location to location and from time to time. Accordingly, it was necessary that gas chromatographs be installed at a number of additional locations, namely Alansford, Brooklyn and Corio.

The three new gas chromatographs were installed for a reported[15] total cost of $0.46m, giving an average of $150,000 per installation. This is below industry indicative cost levels. As a rule of thumb, a single gas chromatograph installation could be expected to cost around $0.25m. The primary reason for the GasNet cost being below the industry indicative level is that installation labour costs have been internalised[16].

The cost incurred by GasNet for installation of gas chromatographs is reasonable, prudent and consistent with good industry practice.

4.6 Other Maintenance Capex

There is potentially a fine line between routine maintenance activities, which should be expensed, and more significant work, which could be capitalised since it gives rise to benefits that are available for an extended period.

Maintenance costs that have been expensed (rather than capitalised) are not taken into account by way of additions to the capital base for tariff setting purposes in subsequent periods. Therefore the risk of cost blow-outs (or the benefit of cost improvements) lies with the Service Provider. It is important to ensure that routine maintenance costs are not conveniently capitalised as a means for transfer of adverse maintenance cost outcomes.

Itemised details of capitalised maintenance carried out during the Second Access Arrangement Period have been provided by GasNet for confidential review. The detailed information is presented in Confidential Attachment 2. Information on the types of activities

[15] See GasNet Access Arrangement Submission dated 14 May 2007, page 46.
[16] See GasNet Access Arrangement Submission dated 14 May 2007, page 46. GasNet used internal rather than contract labour to install the gas chromatographs. The implications of expensing rather than capitalising installation costs are beyond the scope of this report and will, if necessary, be addressed by the ACCC.

included in the 'other maintenance capex' category is presented in Table 4.

Table 4: Examples of Capitalised Maintenance Items

Information Technology upgrades - SCADA, control systems, computer hardware and software
Cathodic Protection upgrades - anode beds and CPU equipment
Building upgrades - air conditioning, lighting, fencing
Instrumentation upgrades - fire protection, gas chromatographs
Third party protection (eg, to deal with urban encroachment)
Equipment acquisition - test equipment

It is noted that an amount of $0.28m which relates to aerial photography work has been included in capitalised maintenance costs. This expense is acceptable for pipeline monitoring and planning purposes. In addition, GasNet has indicated the same photography work will (unless land use changes necessitate updating) also be used for pipeline looping project safety management studies and route selection.

A review of the maintenance capex data indicates that the work carried out by GasNet was necessary and appropriate and the costs as incurred are reasonable, prudent and consistent with good industry practice.

5 Actual Investments Not Envisaged Prior to Concluding Period

5.1 Redevelop Brooklyn Compressor

Section 6.14 of this Report provides an overview of the need and justification for refurbishment of the Brooklyn Compressor Station. The refurbishment programme outlined in Section 6.14 commenced during the Second Access Arrangement Period with work as summarised below being carried out.

- Replacement of the C307 wet-seal type compressor (as fitted to Solar Centaur unit 11) with a C337 dry-seal type compressor. This work was completed in 2006 at an installed cost of $3m, which is only moderately in excess of the estimated uninstalled purchase cost of a refurbished compressor. The cost as incurred by GasNet is reasonable, prudent and consistent with good industry practice

- Installation in 2007 of a new Solar Centaur T4700-C336 compressor (referred to as unit 12) at a cost (estimated by GasNet) approaching $17m (inclusive of contingency).

The present (uninstalled) cost of a Solar Centaur package is around US$4m (A$5m). The overall cost, including installation, can be expected to be around three to five times the package cost, depending upon factors such as location and number of units being installed. GasNet's estimated cost, at just over three times the package cost, is at the low end of the expected cost range and is considered to be reasonable, prudent and consistent with good industry practice.

In addition the cold vent at the Brooklyn station, through which gas is discharged when compressor units shut down, is being replaced during 2007. GasNet has identified that a surplus vent silencer from another location can be modified and installed at Brooklyn to reduce total project costs. Design work is progressing. The new vent must be configured to ensure the velocity of gas within the silencer is low enough to allow entrained liquids to be captured rather than discharged but high enough at the silencer outlet to meet environmental requirements. The gas discharge height must also be increased to a minimum of 18 metres.

The vent stack modification is appropriate for environmental reasons, particularly with increased public use of surrounding land. Since an existing, surplus Burgess Manning vent silencer can be utilised, project costs items will comprise:

- Modifications to and installation of the surplus vent stack (including height extension);
- Piled concrete footings;
- design, procurement and installation of connecting pipework (to direct all station vents to the new vent stack); and
- Project management.

GasNet's estimated cost of around $700,000 for replacement of the Brooklyn vent stack is reasonable, prudent and consistent with good industry practice.

5.2 South Melbourne Cut In

During 2006, pig launching and receival facilities were added to the 750 mm diameter 2.76 MPa pipeline (Victorian Pipeline Licence Number 108) that runs from Dandenong to Brooklyn. Installation of the pigging facilities was essential to allow intelligent pigging of the pipeline. Intelligent pigging of high pressure gas pipelines within the metropolitan area is a prudent (and essentially the only reliable) means of assessing pipeline integrity.

The cost of installation of the pigging facilities was $2.98m, comprised as follows[17]:

Materials:	$0.53m
Subcontract services:	$1.87m
Other costs:	$0.14m
Owner's costs:	$0.44m (15%)

For comparative purposes, in order of magnitude terms the indicative cost of a single 750 mm diameter pigging facility will be around $530,000[18] (not including owner's costs) if installed in good conditions when a pipeline is initially constructed. Around one-half of the indicative cost would be associated with materials, the balance being related to installation.

The relatively high cost of the South Melbourne Cut-in project is satisfactorily explained by:

- the need for cut-ins to existing operating pipelines in built-up areas (thereby necessitating additional planning, operator oversight and safety management; and

- severe access constraints, particularly at Brooklyn (where the requisite modifications were in close proximity to existing buildings and geotechnical conditions were unfavourable). Civil works associated with the South Melbourne cut in project were alone in excess of $0.73m.

The cost of materials for the South Melbourne cut in project was consistent with industry indicative expectations outlined above.

The need for installation of the pig launching and receival facilities is indisputable, and it is accepted that the cost of installing the facilities was reasonable, prudent and consistent with good industry practice.

5.3 Wollert Compressor Miscellaneous

The work listed below, which was not specifically envisaged prior to the Second Access Arrangement Period, was carried out at the Wollert Compressor Station facilities during the period:

- Overhaul of the unit 2 gas turbine driver, and upgrade of the driver from T1200 to T1300 rating. The unit had completed 38,580 hours so was due for overhaul[19]. As a matter of routine, at the time of a major overhaul gas turbines are upgraded to

[17] GasNet has provided supporting information on subcontract service requirements and costs.
[18] Sleeman Consulting estimate based upon extrapolation of costs for alternative size, new-build configurations.
[19] Solar's recommended engine overhaul interval was 30,000 hours. GasNet has advised that the overhaul interval has now been extended to 40,000 hours.

incorporate the latest componentry and power rating. The overhaul/upgrade was carried out under GasNet's alliance arrangement with Solar Turbines at a cost of $170,000[20]. This cost is industry competitive. In order of magnitude terms, overhaul of a Solar Saturn compressor could be expected to cost around $200,000 (in 2007 dollars).

- Installation of a fin-fan cooler (to cool hot, compressed gas before it enters downstream pipework) as a replacement for obsolescent water based cooling system. At the same time, a station recycle valve was installed. Recycle valves prevent pressure surges at low gas flows, thereby protecting the compressor form damage.

  The cost of installing the new cooler and recycle valve was $830,000[21]. Although detailed technical specifications and a cost break-up were not available during preparation of this Report, the cost incurred by GasNet is in line with reasonable expectations. The installed cost of a fin-fan cooler, without allowance for removal of old facilities, could exceed $500,000 and the cost of a 300 mm recycle valve with control would be at least $220,000. The cost incurred by GasNet is therefore considered to be reasonable, prudent and consistent with good industry practice.

