

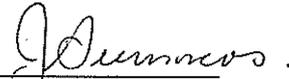
Service Envelope Agreement - Amendment under clause 18.3

- 1 APA GasNet Australia (NSW) Pty Ltd, APA GasNet Australia (Operations) Pty Ltd and Australian Energy Market Operator Limited agree to amend the Service Envelope Agreement made between them in the following manner:
 - (a) Delete Schedule 1 of the Service Envelope Agreement and replace it with the new Schedule 1 set out in Attachment 1 to this document.
- 2 The amendment shall commence operation on the following date: 1 July 2013.
- 3 Each party is bound by the Service Envelope Agreement as amended by this document.

CLAUSE 18.3

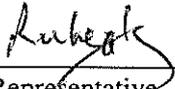
Signed

By **APA GasNet Australia (NSW) Pty Ltd** by its authorised representative in the presence of:


Witness

Jillian Summers
Print Name

02 October 2013
Date


Representative

R. A. Wheals
Print Name

2 October 2013
Date

Signed

By **APA GasNet Australia (Operations) Pty Ltd** by its authorised representative in the presence of:

J. Summers.
Witness

Jillian Summers.
Print Name

02 October 2013
Date

R. A. Wheals
Representative

R. A. Wheals
Print Name

2 October 2013
Date

alson/11/11/11 Signed

By **Australian Energy Market Operator Limited** by its authorised representative in the presence of:

B. Hausler
Witness

Brett A Hausler
Print Name

24/10/13
Date

D. Swint
Representative

David Swint
Print Name

24/10/13
Date

Attachment 1 - New Schedule 1 to the Service Envelope Agreement

Schedule 1 - APA GasNet System Facilities

1 Introduction

This Schedule 1 replaces Schedule 1 to the TPA Service Envelope Agreement dated 22 January 1999, as amended 2 June 1999, November 2006, December 2007 and September 2012.

Schedule 1 sets out the facilities which comprise or will comprise the APA GasNet System, and also the operating constraints and availabilities affecting or relevant to those facilities and to the APA GasNet Service Envelope Capacity.

Whilst most of the facilities described in this Schedule 1 form part of the APA GasNet System as at the date on which the amendments to this Schedule are executed, some of the facilities will become part of the APA GasNet System at a date in the future. These other facilities will become part of the APA GasNet System in accordance with clause 3.1 of this Agreement and as more fully described in section 2.1 of this Schedule 1 below.

1.1 Deleted

1.2 Definitions

- (a) In this Schedule, unless the context otherwise requires, and in addition to the definitions contained in clause 1.1 of this Agreement:

“Assets” means facilities and vice versa.

“Availability” means the availability of facilities included in the Service Envelope for 100% of 24 hours per day for all days of the year less AEMO approved maintenance less any operational ramp up times associated with particular types of facilities.

“Good design practice” means Good Practice and vice versa.

“Licence” means:

- (i) a permit to own and use a pipeline;
- (ii) a licence to construct and operate a pipeline; or
- (iii) a licence to operate a pipeline only,

issued to APA GasNet under the Pipelines Act 2005 (Vic) and all amendments and variations of, and substitutions to, such licences from time to time.

“Maintenance” includes upgrades, refurbishments and similar work.

“Nominal Power” means the shaft power of an industrial gas engine at standard ISO condition of 15⁰C, at sea level, for natural gas fuel approved by the engine supplier for use in the engine at 60% relative humidity, zero inlet and exhaust losses.

- (b) In this Schedule, unless the context otherwise requires,
- (i) All references to engineering documentation such as key plans, site layouts, assembly, process and instrumentation drawings (P&ID) form part of the Service Envelope. Amendments to such drawings shall only be considered valid if mutually agreed to by all parties in writing. In default of agreement the Dispute Resolution Procedure shall apply.
 - (ii) The APA GasNet System assets include transmission system pipelines, pipe line valves, pressure regulator stations, gas compression stations, and telemetry facilities.
 - (iii) Regard shall be had to the common or usual gas industry or engineering descriptions of, and acronyms for, any place, asset, facility, thing, service, quantity, size or matter as an aid to interpretation of this Schedule.
 - (iv) A reference to any licence, permit, plan, drawing, design or other document includes a reference to that licence, permit, plan, drawing or other document as amended, revised, substituted and replaced from time to time as agreed by the parties from time to time in accordance with clause 18.3 of this Agreement.

2 Description of Assets

2.1 Pipelines

The Service Envelope covers the APA GasNet System.

The assets under the pipeline category within the APA GasNet System are located in accordance with the following key plan drawings and all revisions of those drawings agreed by the parties from time to time, initial copies of which are included in the Appendix 1.

The existing APA GasNet System - Part A

In this section 2.1, those assets described in Part A are assets which are included in the APA GasNet System as at the date of execution of the amendments to this Schedule 1.

Sections 2.2-2.6 describe all other assets (including but not limited to regulators, compressor stations and pipeline valves), section 3 describes design capability and section 4 describes operating constraints. These sections apply with immediate effect to the assets described in Part A of section 2.1, insofar as they affect or are directly associated with those Part A assets.

Extensions, expansions and other enhancements to the APA GasNet System - Part B

The assets described in Part B of this section 2.1 are subject to each of those assets and groups of assets becoming part of the APA GasNet System. Each of those assets and groups of assets may become part of the APA GasNet System at different times.

In addition, the operation of sections 2.2-2.6, 3 and 4 of this Schedule 1, insofar as these sections relate to the assets described in Part B of section 2.1, is subject to those Part B assets becoming part of the APA GasNet System.

Future extensions, expansions and enhancements to the APA GasNet System

If further extensions, expansions and enhancements are made to the APA GasNet System, the parties to this Agreement acknowledge and agree that, under clauses 3.1, 3.3, 3.4 and 5.1 of this Agreement, they are required to agree the effect of those changes and to update these Schedules accordingly.