- Upgrading of obsolete electrical equipment at a cost of $1.15m[22]. Although detailed information and cost break ups for this work were not available during preparation of this Report, the cost incurred by GasNet is judged to be reasonable for the scope of work completed. The major items of electrical upgrade work carried out were as follows:
  - Replacement of obsolescent motor control system;
  - Installation of new 315 kVA back-up generator;
  - Replacement of deteriorated lighting, electrical cables and equipment and upgrade of station earthing system; and
  - Relocation of 22 kV power supply feed (to meet current hazardous area requirements) and upgrade of transformer to accommodate increased site power requirements.

The overall costs incurred for the Wollert Compressor Station work are considered to be reasonable, prudent and consistent with good industry practice.

5.4 Pig Traps

Pig launching and receival facilities are being installed on the Bunyip to Pakenham pipeline (Victorian Pipeline Licence Number 135) so that intelligent pigging of the pipeline can be carried out. The use of

[20] Source: Table 5.4 of GasNet Access Arrangement Submission 14 May 2007.
[21] Source: Table 5.4 of GasNet Access Arrangement Submission 14 May 2007.
[22] Source: Table 5.4 of GasNet Access Arrangement Submission 14 May 2007.

intelligent pigging is the only effective way of assessing the integrity of a gas pipeline along its entire length. There can be no doubt of the need for GasNet to be able to carry intelligent pigging surveys of its pipelines.

In order of magnitude terms, the cost of a single 750 mm diameter pigging facility could be expected to be around $530,000 if installed when a pipeline is initially constructed. GasNet's estimated $720,000 total cost for installation of two pig traps (ie, one at each end of the Bunyip to Pakenham pipeline) is around 30% below the industry indicative estimate.

The estimated costs for installation of pigging facilities on the Bunyip to Pakenham pipeline are reasonable, prudent and consistent with good industry practice.

5.5 Safety and Security

a) Security

The Victorian *Terrorism (Community Protection) Act 2003* provides that the operators of declared essential services[23] must prepare risk management plans to identify and mitigate the risk of terrorist acts[24]. Considerable detail is set out regarding the requisite content of the risk management plans. This includes an explicit requirement to identify measures to be undertaken to prevent or reduce the risk to and ensure the physical security of key infrastructure[25].

While judgement may arguably be exercised regarding measures to be implemented to reduce risk and ensure security, the installation of remote monitoring infrastructure at key operational sites is a logical initiative, particularly since it can be tied into existing communications systems.

The proposed installation of remote monitoring infrastructure at the Dandenong and Pakenham sites, at a budgeted cost[26] of $480,000 is considered to be appropriate since:

- the security upgrade programme was specifically formulated for the Dandenong and Pakenham sites by Counterisk Australia Pty Ltd; and

- the budget cost for the programme is based upon independent cost estimates as advised by Counterisk.

[23] Clause 21 of the Act specifies that gas services are essential services.
[24] See Part 6 of the Act.
[25] See Clause 31(b) of the Act.
[26] The budget cost is specific to the GasNet sites. Hence generalised costs comparisons are not practicable.

It is accepted that the expenditure to be incurred at Dandenong and Pakenham is reasonable, prudent and consistent with good industry practice.

GasNet also proposes installation of additional monitoring equipment during the Third Access Arrangement Period. Installation of the additional equipment is addressed in Section 6.13.

b) Safety

The Victorian *Gas Safety (Safety Case) Regulations 1999*, promulgated pursuant to the Victorian *Gas Safety Act 1997*, contain a specific requirement that 'Formal safety assessments' be carried out to, among other things, identify all hazards that have the potential to cause a gas incident. Recognising this obligation, GasNet is developing dossiers to identify all electrical equipment within hazardous areas.

Development of the dossiers is specialised task that must be carried out by technicians with qualifications and training beyond that required of GasNet personnel. It is therefore necessary for the work to be carried out under contract. Dossiers must be developed for 20 regulator sites and 7 compressor stations. On the basis of a scope of work independently developed for GasNet, it is estimated the cost of preparing the dossiers will be around $475,000.

GasNet anticipates, on the basis of past experience, that in the course of developing the electrical equipment dossiers rectification works will be identified that require immediate attention. A provision of $315,000 has been made for the cost of rectification works. Although the likelihood that there will be a need for some rectification works is accepted, it is not possible to pass judgement regarding the adequacy of the proposed provision[27].

GasNet's estimated costs for safety related work are considered to be reasonable, prudent and consistent with good industry practice.

The total of the amounts set out above for Safety and Security related expenditure is $955,000 (with a further $315,000 contingent upon inclusion of provisions). In comparison, the amount included by GasNet in Table 5.4 of its Access Arrangement Submission dated 14 May 2007 is $790,000. It appears the amount reported by GasNet may have been in error.

[27] The ACCC will address the inclusion of provisions in estimated NFI.

5.6 Iona Cooler Upgrade

It has been identified that during periods of high gas demand in regions serviced by the Western Transmission System minimum gas pressure requirements at Portland may not be satisfied. The Portland gas pressure problem arises despite the prospect that gas supplies from the Otway Basin are likely to grow (thereby increasing gas pressures at Iona). Under the Victorian spot gas market system it is possible that deliveries of Otway Gas might be curtailed[28].

To resolve the gas pressure constraint at Portland the gas cooling[29] capacity of the Iona Compressor Station is to be expanded. With expanded cooling capacity there will be less pressure drop across the gas coolers and a correspondingly higher gas pressure in downstream pipework. Possible alternatives to the cooling capacity expansion include the following.

- Ensuring continuity of gas supply from Otway sources, thereby avoiding need for capacity expansion. This would require a change to the Victorian spot gas market system.

- Expanding the Iona compressor station (ie, increasing available compression power). This approach would be higher cost than the approach recommended by VENCorp and would also aggravate temperature related constraints.

- Partial looping of the Western Transmission system, which would also be higher in cost than the recommended approach.

Given the modus operandi of the Victorian market system, the installation of additional gas cooling capacity is a logical and lowest cost solution to the potential Portland gas pressure problem.

GasNet's forecast of cost for expanding the Iona gas cooling capacity is rounded up from the following estimate:

Aftercooler, installed:	$500,000
Owner's costs:	$ 75,000
Contingency:	$100,000
Total:	$675,000

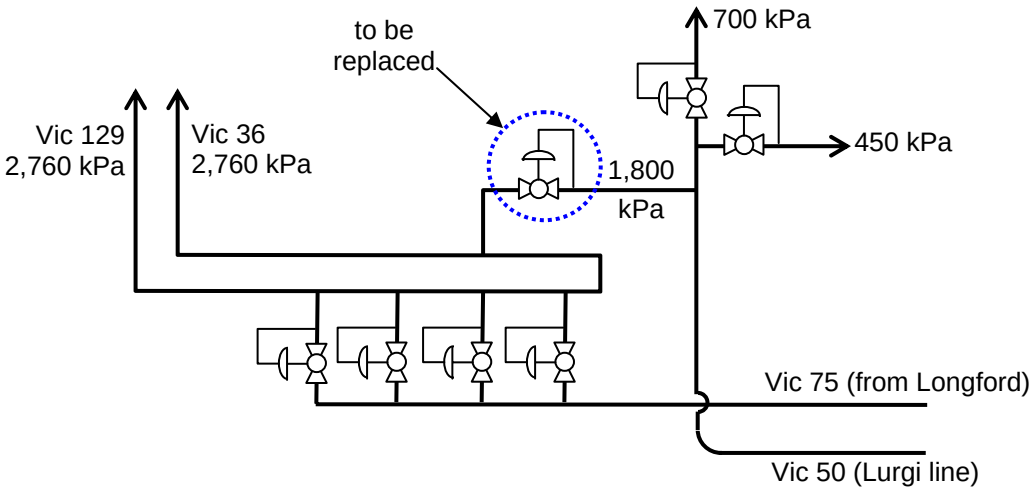
GasNet's owner's cost and contingency provisions are relatively high at 15% and 20% respectively[30]. Notwithstanding that detailed design and specification work has yet to be progressed, it is recommended

[28] Delivery allocations are determined on the basis of a market bid stack.
[29] The gas coolers reduce the temperature of compressed gas leaving the compressor station.
[30] Provisions of around 10% for owner's costs and 10% contingency could be adopted for a project of this size and with a view to developing a forecast that has equal likelihood of being an under or and over forecast. This would give a total estimated cost of $600,000.

that revision of a cost estimate of $600,000 would be reasonable, prudent and consistent with good industry practice.