Part A: Assets included in APA GasNet System as at date of execution of amendments to these Schedules

- (a) APA GasNet System, Longford - Dandenong - Wollert
A4 - 363 - 1
- (b) APA GasNet System, 750 diameter Dandenong - West Melbourne - Brooklyn
A4 - 363 - 2
- (c) APA GasNet System, Brooklyn - Geelong
A4 - 363 - 3
- (d) APA GasNet System, Ballarat - Bendigo
A4 - 363 - 4
- (e) APA GasNet System, Wollert - Albury - Echuca - Koonoomoo - Culcairn
A4 - 363 - 5
- (f) APA GasNet System, (Lara - Iona)
A4 - 363 - 7
- (g) APA GasNet System, North Paaratte - Portland, Cobden and Hamilton
A4 - 363 - 6
- (h) APA GasNet System, Truganina - Plumpton,
A4 - 363 - 3

Part B: Assets to be included in APA GasNet System

Nil

The pipeline assets include the provision of passive linepack as follows:

- (a) The pipelines owned and operated by GTC immediately prior to 11 December 1997 - 462,117 GJ;
- (b) Chiltern to Koonoomoo - 2,135 GJ;
- (c) Barnawartha North to Culcairn - 9,733 GJ;
- (d) Lara to Iona - 21,875 GJ;
- (e) Paaratte to Iona - 106 GJ;
- (f) Paaratte/Allansford/Portland/Cobden/Hamilton - 6,116 GJ; and
- (g) Epping to Somerton - 143 GJ.
- (h) Brooklyn to Lara – 8735 GJ
- (i) Truganina - Plumpton 2,505 GJ

2.1.1 APA GasNet System

Rural Eastern (Key Plan No. A4-363-1)

Licence 50 (part) - T1 Diameter 450 mm Morwell to Dandenong (Morwell to Dandenong)

The pipeline commences from line valve T001-LV16 near Morwell City Gate travelling in a westerly direction to Dandenong Terminal Station Frankston/Dandenong Road, Dandenong. The length of the pipeline is 126.8 km.

Licence 50 (part) - T1, 300 mm Diameter Supply to Jeeralang (Morwell to Dandenong)

This pipeline commences from branch valve T001-BV20 off the 450 mm Morwell to Dandenong pipeline travelling in an easterly direction to the Jeeralang Metering Station. The length of the pipeline is 0.4 km.

Licence 68 - T38 Diameter 80 mm Pakenham (Healesville - Koo-Wee-Rup Road)

The pipeline commences from branch valve T001-BV09 on pipeline licence 50 in Pakenham travelling along Healesville - Koo-Wee-Rup Road to Meter Station M040 at the Pakenham South City Gate at Healesville - Koo-Wee-Rup Road/Bald Hill Road. The length of the pipeline is 1.2 km.

Licence 67 - T37 Diameter 150 mm Maryvale (Supply to APM Maryvale)

The pipeline commences from two branch valves T060-BV05S and T060-BV05N on pipeline licences 75 and 117 in Tyers travelling in a southerly direction to A.P.M. Maryvale. The length of the pipeline is 5.4 km.

Licence 91 - T44 Diameter 100 mm Warragul (*Supply to Anderson Street, Warragul*)

The pipeline commences from branch valve T001-BV13 on pipeline licence 50 travelling in a northerly direction to Meter Station M090 near the regulator/station at Anderson Street/Princes Highway. The length of the pipeline is 4.8 km.

Licence 75 - T60 Diameter 750 mm Longford to Dandenong (*Longford to Dandenong*)

The pipeline commences from Longford Metering Station travelling in a westerly direction via Gooding Compressor Station to Dandenong City Gate in Frankston/Dandenong Road, Dandenong. The length of the pipeline is 174.2 km.

Licence 117 - T60 Diameter 750 mm Rosedale to Tyers (*Rosedale to Tyers*)

The pipeline commences from the tee after the line valve T060-LV02 on pipeline licence 120 near Rosedale-Limestone Quarry Road/Old Rosedale Road travelling in a westerly direction parallel and to the south of pipeline licence 75 to Tyers Pressure Limiter near Tyers Glengarry West Road. The length of the pipeline is 34.3 km.

Licence 107 - T32 Diameter 100 mm Clyde North (*Pound Road to Tuckers Road*)

The pipeline commences from branch valve T001-BV06 on pipeline licence 50 at Clyde North Offtake travelling along Pound Road in a southerly direction to Meter Station M038 near Clyde North regulator station at Tuckers Road. The length of the pipeline is 2.0 km.

Licence 120 - T60 Diameter 750 mm Longford to Rosedale (*Longford to Rosedale*)

The pipeline commences from the Longford Metering Station travelling in a westerly direction in parallel with and to the south of pipeline licence 75 to terminate at a tee on pipeline licence 117 after line valve T060-LV02S and at two branch valves T060-SV204 and T060-SV205 on the pipeline licence 75 at Old Rosedale Road. The length of the pipeline is 30.5 km.

Licence 121 - T63 Diameter 500 mm Tyers to Morwell (*Tyers to Morwell*)

The pipeline commences from the line valve T001-LV16 on pipeline licence no. 50 near Morwell City Gate at Fourth Avenue travelling in a northerly direction to the branch valves on the pipeline licences 75 and 117 at Tyers Pressure Limiter near Tyers Glengarry West Road. The length of the pipeline is 15.7 km.

Licence 135 - T60 Diameter 750 mm Bunyip to Pakenham (*Bunyip to Pakenham*)

The pipeline commences from two branch valves T060-SV804 and T060-SV805 on licence 75 at Line valve 8 at Doran Road travelling in a westerly direction parallel with and to the south of pipeline licence 75 to branch valves T060-SV904 and T060-SV905 and the welds on the tees on pipeline licence 141 at Line valve 9 at Dore Road, Princes Highway. The length of the pipeline is 18.7 km.

**Licence 141 - T61 Diameter 750 mm Pakenham to Wollert
(Pakenham to Wollert)**

The pipeline commences from the Pakenham Offtake (Line valve 9) at Dore Road/Princes Highway travelling in a north westerly direction to the Wollert Compressor Station along Summerhill Road. The length of the pipeline is 93.1 km.

2.1.2 APA GasNet System

Rural Central Northern (Key Plan No. A4-363-5)

Licence 101 (part) - T74 Diameter 300 mm Melbourne-Wodonga-Shepparton (Wollert to Wodonga)

The pipeline commences from Wollert Compressor Station near Summerhill Road travelling in a north easterly direction to Meter Station M091 at the Wodonga City Gate near Hume Freeway/Old Murray Valley Highway. The length of the pipeline is 269.4 km.

Licence 101 (part) - T59 Diameter 200 mm Melbourne-Wodonga-Shepparton (Euroa to Shepparton)

The pipeline commences from a branch valve T074-BV09 near Meter Station M064 at Euroa City Gate on the Wollert to Wodonga pipeline travelling in a north westerly direction to Meter Station M081 at Shepparton City Gate, Archer Street. The length of the pipeline is 34.5 km.

Licence 132 - T71 Diameter 200 mm Tatura (Shepparton to Tatura)

The pipeline commences from a weld west of line valve T059-LV02 on the pipeline licence 101 near Meter Station M081 at Shepparton City Gate, Archer Road travelling in a westerly direction to a weld west of line valve T071-LV05 on pipeline licence 132 at Meter Station M082 at Tatura City Gate, Dhurringile Road. The length of the pipeline is 16.2 km.

Licence 136 - T71 Diameter 200 mm Tatura to Kyabram (Tatura to Kyabram)

The pipeline commences from a weld west of line T071-LV05 on the pipeline licence 132 at Meter Station M082 at Tatura City Gate, Dhurringile Road travelling in a north westerly direction to a weld west of line valve T071-LV09 at Meter Station M067 at Kyabram City Gate at McEwan Road/Lilford Road. The length of the pipeline is 21.3 km.

**Licence 152 - T85 Diameter 150 mm Kyabram to Echuca
(Kyabram to Echuca)**

The pipeline commences from a weld west of line valve T071-LV09 at Meter Station M067 at Kyabram City Gate at McEwan Road/Lilford Road travelling in a north westerly direction to Meter Station M063 at Echuca City Gate at Echuca Road/Cornella Road. The length of the pipeline is 30.7 km.

**Licence 176 - T96 Diameter 200 mm Chiltern to Rutherglen
(Murray Valley)**

The pipeline commences from a branch valve T074-BV16B located on the pipeline licence 101 at Chiltern travelling in a north westerly direction to a weld west of line valve T096-LV03 at the Rutherglen City Gate at Jacks Road/Kings Road in Rutherglen. The length of the pipeline is 14.7 km.

**Licence 182 - T98 Diameter 200 mm Rutherglen to Koonoomoo
(Murray Valley)**

The pipeline commences at a weld west of line valve T096-LV03 at Rutherglen City Gate and travels in a north westerly direction to the Koonoomoo City Gate. The length of the pipeline is 88.8 km.

**Licence 178 - T99 Diameter 450 mm Barnawartha North to
VIC/NSW Border (Barnawartha North to VIC/NSW Border) and
NSW Licence 24 - T99 Diameter 450 mm VIC/Border to Culcairn
(VIC/Border to Culcairn)**

The pipeline commences from branch valve T074-BV16C and T074-BV16D on the Wollert to Wodonga pipeline at Barnawartha - Howlong Rd in Barnawartha travelling in a northerly direction to the EAPL Culcairn Meter Station in NSW. The length of APA GasNet - owned pipeline is 62.5 km.

2.1.3 APA GasNet System

Rural Central (Key Plan No. A4-363-4)

**Licence 78 (part) - T56 Diameter 200 mm Brooklyn-Ballarath-Bendigo
(Brooklyn to Ballan)**

The pipeline commences from Brooklyn Compressor Station in Brooklyn travelling in a westerly direction to Ballan Bifurcation at Ballan. The length of the pipeline is 66.6 km.

**Licence 78 (part) - T57 Diameter 150 mm Brooklyn-Ballarath-Bendigo
(Ballan to Ballarat)**

The pipeline commences from Ballan Bifurcation at Ballan travelling in a westerly direction parallel and to the south of pipeline licence 134 to Meter Station M057 at Ballarat City Gate at Warrenheip Road/Clarks Road, Ballarat. The length of the pipeline is 22.7 km.

Licence 78 (part) - T70 Diameter 150 mm Brooklyn-Ballarat-Bendigo (*Ballan to Bendigo*)

The pipeline commences from Ballan Bifurcation at Ballan travelling in a northerly direction to Bendigo City Gate near Calder Highway. The length of the pipeline is 90.8 km.

Licence 125 - T67 Diameter 150 mm Maryborough (*Guildford to Maryborough*)

The pipeline commences from branch valves T070-BV05W, T070-BV04W and T070-BV05E on the pipeline licence 78 and 131 at Guildford Offtake near Midland Highway travelling in a north westerly direction to Meter Station M068 at Maryborough City Gate at Pyrenees Highway/Townsend Road. The length of the pipeline is 31.4 km.