5.7 Regulators Work

Certain gas pressure regulators installed at Dandenong[31] have reached the end of their operating life and are to be replaced. The regulators in question are indicated in the following, simplified schematic.



VENCorp has also identified[32] a possible capacity issue with the regulator that is to be replaced. GasNet has confirmed that the proposed work will also address the capacity issue as identified by VENCorp.

In addition to replacement of the obsolescent regulators, a back-up regulator system will be installed. The present installation has only one regulator run which means, in the event of failure, continuity of gas supply could be compromised.

GasNet's estimated cost for completion of the regulator modifications is $420,000. The GasNet estimate compares favourably with the following independent cost estimate:

[31] The gas pressure regulators in question provide a back-up supply of gas from the metropolitan system into the Lurgi line just downstream of the Dandenong City Gate.
[32] See comments under the heading 'Morwell back up regulator' on page 7 of Vencorp's 'Network
Planning Report - P004 Warragul (Planning)', dated March 2007. There is concern that flows through the regulator could exceed the capacity of the existing regulator.

Regulators (2 off):	$100,000
Isolation valves[33]	$ 40,000
Miscellaneous materials:	$ 25,000
Installation	$135,000
Provision for unidentified:	$ 30,000
Owner's costs	$ 30,000
Provision for brownfields imposts	$ 55,000 (15%)
Total:	$415,000

The estimated cost for replacement of the regulators and installation of a back-up system is reasonable, prudent and consistent with good industry practice.

5.8 Maximo

GasNet has upgraded its asset management system to the latest version[34] of Maximo, an asset management computer programme marketed by IBM.

The use of an asset management system is a technical regulatory requirement (pursuant to approved Safety Cases). A key feature of the Maximo system as now implemented is field based access to all technical specifications, work procedures and other similar information. The system also facilitates management of maintenance and test records (with immediate on-line updating by field based technicians) and scheduling of work activities.

It is often the case that proposals for introduction or upgrading of computer systems are evaluated to ensure they have economic merit. GasNet has advised that the Maximo upgrade was not evaluated in this manner since improved asset management capabilities were a pre-requisite for ongoing pipeline operations and maintenance activities. It is accepted that:

- the introduction of enhanced asset management capabilities was a necessary and prudent initiative; and

- upgrading of the pre-existing system (rather than introduction of a completely new system) is logical.

For management of a gas pipeline system with the extent and complexity of the PTS to be consistent with good industry practice it is necessary for GasNet to utilise a modern, computer based asset management system with on-line accessibility.

The total cost of the Maximo upgrade was $1.55m of which $1.38m has been allocated to the regulated asset base.

[33] Assumes isolation valves on existing run are serviceable
[34] GasNet was already a user of the Maximo system, but its use was limited to record-keeping type activities.

The cost of the Maximo asset management system is based upon the actual cost of system upgrade and is reasonable, prudent and consistent with good industry practice.

5.9 Corporate Restructuring

For the purpose of the Code, a New Facility is:

a) any extension to, or expansion of the Capacity of, a Covered Pipeline which is to be treated as part of the Covered Pipeline in accordance with the Extensions/Expansions Policy contained in the Access Arrangement for that Covered Pipeline;

b) any expansion of the Capacity of a Covered Pipeline required to be installed under section 6.22; or

c) any capital asset constructed, developed or acquired to enable the Service Provider to provide Services including, but not limited to, assets required for the purposes of facilitating competition in retail markets for Natural Gas.

Corporate restructuring cannot be considered to represent a New Facility and corporate restructuring costs are not a New Facilities Investment.

Consideration of whether Corporate Restructuring costs may be recoverable is outside the scope of this report and will be addressed by the ACCC.

6 Investments Forecast to be Required in Forthcoming Period

Sleeman Consulting has developed a steady-state simulation of the performance of the PTS. The simulation:

- facilitates quick review of gas pressure and flow constraints but is not suitable for assessing interactions between linepack and daily load profiles; and

- has been used to gauge whether there may be alternative approaches to solving identified system problems (noting however that, where further alternatives are identified, detailed transient analyses need to be carried out by VENCorp as a basis for firm planning and decision making).

6.1 Northern Zone Augmentation

The steady-state system simulation confirms:

- the Northern Zone is not presently capable of exporting gas through Culcairn at the authorised rate of 17 TJ/d; and

- there is a peak-day risk that the gas pressure at Shepparton will not meet the specified minimum requirement.

It is also evident that the identified problems are likely to be resolvable in the manner proposed by GasNet, that is, through a combination of:

- expansion of the Wollert Compressor Station;

- looping of the pipeline from Wollert to Line Vale 3; and

- development of a compressor station at Euroa.

When comparing options for augmentation of the Northern Zone it is important that both capital costs and future operating, maintenance and compressor fuel costs be taken into account using discounted cash flow analyses. The recurring cost impacts of compression are significantly higher than the ongoing costs associated with installation of pipeline looping. It would appear that the augmentation presently proposed by GasNet (as outlined above) has been selected through consideration of capital costs only.

Taking account of both capital and ongoing costs, it appears that a further, possibly more attractive augmentation option is to install additional 450 mm diameter looping (to nominally Line Valve 5), thereby avoiding the need to develop the Euroa Compressor Station and increasing system linepack. The technical suitability of this

alternative capacity augmentation option has been confirmed by VENCorp using the Gregg Engineering transient pipeline model[35].

The estimated costs of the proposed and alternative approaches to augmentation of the Northern Zone are compared in Table 5.

Table 5: Northern Zone Augmentation - Cost Comparison

Item	Proposed Augmentation	Alternative Augmentation
Wollert Expansion	$39.6m	$39.6m
Pipeline Looping (450 mm)	$14.6m (12 km)	$37.7m (35 km)
Euroa Compressor[36]	$24.9m	-
Total capital cost	$79.1m	$77.3m
Indicative O&M increment	See note below	
Compressor fuel		

Note to Table 5: By inspection, the incremental O&M and fuel costs of the proposed augmentation will exceed those of the alternative augmentation since:

- compressor O&M costs are higher as a percentage of capital cost than pipeline O&M costs; and
- the additional compression power requirement of the proposed augmentation will lead to the fuel requirement of that option being higher.

The present value of costs of the proposed augmentation will be considerably higher than the present value of the costs of the alternative augmentation. The alternative augmentation (ie, use of additional looping) is therefore recommended.

Notwithstanding the observation that additional looping is preferable to development of the Euroa Compressor Station, the capital costs of the augmentation programme as presently proposed by GasNet have been assessed and the following observations are made.

[35] It is understood the alternative augmentation option will be addressed by VENCorp in its Annual Planning Report for 2007.

[36] The Euroa Compressor Station costs provides for the installation of two compressor units. This is:

- consistent with the approach adopted in Vencorp's Network Planning Report - P003, Northern Zone Planning, April 2007; and
- necessary in order to achieve a level of reliability that is comparable with that achievable through looping. Looping is inherently reliable. Compression plant suffers from both planned and unplanned outages.

i) Looping of Pipeline north of Wollert

To the north of Wollert, GasNet's existing pipeline (to be looped) passes through numerous open farmland properties. Access is not constrained but ground conditions are difficult (ie, rock). There will be crossings of one major regional road and of the Merri Creek. The Merri Creek crossing is at a location in farmland where the creek is relatively narrow with little riparian vegetation present.

The cost of installing a 450 mm diameter loop line from Wollert to Line Valve 3 is estimated[37] by GasNet to be $14.6m, which is equivalent to $2,640 per mm-km ($67,000 per inch-km). While this appears high relative to what is achievable for a new build, long distance pipeline in open country[38], some, but not all, of the cost difference may be explained by the following factors:

- Construction of the loop pipeline through rock (basalt) will lead to major cost increases. Since the looping will be installed alongside an existing, operational gas pipeline, blasting of the rock is not practical. The pipe trench will need to be opened using a rock hammer and the rock spoil disposed of. This will increase costs[39] by around $60/m ($3,300/inch-km).