Licence 128 - T66 Diameter 300 mm Mt. Franklin to Kyneton (*Mt. Franklin to Kyneton*)

The pipeline commences from a branch valve T070-BV03 on pipeline licence 78 and line valve T070-LV04 on pipeline licence 128 at Mt. Franklin Offtake travelling in a easterly direction to a tee south of line valve T066-LV02 at the Kyneton City Gate near Harts Road. The length of the pipeline is 24.5 km.

Licence 131 - T70 Diameter 300 mm Mt Franklin to Bendigo (*Mt. Franklin to Bendigo*)

The pipeline commences from a tee on the line valve T070-LV04E pipeline licence 128 at Mt. Franklin Offtake near Porcupine Ridge Road travelling in a northerly direction parallel and to the east of pipeline licence 78 to Meter Station M057 at Bendigo City Gate. The length of the pipeline is 50.8 km.

Licence 134 - T57 Diameter 300 mm Ballan to Ballarat (*Ballan to Ballarat*)

The pipeline commences from three branch valves T057-SV107, T057-SVBBF13 and T056-BV09 on licence 78 at Ballan Bifurcation travelling in a southerly direction in parallel with and to the north of pipeline licence 78 to Meter Station M054 at the Ballarat City Gate at Clarks Road/Warrenheip Road. The length of the pipeline is 22.8 km.

Licence 143 - T75 Diameter 300 mm Wandong to Kyneton (*Wandong to Kyneton*)

The pipeline commences from two branch valves T074-BV04 and T074-BV05 on pipeline licence 101 at Wandong Offtake in Wandong travelling in a westerly direction to a tee south of line valve T066-LV02 at Meter Station M068 at Kyneton City Gate near Lauriston-Reservoir Road/Harts Road. The length of the pipeline is 59.5 km.

2.1.4 APA GasNet System

Northern Metropolitan (Key Plan No. A4-363-1)

Licence 101 (part) - T74 Diameter 600 mm Melbourne-Wodonga-Shepparton (*Keon Park to Wollert*)

The pipeline commences from the Wollert Compressor Station near Summerhill Road travelling in a southerly direction to two branch valves T018-BV38 and T018-BV39 on pipeline licence 202 at Keon Park Offtake. The length of the pipeline is 14.1 km.

Licence 202 (part) - T18 Diameter 450 mm Dandenong to West Melbourne (*Keon Park East - Keon Park West*)

The pipeline commences from Metering Station M115 at Keon Park East along Anstey Avenue travelling in a westerly direction to Metering Station M116 at Keon Park West. The length of the pipeline is 0.6 km.

Licence 238 - T102 Diameter 250 mm Somerton (*Epping to Somerton*)

The pipeline commences from a branch valve T074-BV01A at line valve T074-LV01 on 600 mm Keon Park to Wollert pipeline at O'Herns Road and travels westerly to AGL Power's power station in O'Herns Road, Somerton. The length of the pipeline is 3.4 km.

2.1.5 APA GasNet System

South Eastern Metropolitan (Key Plan No. A4-363-2)

Licence 36 (part) - T16 Diameter 750 mm Dandenong to West Melbourne (*Dandenong to West Melbourne*)

The pipeline commences from Dandenong to City Gate in Frankston/Dandenong Road, Dandenong via Dandenong Terminal Station to the West Melbourne Regulator Station Footscray Road, West Melbourne. The length of the pipeline is 36.2 km.

Licence 36 (part T15 Diameter 200 mm Dandenong to West Melbourne (*Princes Highway to Regent St.*)

The pipeline commences from a branch valve T016-BV07 on pipeline licence 36 at Princes Highway along Clyde Street and Regent Street to Meter Station M017 at Regent Street/Burlington Street. The length of the pipeline is 0.8 km.

Licence 129 (part) - T65 Diameter 750 mm Dandenong to Princes Highway (*Dandenong to Princes Highway*)

The pipeline commences from Dandenong City Gate branching to Dandenong Terminal Station, and travelling in a northerly direction to a branch valve T65-LV84 on pipeline licence 36 near Princes Highway/Henty Street. The length of the pipeline is 5.0 km.

Licence 129 (part) - T65 Diameter 500 mm Dandenong to Princes Highway (*Princes Highway to Henty Street*)

The pipeline branches from the 750 mm pipeline licence 129 mentioned above section travelling in a north easterly direction via Meter station M003 to a branch valve T065-BV07 on the pipeline licence 36. The length of the pipeline is 0.2 km.

2.1.6 APA GasNet System

Western Metropolitan (Key Plan Nos. A4-363-2, 3 and 4)

Licence 108 - T33 Diameter 750 mm South Melbourne to Brooklyn (*South Melbourne to Brooklyn*)

The pipeline commences from two branch valves T016-BV17 and T016-BV18 on pipeline licence 36 along Cecil Street at South Melbourne travelling in a westerly direction to Brooklyn Compressor Station at Old Geelong Road/Jones Road. The length of the pipeline is 12.8 km.

Licence 122 - T62 Diameter 150 mm Derrimut to Sunbury (*Derrimut to Sunbury*)

The pipeline commences from two branch valves T056-BV02 and T056-BV03 on pipeline licence 78 at Hopkins Road/Middle Road travelling in a northerly direction to Meter Station M045 at Sunbury City Gate near Government Road/Shields Street. The length of the pipeline is 24.0 km.

Licence 124 - T64 Diameter 450 mm Newport (*Supply to Newport Power Station*)

The pipeline commences from a branch valve T033-BV07 on pipeline licence 108 near Craig Street travelling in a southerly direction to Meter Station M103 at Newport Power Station. The length of the pipeline is 1.0 km.

Licence 164 - T89 Diameter 150 mm Unichema (*Bay Street to Unichema*)

The pipeline commences from a branch valve T033-BV04 on pipeline licence 108 at Bay Street/Buckhurst Street travelling in a north westerly direction to the Unichema Meter Station M105 at Boundary Street/Munro Street. The length of the pipeline is 0.4 km.

Licence 162 - T88 Diameter 150 mm Laverton to Coogee (*Laverton to Coogee*)

The pipeline commences from Laverton North City Gate travelling in a northerly direction along Fitzgerald Road to the Meter Station M107 Coogee Methanol at Fitzgerald Road/William Angliss Road. The length of the pipeline is 1.6 km.

Licence 81 - T24 Diameter 350 mm Brooklyn to Corio (*Brooklyn to Corio*)

The pipeline commences from Brooklyn Compressor Station at Brooklyn travelling in a south westerly direction to Meter Station M065 at Corio City Gate near School Road in Corio. The length of the pipeline is 50.7 km.

Licence 253 – T110 Diameter 350 mm Supply to Snowy Hydro Power Plant, North Laverton (*Snowy Hydro*)

The pipeline commences from a branch valve T24-BV03D on Pipeline Licence 81 at James Street travelling in a south easterly direction then westerly along Cherry Lane terminating at the outlet of Meter Station M143 at Cherry Lane in North Laverton. The length of the pipeline is 1.6 km.

Licence 122 – T118 Diameter 500 mm Truganina to Plumpton (*Truganina to Plumpton*)

The pipeline commences from three branch valves T112-BV04A, T112-BV03 and T112-BV04 on pipeline Licence 266 at Hopkins Road/Middle Road travelling in a northerly direction to Plumpton PRS near Taylors Rd, Plumpton. The length of the pipeline is 8.4 km.

2.1.7 APA GasNet System - South West Pipeline

South West Pipeline (Key Plan No. A4-363-7)

Licence 231 - T92 Diameter 500 mm South West Pipeline (*Lara to Iona*)

This pipeline commences at two branch valves T024-BV12A and T024-BV12B at the Lara SWP City Gate at Lara travelling in a south westerly direction to the Iona SWP City Gate. The length of the pipeline is 143.9 km.

Licence 266 – T112 Diameter 500 mm Brooklyn Lara Pipeline (*Brooklyn to Lara*)

This pipeline commences at valve 1221UV62001 on the Brooklyn BCP City Gate Pipeline Licence 81 at Jones Road Brooklyn travelling in a south westerly direction to the Lara SWP City Gate at Hovells Creek Reserve terminating at a weld on the SWP Licence 231 east of T092-BV01. The length of the pipeline is 58.0 km.

2.1.8 APA GasNet System

North Paaratte to Iona Transmission Pipeline (Key Plan No. A4-363-6)

Licence 227 - T100 Diameter 150 mm North Paaratte to Iona

The 150 mm pipeline starts at branch valve T081-BV01A and T081-SVPMA15 on the Paaratte to Allansford pipeline at the North Paaratte Metering Station travelling in an easterly direction to the Iona South West Pipeline City Gate where it terminates at the branch valve T092-SC1G12 on the Lara to Iona pipeline. The length of the pipeline is 7.80 km.

2.1.9 APA GasNet System

Western Transmission Pipeline (Key Plan No. A4-363-6)

Licence 145 - T81 Diameter 150 mm Paaratte to Allansford

The pipeline commences at an isolating valve T081-SCPMA14 and branch valves T081-BV01A and T081-SVPMA15 at the North Paaratte Metering Station travelling in a north westerly direction to branch valve T081-BV03, T081-SVACG262 and T081-SVACG263 and meter M097 at the Allansford City Gate. The length of the pipeline is 33.3 km.

Licence 155 - T86 Diameter 150 mm Allansford to Portland

The pipeline commences from the Allansford City Gate at branch valve T081-BV03 and T086-BV01A travelling in a westerly direction to meter M096 at the Portland City Gate. The length of the pipeline is 100.4 km.

Licence 168 - T91 Diameter 150 mm Curdievale to Cobden

The pipeline commences from the branch valve T081-BV01 at the Curdievale Offtake travelling in a northerly direction to the Cobden City Gate and terminating at meter M093. The length of the pipeline is 27.7 km.

Licence 171 - T93 Diameter 150 mm Codrington to Hamilton

The pipeline commences from the weld on reducer north of branch valves T086-BV06 and T086-BV07 at the Codrington Offtake travelling in a northerly direction to the Hamilton City Gate and terminating at meter M094. The length of the pipeline is 54.6 km.

Licence 252 – T109 Diameter 100 mm Supply to Iuka Resources, Hamilton

The pipeline commences from the branch valve T093-BV01 on the Codrington to Hamilton pipeline Licence 171 near Monivae Subdivision Rd, travelling in a westerly direction to the gas yard

within Iluka Resources and terminating at valve 51. The length of the pipeline is 1.1 km.

2.2 Pressure Regulators

The assets under this category are installed within the APA GasNet System and identified as City Gate (CG) or Pressure Limiter (PL) or Pressure Reduction Station (PRS) installations.

The asset reference number, a Key Plan drawing number, and relevant P&IDs are identified in Appendix 8 – Regulator Drawing Index.

The nominated layout plans, assembly drawings, P&IDs and any changes to such drawings will be available to AEMO through formal Data Transmittal and Change Management procedures (MAN 232 Change Management).

Procedures for operating pressure regulators and associated equipment are listed in Appendix 2. - Operational Procedures.

2.2.1 Tyers Pressure Limiter

The installation provides a pressure limiting function for gas supplied into the downstream pipeline Licence 121, T63, 500 mm diameter transmission system and connecting to Morwell Regulator Station. The two branch valve off takes to Tyers Pressure Limiter are from the 750 mm diameter pipelines on the Longford to Dandenong 6890 and 7070 kPa(g) pressure transmission system.