- Since some pipeline construction costs are relatively fixed in nature (like mobilisation and hydro-testing), the cost of short pipelines will be higher than the cost of long pipelines when expressed in terms of $/inch-km. At 12.1 km length, the proposed looping represents a short pipeline project.

- It will be necessary to either use rock jacket or source sand fill as a bed for and to cover the loop line. As a consequence, a cost impost of the order of $35/m (1,950/inch-km) could be expected.

In the course of preparing this Report, GasNet provided some explanatory information on the break-up of its cost estimate. While the available information was incomplete, it was sufficient to allow a high-level comparison of forecast costs, as presented in Table 6.

[37] This is the estimate as used by Vencorp in 'Network Planning Report - T003, Northern Zone (Timing)', dated April 2007. GasNet has subsequently adjusted the forecast to $15.8m

[38] A pipeline construction cost of the order of $40,000 to $46,000 per inch-km could be expected for a new build long distance pipeline in good pipe laying conditions (ie, open country in which a bucket-wheel trencher can be used). This cost measure is itself considerably higher than has been achievable prior to recent, rapid rises in steel and labour costs.

[39] Sleeman Consulting estimate based upon industry indicative information.

Table 6: Wollert Looping Cost Comparison

Item	GasNet Estimate	Independent Estimate[40] (+/- 30% accuracy)
Linepipe, delivered	$2.816m	$2.992m
Construction[41]	$5.795m	$4.823m
Facilities & hot-taps	included above	$1.341m
Access, approvals	$0.757m	$0.140m
EPCM and owner's costs	$1.788m	$1.373m
Contingency	$2.427m[42]	n/a
Provision for Unidentified	n/a	$ 1.053m
Unexplained	$0.977m	n/a
Total	$14.560m	$11.723m

The following comparative observations have been made:

- The forecast costs of linepipe are comparable.

- GasNet's provisions for clear and grade of the pipeline route, stringing and bending of pipe and reinstatement of the right-of-way are considerably higher than Sleeman Consulting's provisions but provisions for trenching and backfill are lower. Overall, the forecast construction costs (including the cost of facilities) are reasonably comparable.

- GasNet's provisions for access and approvals and for EPCM are higher than Sleeman Consulting's estimate. It is understood GasNet has allowed for net gain offsets in relation to native vegetation and for cultural heritage matters. Sleeman Consulting has not made specific allowances for these items since preliminary analysis suggests there is little native vegetation along the pipeline route and (since the land is used for farming and has already had a pipeline constructed across it) major cultural heritage issues are considered unlikely. For the independent estimate, costs of this nature are provided for by way of the provision for unidentified items, being items that could prove to be necessary but which were not specifically identified during preliminary cost estimation.

  Since field studies have not yet been carried out it cannot be concluded that the GasNet provisions are excessive.

[40] Prepared by Sleeman Consulting using industry indicative data.
[41] Includes mobilisation, clear & grade, trenching, string & bend, welding, joint coating, NDT, lower-in, pad, backfill, cathodic protection, reinstatement, road and creek crossings, commissioning.
[42] The GasNet contingency provision is estimated.

- GasNet's cost estimate includes a sizeable contingency. Sleeman Consulting considers that the effect of the contingency (when considered with regard for other specific provisions that have been made) is to make the cost estimate one that is unlikely to be exceeded[43].

Should the ACCC consider that the cost estimate (representing forecast NFI) to be used for tariff setting purposes should be a central estimate it is recommended that a Wollert looping cost provision of $12.9m would be reasonable, prudent and consistent with good industry practice. This figure represents the independent cost estimate, adjusted to include GasNet's assessment of access, approvals and EPCM costs, and including a 10% provision for unidentified costs.

ii) Euroa Compressor

GasNet estimates the cost of developing the Euroa Compressor Station will approach $25m, based upon use of two solar Saturn 20 compressors and inclusive of contingency. The present (uninstalled) cost of a Solar Saturn package is around US$1.9m (A$2.4m). For this size of compressor, the installed cost can on an industry indicative be expected to approach five times the package cost (ie, total $12m for one unit or $24m for two units). GasNet's estimated cost appears marginally high but is not unreasonable.

iii) Wollert Compressor Station upgrade

The proposed refurbishment of the Wollert Compressor Station (at an overall cost of $39.56m) is addressed in Section 6.15 below. It is considered reasonable.

It is recommended that:

- the Northern Zone augmentation programme be amended to incorporate additional 450 mm nominal diameter looping north of Wollert (to Main Line Valve 5) thereby avoiding need for development of the Euroa Compressor Station; and

- a provision of $37.7m[44] be made for the pipeline looping.

[43] Rather than an estimate for which the probability that actual costs will be below the estimate is equivalent to the probability that actual costs will be above the estimate.
[44] This figure has been derived by scaling the $12.9m estimate (for 12. km) to take account of the additional length of looping.

6.2 Sunbury Loop

Modelling of the Sunbury lateral on the basis of peak hourly gas flows extrapolated to 2012 indicates that the lateral should be capable of supplying market requirements provided gas is available at the inlet to the lateral (ie, from the Brooklyn – Ballan pipeline) at a pressure of the order of 4,000 kPa. This is well below the 7,390 kPa rating of the Brooklyn - Ballan pipeline. Since the inlet of the Sunbury lateral is only about 14 km downstream of the Brooklyn Compressor Station, it would appear that problems with performance of the lateral may be related to lack of compression power (and hence gas discharge pressure) at the Brooklyn Compressor Station. This has been confirmed in discussions with VENCorp.

Investigations regarding the performance of the Sunbury lateral, and the judgement that partial 200 mm diameter looping of the lateral is required by 2012, are based upon a Brooklyn Compressor Station configuration different to that being implemented by GasNet (see Section 6.14). VENCorp noted[45] that detailed modelling would be carried out to assess the impact of GasNet's compressor strategy.

Sleeman Consulting considers, and VENCorp has subsequently confirmed, that partial looping of the Sunbury lateral will not required during the Third Access Arrangement Period. Therefore, provision for partial looping of the Sunbury lateral should not be included as a forecast New Facilities Investment.

6.3 Ballarat Loop

Investigations regarding gas pressures at Ballarat and the judgement that looping of the Mt Franklin to Ballan pipeline is required by 2010 were based upon compressor station configurations different to that being implemented by GasNet (see Section 6.14). In particular, it was assumed there would be only 1,700 kW of duty compression power available at both Brooklyn (for compression to Ballan) and at Wollert[46].

The proposed configurations of the Brooklyn and Wollert Compressor Stations will result in 3,500 kW of compression power being available at both stations. Having regard for the compression power to be available after upgrading of the compressor stations it appears that looping of the Mt Franklin to Ballan should not be necessary during the Forthcoming Period. This observation has been subsequently confirmed by VENCorp using the Gregg Engineering model of the PTS.

Looping of the Mt Franklin to Ballan pipeline is not presently required.

[45] Page 4 of Sunbury (Planning) Report, Vencorp, March 2007
[46] Page 8 of Ballarat (Planning) Report, Vencorp, March 2007.

6.4 Warrugul Loop

Modelling of the Warragul lateral on the basis of peak hourly gas flows confirms there is a risk that minimum gas pressure requirements at Warrugul might not be satisfied. VENCorp's review of options to resolve the problem[47] is comprehensive and is supported. Looping of the 100 mm diameter section of the Warrugul lateral represents the best option for pursuit.

The estimated cost of looping the Warrugul lateral with 150 mm diameter pipeline is $4.84m. This is equivalent to $6,700 per mm-km ($168,000 per inch-km), which is high when compared with what is achievable for long-distance pipeline construction in open country. There are several reasons for the high cost-rate, including the following.

- The pipeline will be constructed in confined space within road reserves and, for significant parts of its length, beneath roads and car parks. This leads to significant difficulty and costs in relation to accessibility, traffic management, handling of spoil and reinstatement.

- Owing to proximity to populated areas and the use of road reserves, it is likely that only small lengths of pipeline trench will be able to be left open at night. Construction rates will be low.

- A drilled crossing of the Princes Highway is required.

An independently prepared estimate of the cost of the Warrugul loop line is presented in Table 7.