The site plan P9-3-24 shows the layout details of this installation. Monitoring of the facility operational conditions is by inlet and outlet pressure transmitters and outlet temperature transmitter, the data from which is telemetered to the AEMO Operations Centre. The two branch valves can each be remotely opened or closed. Regulator pressure set point can be remotely adjusted.

The station also has an actuated bypass which will open automatically in the event of the pressure limiter going fully open under high demand. The regulator station may be manually bypassed for maintenance, or during unusual operation of the pressure limiter.

The drawings P9-3-8 and P9-3-5 show the general arrangement and instrumentation for this installation.

The purpose of the installation is to achieve delivery temperatures at M102 Jeeralang meter station above minus 2 degrees C through ground heat recovery in the Tyers to Morwell pipeline without the need for heaters under all reasonable conditions of inlet temperature, pressure and flow.

The complete pressure limiter facility is within a security fence enclosure and includes station inlet pipe work connecting from the off-takes on the North and South Longford to Dandenong 750mm diameter duplicate pipelines and the station outlet including the pig trap assembly serving the 500 mm Tyers to Morwell pipeline. The

pressure regulator installation is enclosed in a solid brick building providing protection and security for that asset.

2.2.2 Morwell City Gate

The regulator station provides pressure reduction for gas supplied from the Tyers to Morwell MAOP 7070 kPag pipeline into the Morwell to Dandenong MAOP 2760 kPag “Lurgi Pipeline” 450 mm diameter transmission system and connecting to Dandenong Terminal Station/Dandenong Pressure Limiter.

The site plan N3-076-6 shows the site layout details of this installation.

The drawings P8-13-5 and P8-13-4 show the general arrangement and instrumentation for this installation.

The complete City Gate facility is an above ground assembly within a security fence enclosure and includes station inlet pipe work and pig trap assembly connecting from the 500 mm Tyers to Morwell pipeline and supplies the 450 mm “Lurgi Pipeline”.

2.2.3 Dandenong City Gate

The regulator station provides pressure reduction of gas supplied from the Longford to Dandenong MAOP 6890 kPa(g) pipeline system and delivering into the 750 mm diameter MAOP 2760 kPa(g) transmission pipeline to West Melbourne.

The drawings Q31-3-29 and Q31-3-36 show the site layout of this facility.

The regulator assembly includes remote control capability for regulator run shutoff and outlet pressure set point adjustment that is operated and maintained in accordance with APA GasNet procedures listed in Appendix 2.

The drawings 3221-PB-001 through 3221-PB-007 show the details for this installation.

The regulator assembly has provision for the addition of three extra assemblies.

The complete City Gate facility is an above ground complex within a security fence enclosure and includes the station pig trap receiving assembly from the Longford Pipeline Licence 75, T60, 750 mm diameter and the outlet station pipe work connecting to the 750 mm diameter transmission pipelines to West Melbourne.

2.2.4 Wollert City Gate

This regulator station provides pressure reduction of gas being supplied into the “Keon Park to Wollert” transmission pipeline, (Licence 101-T74, 600 mm diameter) connecting to the distribution pipeline assets at Meter stations M116 and M115 respectively.

The facility provides a selection of two alternative sources of gas being supplied into the Keon Park to Wollert pipeline (Licence 101-T74, 600 mm 2760 kPa(g) MAOP) via either Run 1 or Run 2 of the Wollert City Gate (P8-16). The two sources of gas supply are Longford gas from the Pakenham to Wollert pipeline (Licence 141 T61, 750mm 6890 kPa(g) MAOP) and Moomba gas from the Wollert to Wodonga pipeline (Licence 101, T74, 300mm 7400kPa(g) MAOP).

The general site plan L1-37-48 shows the layout details of this installation.

P&ID drawings 1312-PB-001 through 1312-PB-007 and 1312-PB-013 and 1312-PB-014 show the details of the control and instrumentation system.

The Wollert City Gate consists of a water bath heater, four regulator runs (each with slam-shut valves and single active regulator), station inlet and outlet isolation valves.

The facility has an RTU, shared with the Wollert Pressure Limiter, which allows remote set-point control of the single cut regulators and remote operation of both the slam-shut and run selection valves. The station PLC controller performs other local control, flow calculation and monitoring functions as shown on the P&ID drawings.

The regulator assembly includes remote control capability for the following equipment that is operated and maintained in accordance with the APA GasNet procedures listed in Appendix 2.

- Remote operation of inlet actuated valves for Runs 1 and 2. (There are two actuated inlet valves in each run to select source of gas).
- Remote shutoff of inlet slamshut valves to isolate regulator runs.
- Outlet pressure set point adjustment.
- There is no flow control at Wollert City Gate (P8-16)

The drawings P8-16-1 and L1-37-25 show the general arrangement and flow diagram details for this installation.

The Wollert City Gate facility is an above ground facility fully enclosed within a security fence enclosure and includes the station pig trap receiving assembly from the Pakenham to Wollert pipeline (Licence 141-T61, 750 mm diameter) and the outlet station pipe work connecting to the Wollert Compressor Station and Keon Park pipeline.

2.2.5 Wollert Pressure Limiter

The Wollert Pressure Limiter has been designated as P9-12. The facility provides one of the following two operational modes:

- (1) Bi-directional flow of gas between the Pakenham to Wollert pipeline (Licence 141 T61, 750mm 6890 kPa(g) MAOP) and the Wollert to Wodonga pipeline (Licence 101, T74 300mm, 8800 kPa(g) MAOP) or
- (2) Pressure reduction of gas flowing from the Pakenham to Wollert pipeline and into the Wollert to Wodonga pipeline and/or into the inlet of the City Gate regulator runs.

Site plan 1321-MA-001 shows the layout of this pressure limiter installation.

P&ID drawings 1312-PB-010, 1312-PB-011 and 1312-PB-012 show the details of the control and instrumentation system of this pressure limiter.