Table 7: Estimated Cost of Warrugul Loop

Item	Independent Estimate[48] (+/- 30% accuracy)
Linepipe, delivered	$0.401m
Construction	$2.47m
Facilities & hot-taps	$0.510m
Access, approvals	$0.125m
EPCM and owner's costs	$0.526m
Provision for Unidentified	$0.403m
Total	$4.434m

The GasNet estimate is approximately 9% higher than the estimate set out above. It is possible that the primary reason for the difference in

[47] See Warrugul (Planning) Report dated March 2007.
[48] Prepared by Sleeman Consulting using industry indicative data.

estimates is the inclusion by GasNet of a 20% contingency as opposed to the 10% provision for unidentified costs that is included above.

The GasNet estimate is considered to be reasonable and consistent with good industry practice.

6.5 Pakenham Loop

The erosional velocity (not to be exceeded) for an 80 mm diameter pipeline operating at a pressure of 2.76 MPa is dependent upon gas quality related characteristics but will be of the order of 25 m/s.

It is predicted[49] that flow velocities in the Pakenham lateral may reach 22 m/s (80 km/h) during peak periods by 2009. Although the predicted peak gas flow velocity occurs at a gas pressure below 2.76 MPa it is, nonetheless, high enough to be of concern. While looping of the remaining 80 mm diameter section of the Pakenham lateral is not an absolute technical requirement, it is accepted as a prudent initiative[50].

An independently prepared estimate of the cost of the short (500 metre length) loop line is presented in Table 8.

Table 8: Estimated Cost of Pakenham Loop

Item	Independent Estimate[51] (+/- 30% accuracy)
Linepipe, delivered	$0.060m
Construction	$0.626m
Access, approvals	$0.030m
EPCM and owner's costs	$0.357m
Provision for Unidentified	$0.107m
Total	$1.181m

The cost estimate set out above is marginally (around 3%) lower than the estimate prepared by GasNet ($1.220m). It is however important to note that estimate set out above includes a cost penalty associated with procurement of a small order of linepipe (around 26 tonnes). The cost penalty has been included since the tabulated cost estimate has been prepared on a stand-alone project basis. It is probable (indeed desirable) that GasNet avoid the cost penalty[52] through coordination of

[49] The VENCorp prediction (ie, 22 m/s) has been confirmed. The peak gas flow velocity occurs at a location along the lateral where the gas pressure is below the MAOP.
[50] Acceptance of the need for looping should not be construed as an endorsement of the use by GasNet of a 15 m/s flow velocity limit. A 15 m/s limit is reasonable for a pipeline operating at a pressure of around 7 MPa (corresponding with the rating of much of the PTS) but is unnecessarily low for infrastructure with a lower operating pressure.
[51] Prepared by Sleeman Consulting using industry indicative data.
[52] The linepipe provision incorporated in GasNet's estimate of the cost of the Pakenham loop is at a level the reflects purchasing efficiency.

its material acquisitions (in particular, by purchasing linepipe for the Warrugul and Pakenham projects at the same time). Avoidance of the cost penalty would reduce the tabulated cost estimate to approximately $1.16m, which is 5% below the GasNet estimate.

The cost of constructing and commissioning the short Pakenham loop line is particularly sensitive to the impact of costs that are relatively fixed in nature (like mobilisation and hot-taps and some engineering activities). It will be desirable, to the extent practical, for GasNet to coordinate the Warrugul and Pakenham looping projects. This may allow some economies to be realised, for example, through sharing of mobilisation costs.

GasNet's estimate of the cost of installing the Pakenham looping is reasonable, prudent and consistent with good industry practice.

6.6 Stonehaven Compressor

Development of a new compressor station at Stonehaven has been presented as a logical staged development to supplement construction of the Brooklyn to Lara (Corio loop) pipeline.

While it is accepted that:

- installation of compression is frequently the preferred means for expanding the capacity of a gas transmission pipeline; and

- the South West Pipeline ('SWP') represents a constraint on overall PTS capacity (since gas is available from Iona and SEAGas at rates in excess of the 307 TJ/d deliverable through the SWP)

it does not follow that development of the Stonehaven Compressor Station is a necessary or most logical development of the PTS.

The following observations are relevant.

a) The precise nature and extent of concerns regarding the performance of the PTS has yet to be quantified.

   Extrapolation of information presented in VENCorp's Gas Annual Planning Report 2006 suggests that 1 in 20 peak winter day demands in 2012[53] although the total winter requirement for LNG will probably approach the full capacity of the LNG storage facility[54]. Concern in this regard could easily be overcome with a modest increase in system linepack[55]. In contrast, the addition of

[53] Refer to table 6.2 of Gas Annual Planning Report 2006.
[54] Refer to table 6.4 of Gas Annual Planning Report 2006.
[55] For example, see page 30 of Vencorp Gas Annual Planning Review 2004. A 19 TJ increase in linepack was assessed to reduce peak day dependence upon LNG by 30 TJ.

compression at Stonehaven gives no increase in system linepack[56].

b) Since the nature and extent of PTS performance concerns is unquantified, estimation of system wide benefits (that could accrue from addition of compression at Stonehaven) by comparison with benefits arising from development of the Corio loop is, at best, indicative and, potentially, erroneous. If there is little or no need for the proposed enhancement, little or no benefit will be realisable.

c) If there is a need for development of the PTS it would be prudent for alternative development options to also be identified and assessed.

For example, there may be significant scope to optimise the way in which the SWP is operated. A modest increase in gas pressure at the Iona inlet to the SWP will increase the capacity[57] and efficiency[58] of the pipeline, increase linepack within the pipeline and, potentially, deliver benefits in terms of available gas pressure at Brooklyn (with a reduction in Brooklyn compressor loadings or a beneficial[59] increase in gas pressures in the Brooklyn to Ballan pipeline). An initiative of this nature might increase heater loadings at Lara and Brooklyn and, in this regard, it is noted that upgrade of relevant heating facilities is already planned[60]. VENCorp has indicated that operational issues[61] could result from higher gas pressures. The operational issues as described may be resolvable through improved operational management complemented, if necessary, by minor system enhancements such as refinement of regulator set points or possible addition of flow control valves at some locations.

Alternatively, the use of looping would increase both system capacity and linepack without incurring ongoing costs associated with compressor operations and maintenance.

The proposed Stonehaven Compressor Station does not satisfy the conditions for its cost to be included in the Capital Base as a forecast New Facilities Investment. The conditions cannot be satisfied until such time as PTS constraints have been quantified, options for

[56] See second paragraph on page 3 of Stonehaven (Timing and Planning) Report, VENCorp, April 2007.
[57] See figure 5.3 in VENCorp Gas Annual Planning Review 2004.
[58] A higher operating pressure reduces the volume of, and flow velocity at which, gas is to be delivered, leading to an exponential reduction in friction losses.
[59] An increase in pressure in the Brooklyn to Ballan pipeline will help to resolve concerns regarding gas pressures at Sunbury and Ballarat. See Sections 6.2 and 6.3 of this Report.
[60] See Section 6.10 of this Report.
[61] See page 47 of Gas Annual Planning Review 2004.

addressing those constraints properly investigated and thorough economic analyses completed to determine which option is optimal.

6.7 Carisbrook Loop

On the basis that the recommendations of the Northern Zone augmentation (as described in Section 6.1 of this Report) is completed it does not appear[62] that gas pressure issues will arise at Carisbrook.

VENCorp has provided[63] an eloquent explanation for the difference between its predictions and those of GasNet. In essence:

- the presence of a non-return valve at Carisbrook (on the inlet to Gas Pipelines Australia's Horsham Pipeline) leads to gas flows measured at Carisbrook not being indicative of actual gas usage at locations supplied by the Horsham Pipeline. When gas pressures at Carisbrook are lower than the gas pressure in the Horsham Pipeline, no gas flows into the Horsham Pipeline. When gas pressures at Carisbrook are high in relative terms, gas flows at relatively high rates into the Horsham Pipeline;

- GasNet has used measured Carisbrook flows (which are much higher than actual deliveries from the Horsham Pipeline and which occur at times of high, rather than low, Carisbrook pressure) in its modelling of the Carisbrook lateral. As a result, gas flow requirements have been overstated and gas pressure problems inadvertently predicted.

The proposed Carisbrook pipeline looping should not be approved as a New Facilities Investment.

6.8 Brooklyn Lara (Corio) Loop

Justification for and the cost of developing the Brooklyn to Lara (Corio) Loop have been comprehensively investigated on previous occasions.

The ACCC's Report titled "GasNet Australia Major System Augmentation – Corio Loop" dated 6 June 2006 confirmed that the conditions for inclusion in the Capital Base would be satisfied by the proposed Corio Loop project.

Accordingly, further review of the proposed Corio Loop development is not necessary.

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[62] This judgement is based upon: simplified, steady-state modelling carried out by Sleeman Consulting using forecast peak day and estimated peak hour flow rates; and, more significantly, transient analyses undertaken by Vencorp using the Gregg Engineering Model.
[63] See Vencorp Report "Analysis of Carisbrook Flows:, April 2007.

6.9 Brooklyn - Wollert Easements

Conceptually, development of a high-pressure east - west gas pipeline link around Melbourne has appeal in that it may allow improved system and linepack management, particularly in the event of an interruption to normal gas supplies. However, there is not yet any suggestion that development of such a link is presently, or will necessarily in future be, justified.

Ultimately, determination of whether development of an east - west link is justified will need to take into account the value of benefits that will be generated.

In the absence there being a demonstrable need for an east - west link it is difficult to conceive how a pre-investment in acquisition of easements (to facilitate future development of the link) will satisfy any of the conditions[64] set out in Paragraph 8.16(b) of the Code. In respect of those conditions a pre-investment in easements:

i) will not generate incremental revenue;

ii) cannot be considered to have system-wide benefits given that the need for an east - west link is conceptual only; and

iii) is not necessary for safety, integrity or contracted capacity reasons.

Notwithstanding the comments set out above, if GasNet is confident that development of an east - west link will, in future, be necessary then the merit of acquiring easements now is evident. It is probable that the easement acquisition costs would qualify for treatment as a speculative investment. Consideration of speculative investment matters is beyond the scope of this Report.

6.10 Gas Heating Facilities

Increases in Otway and Yolla gas injections will lead to:

- higher gas pressures at some locations within the PTS (and hence a need for additional pressure reduction at points of gas supply into the distribution system); and

- changes in the composition of gas transported through the PTS (as already mentioned in Section 4.5 of this Report).

The installation of gas heaters is a reasonable, prudent and industry standard measure to ensure gas temperatures are above contract and

[64] These are conditions, one of which must be satisfied in order that the cost of a New Facilities Investment to be added to the Capital Base.

regulatory requirements and to ensure liquids do not drop out of the gas stream.

GasNet proposes to install gas heaters as summarised in Table 9.

Table 9: Proposed Gas Heater Installations

Location	Heater Size	Heater Cost
Lara	Install 2 x 2,000 kW at Brooklyn; relocate Brooklyn heater to Lara	$0.5m
Brooklyn		$2.27m
Dandenong	5,000 kW	$3.44m
Wandong	500 kW	$1.18m
Clonbinane	500 kW	$0.81m
North Laverton	100 kW	$0.51m
Dandenong	500 kW (replacement of Morwell back-up up)	$0.50

Detailed assessments of heater sizing requirements have not been carried out for the purpose of this Report. The need for installation of gas heaters is clear, and it is accepted that the heater sizes as proposed by GasNet are appropriate. By inspection, the heater sizes proposed by GasNet can be seen to reflect the relative gas throughputs and pressure drops at the various locations.

In addition to the installation of heaters, but not separately identified by GasNet, the programme of works outlined in Table 9 includes the following activities.

- installation of coriolis metering skids at North Laverton, Clonbinane and Wandong. The new metering facilities are required to measure the quantity of gas used as fuel in the heaters (since the fuel gas must be paid for by GasNet); and

- installation of a gas chromatograph at Wandong. GasNet considers the gas chromatograph may be required to provide gas quality information for Northern Zone billing purposes, given variability in gas composition with changes in gas sourcing. More specifically, it is possible that operating circumstances could arise whereby gas flows from the Ballarat system into the Northern Zone via Wandong.

  It is understood that VENCorp has not yet determined that gas quality measurement facilities are required at Wandong. Until such time as a determination is made it is inappropriate to make provision for the gas chromatograph installation. Removal of the gas chromatograph cost reduces the total Wandong project cost to $0.84m (on the basis of owner's cost and contingency percentage s as used by GasNet).

The project costs set out in Table 9 are aligned with but higher than industry indicative prices for packaged gas water-bath heaters, as summarised in Table 10, and coriolis metering installations.

Table 10: Industry Indicative Gas Heater Costs

Size	Equipment Cost	Installed Cost (Greenfield)
100 kW	$0.1m	$0.2m
2 MW	$0.6m	$1.1m - $1.2m
5 MW	$0.85m	$1.5m - $1.7m

While it is accepted there will be additional costs associated with addition of equipment to existing, pressurised facilities, it has been noted that GasNet's cost estimates include a provision for owner's costs, typically of the order of 15% to 17%, plus contingencies of 20%. While the precise scope of work at each location has yet to be finalised, GasNet's proposed add-ons to the installed costs of the heaters and associated facilities are generous.

The owner's cost provision covers project and site management, commissioning, spare parts, updating of operating and maintenance procedures and staff training. It is considered likely that the combined effect of making generous provisions for owner's costs and for contingency will be that the project cost estimates are skewed. Rather than being central cost estimates (ie, equal likelihood of being low or high) they will be estimates that should be unlikely to be exceeded.

Provisions of 10% for both owner's costs and unidentified[65] costs (given the preliminary nature of the cost estimate) are considered reasonable and appropriate.

If owner's costs and the provision for unidentified costs are both limited to 10%, the total provision for installation of gas heaters (not including the Wandong gas chromatograph) will be reduced from $9.21m to $7.25m. The lower figure is considered appropriate for utilisation in tariff setting.

6.11 City Gate Works

Upgrades are proposed for the Brooklyn, Lara and Dandenong City Gates. In essence, the upgrade works involve essential replacement of equipment that has reached the end of its working life. City Gate upgrade work to be carried out is summarised in Table 11.

[65] Given the preliminary nature of the cost estimate, made without specific identification of all items of equipment.

Table 11: Scope of City Gate Upgrade Work

	City Gate		
Upgrade Work	Brooklyn	Lara	Dandenong
Instrument air	✓		
Fuel gas	✓	✓	
Liquids collection	✓	✓	✓
Regulators and Control systems	✓	✓	✓
Bypass	✓		
Other	Ballan pressure limiter	-	-
Cost	$4.03m		$2.65m

The total cost of the city gate upgrade work is estimated by GasNet to be $6.68m, of which it is understood $2.65m[66] relates to Dandenong City Gate upgrade work that was originally planned for the Second Access Arrangement Period but, owing to equipment availability problems, was delayed.

The scope of work being carried out is as outlined below.

- The Brooklyn instrument air system (for dry seal compressors) is to be extended to operate other site equipment and some storage capability developed.

- Fuel gas system upgrades are required to provide fuel for operation of gas fired heaters.

- Liquids collection facilities are to handle both liquids drop-out from the gas stream and possible slugs of liquid.

- New regulators are required to replace obsolete hydraulically operated valves that are unreliable and require high maintenance. Replacement regulators will be slam-shut, fail-safe configuration and will be sourced through competitive tender. The cost of individual regulators (not including control systems or installation) is likely to be around $30,000 each. There are seven regulators to be replaced at Dandenong.

- Control system upgrades are required to allow reliable, automated control of pressure regulators. Existing systems require operator intervention (several times daily) to adjust regulator set points.

[66] GasNet has indicated that the estimated cost of the deferred Dandenong works is $6.09m. Of this, $3.44m represents the cost of a heater installation (outlined in Section 6.10 of this Report) cost.

- The bypass upgrade at Brooklyn is required to meet safety and regulatory requirements. The present bypass system is based upon a non-return valve only, without over-pressure protection.

To the extent that component costs of the proposed city gate works have been available for review they have been found to be consistent with industry pricing expectations. However, as has been the case with other proposed NFI amounts, contingency provisions appear to be excessive[67]. It is recommended the contingency provision be treated as a provision for unidentified costs and set at 10%. A provision of this magnitude should cover the cost of unidentified items (ie, items not specifically identified during a preliminary, industry indicative costing exercise).