The facility comprises three parallel runs:

- One 300mm bi-directional un-regulated by-pass run through which gas can flow between the Pakenham to Wollert pipeline and the Wollert to Wodonga pipeline.
- Two uni-directional pressure/flow regulator runs (one duty and one stand-by) which provide pressure reduction of gas flowing from the Pakenham to Wollert pipeline and into the Wollert to Wodonga pipeline.

The outlet header of the regulator runs is connected to inlet valves to Run 1 and Run 2 of Wollert City Gate which in turn supply gas into the Keon Park to Wollert pipeline (Licence 101, T74 600mm 2760 kPa(g) MAOP).

The facility has an RTU, shared with the Wollert City Gate, which allows remote set-point control of the single cut regulators and remote operation of both the slam-shut and run isolation valves. The station PLC controller performs other local control, flow calculation and monitoring functions as shown on the P&ID drawings.

The complete pressure limiter facility is an above ground assembly installed within the same security fence enclosure as the Wollert City Gate P8-016. The facility includes:

- (a) Inlet pipe work connecting to the Wollert City Gate inlet header; and
- (b) Outlet pipe work connection to Run 1 and Run 2 of the Wollert City Gate P8-016, and to valve 501 on the Wollert Compressor Station outlet pipe work.

2.2.6 Laverton North City Gate

The City Gate provides pressure reduction of gas from the Brooklyn Compressor Station to Corio City Gate transmission pipeline Licence 81, T24, 350 mm diameter and supplies gas into the transmission

pipeline Licence 162, T88, 150 mm diameter connecting to the Coogee Methanol Plant.

The site plans L1-49-1 and L1-49-4 show the layout of this City Gate installation.

The drawings P8-27-9 and P8-27-3 show the general arrangement and auxiliary diagram details for this installation.

The complete City Gate facility is an above ground assembly installed within a security fence enclosure and includes the station inlet pipe work connecting from the Brooklyn-Corio transmission pipeline and outlet pipe work connecting to the pipeline supplying the Coogee Methanol Plant. This is adjacent to another City Gate.

The City Gate is located within a brick building on APA GasNet property.

2.2.7 Hopkins Road Pressure Limiter

Decommissioned.

2.2.8 Clunes Road Pressure Limiter

Decommissioned.

2.2.9 Toolamba Road Pressure Limiter

Decommissioned.

2.2.10 Dandenong Pressure Limiter (Lurgi Backup Regulator)

The facility is also known as the “Lurgi backup regulator” and is operated to support receipt pressures at Dandenong from the Morwell to Dandenong “Lurgi” 450mm diameter pipeline.

The drawings N3-005-2, N3-005-5 and N3-005-26 show the layout of this facility.

The facility comprises two runs each fitted with an active regulator.

The facility provides pressure reduction from a maximum 2760 kPa(g) to a typical 1700 kPa(g) minimum.

The complete regulator assembly is an above ground facility installed within the security fencing of the Dandenong Terminal Station complex.

The facility includes a gas water bath type heater installed to offset the Joule-Thompson cooling effect produced by the pressure reduction through the regulator assembly.

2.2.11 Clonbinane Pressure Limiter

Decommissioned.

2.2.12 Lara SWP City Gate

The Lara SWP City Gate facility is designed to:

- supply gas from the Port Campbell gas fields and Western Underground Gas Storage facility (WUGS) as well as the SeaGas / Otway / Mortlake gas facilities to the APA GasNet System (GNS) and;
- deliver gas from Brooklyn to WUGS and the Paaratte / Allansford / Portland / Cobden / Hamilton pipeline during the off-peak season.

This pressure regulator facility has been designated as P10-01. This facility can be operated in either one of the following two modes of operations:

- (1) Uni-directional flow of gas from Brooklyn to Corio pipeline (Licence 81, T24, 350mm) to the South West Pipeline (Licence 183, T92, 500mm)
- (2) Pressure reduction of gas flowing from the South West Pipeline into the Brooklyn to Corio pipeline.

Lara SWP City Gate consists of a bi-directional flowmeter, a water bath heater, five regulator runs [i.e. one small run (Run 1) and four larger runs of equal size (Runs 2, 3, 4 & 5)] with slam-shut valves and a by-pass line with over-pressure protection.

Site plan 2631-MA-001 shows the general layout of this City Gate installation.

P&ID drawings 2631-PB-001, 2631-PB-002, 2631-PB-003, and 2631-PB-004, show the details of the control and instrumentation system of this City Gate.

The facility has an RTU, which allows remote set-point control of the active regulators and remote operation of the slam-shut valves in all runs. The RTU also performs other local control, flow calculation, set-point tracking of monitor regulators and monitoring functions as shown on the P&ID drawings.

The complete City Gate facility is an above ground assembly installed within a security fence enclosure.

Each regulator run consists of an upstream actuated slam-shut block valve to provide overpressure protection and two independent regulator valves in series to provide pressure control. The upstream regulator is known as the *Monitor Regulator* and the downstream regulator is known as the *Active Regulator*. A check valve is located downstream of the regulators, followed by a manual isolation valve at the end of the run.

2.2.13 Brooklyn (BCP) City Gate

Brooklyn (BCP) City Gate is designed to supply gas from the Port Campbell gas fields and underground gas storage facility (WUGS) as well as the SeaGas / Otway/ Mortlake supplies to the APA GasNet System (GNS):

This pressure reduction station has been designated as P8-28. The station provides pressure reduction of gas flowing from the Brooklyn to Corio pipeline (Licence 81-T24, 350mm 7390kPa(g) MAOP) and/or from the outlet of Brooklyn (BLP) City Gate into the South Melbourne to Brooklyn pipeline (Licence 108-T33, 750mm, 2760 kPa(g) MAOP).