It is considered a provision of $6.18m would be reasonable, prudent and consistent with good industry practice.

6.12 Pipeline Upgrades

The following specific pipeline upgrade projects are to be carried out during the Third Access Arrangement Period.

i) Fitting of pig trap to Keon Park to Wollert Pipeline

The Keon Park to Wollert pipeline (Licence number 101) is 600 mm diameter with an operating pressure up to 2,760 kPa and a length just over 14 km. The pipeline is now 30 years old and, to confirm its integrity, intelligent pigging is necessary.

To allow intelligent pigging to be carried out pig launching and receival facilities must be installed at each end of the pipeline. The estimated cost of this work is $1.57m[68]. Having regard for the cut into live gas pipelines without causing disruption to gas supply, and the built up nature of the area in which the work is to be carried out (particularly at Keon Park) GasNet's estimated cost is reasonable. For comparative purposes it is estimated the cost of installing pigging facilities on a greenfields basis would be of the order of $0.45m per facility (giving $0.9m for two facilities). To provide for costs associated with performance of the work on a live gas pipeline in a built up area an uplift of 75% is reasonable, particularly given experience with the South Melbourne cut-in (see section 5.2) where the costs were more than doubled as a result of such requirements.

[67] The provisions have the effect of making the cost estimates of an order that is unlikely to be exceeded rather than a mid-range estimate (with equal likelihood of being exceeded or bettered).

[68] The GasNet Access Arrangement Submission referred to a cost of $2.45m. GasNet has confirmed the correct value is $1.57m.

The proposed cost of $1.57m is considered reasonable, prudent and consistent with good industry practice.

ii) Dandenong to Brooklyn Line Valve Automation

Fifteen line valves located along the Dandenong to Brooklyn pipelines (Licence numbers 36 and 108) are to be automated to allow isolation of gas flows in the event of an emergency. Automated operation is a prudent upgrade since the pipelines pass through built up areas and have limited accessibility. The estimated cost of this work is $3.24m[69], representing $216,000 per installation. This is slightly more than 50% of the estimated cost of a main line valve installed on a new build basis in a location without access constraints. In addition to the installation of valve actuators, the valve control systems must be linked to the network communications system.

iii) Emergency Vent Upgrades

Emergency vents on the Dandenong to West Melbourne pipeline (Licence number 36, 750 mm diameter, 36 km long) and the Pakenham to Wollert pipeline (Licence number 141, 750 mm diameter, 93 km long) are to be replaced. The existing Unibolt enclosures at 22 locations are no longer serviceable and are not compliant with modern operating requirements. For example, to perform a blowdown with the present configuration would require the operator to stand beneath the vent facility. A provision of $0.4m[70] for this work (representing around $18,000 per site) is reasonable.

In addition to the items set out above, GasNet's overall provision for pipeline upgrade work includes a further amount of $4.44m. The further amount represents the aggregate of annual provisions for replacement of cathodic protection facilities ($0.44m), carrying out pipeline risk assessments in accordance with AS 2885 ($2.0m) and repair of pipeline coating ($2.0m). GasNet has indicated the provisions reflect past experience. The provisions (particularly for pipeline risk assessments) are not unreasonable and it will be necessary for the ACCC to ascertain whether it is appropriate for 'provisions' to be included in forecast NFI.

A total amount of $5.21m is considered reasonable and prudent in respect of pipeline upgrade activities. A further amount of $2.0m, being provision for pipeline risk assessments, is recommended as reasonable. A determination is required regarding handling of the balance of $2.44 m, representing further provisions.

[69] This is a correction of the estimate of $4.13m as set out in GasNet's Access Arrangement Submission.
[70] Corrected from $1.29m as set out in GasNet's Access Arrangement Submission.

6.13 Safety and Security Systems

a) Security

Section 5.5 of this Report overviews the need for:

- implementation of security measures to comply with the Victorian *Terrorism (Community Protection) Act 2003*; and

- completion of Formal safety assessments in accordance with the Victorian *Gas Safety (Safety Case) Regulations 1999.*

The safety and security related expenditure, as outlined above, is clearly necessary to maintain the safety and integrity of the PTS. Since the expenditure is being made in accordance with legislative requirements (the purposes of which are risk mitigation and safety) it would be counter-intuitive to suggest otherwise.

An itemised break-down of the costs of security related facilities (ie, fencing, alarms, lighting and closed-circuit television) to be installed at nominated locations has been provided by GasNet. The recommended security works, and the cost thereof, have been independently formulated on behalf of GasNet by a security industry specialist (Counterisk Australia Pty Ltd). The forecast security related costs of $2.93m are reasonable, prudent and consistent with industry best practice.

b) Safety

GasNet has also proposed an amount of $1.32m be included as forecast NFI for tariff setting purposes. The amount is to cover the cost of continuing the hazardous area risk assessments (referred to in Section 5.5) and the cost any replacement or upgrade of electrical equipment that is identified as necessary. Given the comprehensive nature of the work to be carried out during 2007 (covering 20 regulator sites and 7 compressor stations) it is anticipated a considerable portion of the proposed expenditure will be by way of provision for replacement or upgrade work that might prove to be required. The ACCC will need to make a determination as to the suitability of such amounts for inclusion in forecast NFI.

Overall, a provision of $2.93m for Safety and Security related activity is considered reasonable, prudent and consistent with industry best practice with a determination to be made regarding the treatment of the balance of $1.32m as forecast NFI.

6.14 Brooklyn Compressor Station

The Brooklyn Compressor Station presently incorporates seven compressors, as identified in Table 12. GasNet proposes to refurbish the station so that, after refurbishment, it will house four Solar Centaur compressors[71] with capability to pump gas to Geelong, Bendigo, Corio or the South West Pipeline.

Sleeman Consulting supports GasNet's refurbishment proposal for reasons as summarised below

- The steady-state model developed by Sleeman Consulting to approximate the peak-period operation of the PTS suggests that the availability of compression power at Brooklyn represents a significant constraint upon the capacity of the PTS, particularly to deliver gas to Ballan and Ballarat. Improvements in performance of the Brooklyn Compressor Station may allow avoidance or deferral of pipeline looping work proposed for the Ballarat Zone[72].

- The proposed use of four Solar Centaur compressors (rather than some combination of Centaur and Saturn units) takes advantage of scale economies[73] and will ensure both a high level of reliability and the availability of full powered back-up.

- Many of the facilities presently installed at Brooklyn are sub-standard or antiquated (for example, the relay-based control systems used on the Solar Saturn compressors), the site is congested and poorly laid out, and compressor change-outs (to dry-seal configuration) are required. The proposed four Centaur layout will resolve all of these issues.

[71] The refurbishment will involve installation of two additional Solar Centaur compressors (one of which will be a replacement for unit 10), removal of all existing Solar Saturn compressors and rationalisation of the layout and configuration of the station.
[72] This is addressed in Sections 6.2 and 6.3.
[73] The cost per kW of installed compression power declines as unit size increases.

Table 12: Existing Brooklyn Compressor Units

Unit Number	Type	Comment
6	Solar Saturn T1202	installed 1979
7	Solar Saturn T1300	installed 1979
8	Solar Saturn T1200	installed 1982
9	Solar Saturn T1300	installed 1982
10	Solar Centaur T4000-C306	Integrated skid: cannot be upgraded to dry-seal. Can only pump to Geelong.
11	Solar Centaur T4000-C337	Dry-seal compressor. Can only pump to Geelong.
12	Solar Centaur T4700-C336	Installed 2007. Has dry-seal compressor.

The present cost of a Solar Centaur 40 compressor package is of the order of US$4 m (A$5m). The total cost, including installation, can be expected to be around three to five times the unit cost depending upon factors such as location and number of units being installed. In addition, for Brooklyn provision needs to be made for:

- demolition and removal of existing facilities; and

- relocation of compressor number 11 with acquisition of new ancillaries.

Having regard for the above, an estimate of the cost of compressor upgrade work to be carried out at Brooklyn is set out in Table 13.

Table 13: Forecast Cost of Brooklyn Compressor Upgrade

Item	Cost Estimate
Solar Centaur[74] Package x 2	$10m
Package installation (mid-range estimate)	$30m
Relocate[75] Compressor No 11	$7.5m
Demolish and remove redundant plant	$2m
Total estimated cost	$49.5

[74] Solar Centaur T4700-C336 gas compressor packages are to be installed. They will be referred to as units 13 and 14.

[75] Remove, reinstall and upgrade relevant infrastructure (eg cooling). Provision is based upon 50% of the mid-range cost of installing the new Centaur compressors.

The cost estimate set out in Table 13 is derived on a different basis to the estimate presented by GasNet, but is of identical magnitude. The total refurbishment programme cost as estimated by GasNet is $49.57m[76]. GasNet's cost estimate is considered to be reasonable, prudent and consistent with good industry practice.

GasNet has advised that its experience is that compressor packages removed from service are unsaleable, except for scrap value. Nonetheless, the possibility that the Solar Saturn compressors to be removed from the Brooklyn Compressor Station could be relocated[77] or sold should not be discounted. Consideration as to whether and how this should be taken into account is beyond the scope of this Report.

6.15 Wollert Compressor Station

GasNet proposes to substantially redevelop the Wollert Compressor Station. The three existing Solar Saturn wet-seal compressor sets presently installed at Wollert are to be replaced by two new Solar Centaur dry-seal compressors. GasNet's proposed redevelopment is strongly supported since:

- it ensures compression power is available to meet predicted requirements;

- represents the lowest cost option, both in capital and ongoing operations and maintenance terms; and

- results in improvements to overall efficiency, even if full power is not required[78], and reductions in environmental emissions.

The present cost of a Solar Centaur 40 compressor package is of the order of US$4 m (A$5m). The total cost, including installation, of the units can be expected to be around three to five times the unit cost depending upon factors such as location and number of units being installed. The total refurbishment programme cost as estimated by GasNet is $39.56m[79] which is four times the component cost of two Centaur packages. Since the total cost estimate includes provision for decommissioning and removal of existing pipework and compression equipment it is considered reasonable.

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[76] This amount includes: fitting of fire suppression equipment to units 10 and 11 ($270,000); and new fuel gas system ($600,000)

[77] For example, a Solar Saturn compressor (refurbished and converted to dry-seal configuration, if necessary) could be well suited for use in expansion of the capacity of other pipelines (such as the Carpentaria Gas Pipeline). There is presently a long-lead time for acquisition of gas turbine compression equipment which is likely to enhance the value of second-hand units.

[78] A Solar Centaur turbine at 50% load is marginally more efficient that a Solar Saturn turbine at full load.

The amount of $39.56 is accepted as being reasonable, prudent and consistent with good industry practice. This amount is included in the cost of the Northern Zone augmentation, discussed at Section 6.1 of this Report.

In addition to the $39.56m provision for redevelopment of the Wollert Compressor Station, GasNet has proposed that $1.58 be provided for the cost of a fuel gas system to comply with Solar technical requirements ($1.53m) and fencing upgrades ($0.05m). Information provided by GasNet indicates that the cost of a fuel gas skid (including heating) has already been included in the $39.56m redevelopment cost.

The $0.05m provision for fencing upgrades is accepted as being reasonable, prudent and consistent with good industry practice and should not be included as a forecast New Facilities Investment for tariff setting purposes.

6.16 Other Compression Work

The following further compressor stations upgrade work is proposed for the Third Access Arrangement Period:

- Overhaul of a Gooding compressor unit and installation of a fire suppression system.

  Under alliance arrangements like those in place between GasNet and Solar, compressor overhaul costs are understood to be a function of operating hours. It could be expected that overhaul of a Centaur compressor would cost around $0.5m after 30,000 hours of operation (in accordance with manufacturer's recommended service requirements). GasNet's provision for overhaul costs is lower than this indicative value and is therefore considered to be reasonable, prudent and consistent with good industry practice.

  GasNet has also made provision for installation of a Marioff hi-fog fire suppression at Gooding. It would be imprudent to continue long-term operations without installation of a fire suppression system. The Marioff system has proven effectiveness in suppressing oil and gas fires in turbo-machinery applications, and is an appropriate system for use by GasNet. A cost provision of $0.54m as proposed by GasNet is based upon vendor pricing and is considered reasonable, prudent and consistent with good industry practice.

- Installation of a fire suppression system at the Iona Compressor Station and upgrade of the station control system.

  A Marioff fire suppression system is to be installed at Iona. Again, the system cost ($0.3m) is based upon vendor pricing and is reasonable, prudent and consistent with good industry practice.

GasNet has made provision of $1.62m for upgrading of the Iona Compressor Station control system during the Third Access Arrangement Period. While upgrading of the system will eventually be required, it is reasonable to expect that the existing system (which was installed in 2001) will be serviceable and reliable until at least 2012. Premature upgrading of the compressor control system would not be reasonable or consistent with good industry practice. Should it ensue that early upgrading must be carried out, the indexed costs thereof may be taken into account in subsequent regulatory resets without disadvantage to GasNet.

A total provision of $1.29m for other compressor work is considered to be reasonable, prudent and consistent with good industry practice.

6.17 Other Refurbishments and Upgrades

It is understood GasNet has identified 19 projects of various sizes, with an average cost of $0.86m per annum, that may be undertaken during the Third Access Arrangement Period.

There was not sufficient information available during preparation of this report to facilitate an assessment of the extent to which expenditure on such refurbishments and upgrades will satisfy the requirements of the Code. Accordingly, no view is expressed regarding the requirement for or prudence of the proposed expenditure, or whether it can be accepted as reasonable, prudent or consistent with good industry practice.

If expenditure proves to be necessary GasNet will be able to have the indexed amount of such expenditure included in tariff setting arrangements for subsequent periods.

7 Conclusions

Table 14 provides a summary and comparison of NFI provisions as proposed by GasNet and as recommended herein.

In total, adjustments of $121.31m have been identified. The adjustments:

- relate in the main to items of capital work that it is considered should not be required during the Third Access Arrangement Period; and
- include $4.07m that is contingent upon a determination by the ACCC regarding whether or not it is appropriate for provisions to be included in New Facilities Investments.

Table 14: New Facilities Investment Amounts

New Facility	GasNet Forecast of NFI	Accepted Forecast of NFI
Actual Investments Envisaged Prior to Concluding Period		
Refurbish Gooding Compressor	$16.03m	$16.03m
Refurbish Lurgi Pipeline	$2.82m	$2.82m
City Gate Upgrades and Heaters	$5.38m	$5.38m
Automate Wollert Compressor	$2.76m	$2.76m
Gas Chromatographs	$0.46m	$0.46m
Other Maintenance Capex	$4.70m	$4.70m
Actual Investments Not Envisaged Prior to Concluding Period		
Redevelop Brooklyn Compressor	$17.46m	$17.46m
South Melbourne Cut In	$2.98m	$2.98m
Wollert Compressor Miscellaneous	$2.15m	$2.15m
Pig Traps	$0.72m	$0.72m
Safety and Security	$0.79m	$0.95m
Iona Cooler Upgrade	$0.70m	$0.60m
Regulators Work	$0.42m	$0.42m
Maximo	$1.37m	$1.37m
Corporate Restructuring	$8.84m	none
Investments Forecast to be Required in Forthcoming Period		
Northern Zone Augmentation	$79.03m	$77.3m
Sunbury Loop	$12.46m	none
Ballarat Loop	$29.03m	none
Warragul Loop	$4.84m	$4.84m
Pakenham Loop	$1.22m	$1.22m
Stonehaven Compressor	$26.17m	none
Carisbrook Loop	$24.05m	none
Brooklyn Lara (Corio) Pipeline	$63.71m	$63.71m
Brooklyn - Wollert Easements	$5.37m	none
Gas Heating Facilities	$9.21m	$7.25m
City Gate Works	$6.68m	$6.18m
Pipeline Upgrades	$9.65m	$7.21m*
Safety and Security Systems	$4.25m	$2.93m*
Brooklyn Compressor Station	$49.57m	$49.57m
Wollert Compressor Station	$1.58m	$0.05m
Other Compressor Station Work	$2.96m	$1.29m
Other New Facilities	$4.30m	none

* Amount contingent upon possible inclusion of cost provisions.

Attachment 1: Gooding Compressor Station Refurbishment Costs

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Attachment 2: Maintenance Capex

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