Brooklyn (BCP) City Gate consists of a regulator station containing five regulator runs [i.e. one small run (Run 1) and four larger runs of equal size (Runs 2, 3, 4 & 5)] with inlet isolation (slam-shut) valves and a by-pass line with over-pressure protection. A bi-directional flowmeter and two water bath heaters each with two burners are located in the common line upstream of the regulator station.

Site plan 1221-MA-001 shows the general layout of this City Gate installation. P&ID drawings 1221-PB-001, 1221-PB-002, 1221-PB-003, 1221-PB-004 and 1221-PB-005 show the details of the control and instrumentation system of this City Gate.

Brooklyn (BCP) City Gate shares an RTU with the Brooklyn BBP PRS (P10-05) and Brooklyn (BLP) City Gate. The RTU provides remote set-point control of the active regulators and remote operation of the inlet isolation slam-shut valves. The station safety PLC performs other local control, flow calculation and monitoring functions as shown on the P&ID drawings.

The complete City Gate facility is an above ground assembly installed within the Brooklyn site security fence enclosure.

Each regulator in runs one to four consists of an upstream actuated slam-shut block valve to provide overpressure protection and two independent regulator valves in series to provide pressure control. The upstream regulator is known as the *Monitor Regulator* and the downstream regulator is known as the *Active Regulator*. A check valve is located downstream of the regulators, followed by a manual isolation valve at the end of the run.

Run five consists of an upstream actuated slam-shut block valve to provide overpressure protection and only one independent regulator valve to provide pressure control. This run and the bypass run are directly controlled by the station safety PLC via the station RTU.

All actuated valves operate on instrument air which is generated by the compressor station instrument air system. A dedicated instrument air dry gas receiver is shared between the Brooklyn (BLP and BCP) City Gates and BBP PRS.

2.2.14 Brooklyn (BBP) PRS

Brooklyn BBP PRS is designated as P10-05. The station provides pressure reduction of gas flowing from the Brooklyn to Lara Pipeline (Licence 266-T112, 500mm 10,200 kPa(g) MAOP) into the Brooklyn to Ballan pipeline (Licence 78-T56, 200mm, 7390 kPa(g) MAOP).

Site plan 1221-MA-001 shows the general layout of this pressure limiter installation.

P&ID drawings 1223-PB-001 and 1223-PB-003 show the details of the control and instrumentation system of this pressure limiter.

Brooklyn BBP PRS shares an RTU with the Brooklyn BLP City Gate (P10-04). The RTU provides remote set-point control of the single cut regulators and remote operation of the inlet isolation valves. The station safety PLC performs other local control, flow calculation and monitoring functions as shown on the P&ID drawings.

The complete Brooklyn BBP PRS facility is an above ground assembly installed within the Brooklyn site security fence enclosure. The inlet to the PRS is connected to the inlet header of the Brooklyn BLP City Gate downstream from the BLP CG heaters and upstream of the Qenos Meter Station. The Brooklyn BBP PRS has a dual path ultrasonic flow meter to provide indicative flow measurement for protection against velocity outside design limits.

The PRS consists of two identical runs containing an actuated inlet isolation valve, a pressure regulator, a check valve and a manual outlet isolation valve.

All actuated valves operate on instrument air which is generated by the compressor station instrument air system. A dedicated instrument air dry gas receiver is shared between the Brooklyn (BLP and BCP) City Gates and BBP PRS.

2.2.15 Barnawartha City Gate

The pressure reduction station is designated as P10-02. The facility provides one of the following two operation modes:

- (1) Bi-directional flow of gas between the Barnawartha North to the Victorian/NSW border pipeline (Licence 178-T99, 450mm, 10200kPa(g) MAOP) and the Wollert to Wodonga Pipeline (Licence 101, T74 300mm, 7400kPa(g) MAOP); and
- (2) Pressure reduction of gas flowing from the Interconnect (Barnawartha North to Culcairn) pipeline and into the Wollert to Wodonga pipeline.

Site plan 6650-MA-001 shows the general layout of this City Gate installation.

P&ID drawings 6650-PB-001, 6650-PB-002, 6650-PB-003 and 6650-PB-004 show the details of the control and instrumentation system of this City Gate.

The facility has an RTU, which allows remote set-point control of the active regulators and remote operation of the slam-shut valve in all three runs (two regulator runs and one bypass). The RTU also performs other local control, flow calculation and monitoring functions as shown on the P&ID drawings.

The complete City Gate facility is an above ground assembly installed within a security fence enclosure and includes the station pipe work, two line valve assemblies, a pig launching and receiving assembly, a station vent connecting to the Interconnect (Barnawartha North to Culcairn) pipeline and station pipe work connecting to the Wollert to Wodonga pipeline.

2.2.16 Wandong PRS

This pressure reduction station has been designated as P10-06. The facility provides pressure reduction of gas flowing from the Wollert to Euroa pipeline (Licence 101, T74, 300mm 8800 kPa(g) MAOP) into the Wandong to Kyneton pipeline (Licence 143 T75, 300mm, 7390 kPa(g) MAOP).

Site plan 2451-MA-001 shows the general layout of this pressure reduction installation. Wandong PRS consists of a regulator station containing two regulator runs of equal size (Runs 1 & 2) each with inlet isolation (slam-shut) valves. A water bath heater with two burners is located in the common line upstream of the regulator station.

P&ID drawings 2451-PB-001, 1312-PB-002, 1312-PB-003, 1312-PB-005 and 1312-PB-006 show the details of the control and instrumentation system of this PRS and heater.

The facility has an RTU, which allows remote set-point control of the single cut regulators and remote operation of the run isolation valves. The RTU also performs other local control, flow calculation and monitoring functions as shown on the P&ID drawings.

The complete PRS is an above ground assembly installed within a security fence enclosure and includes inlet pipe work that connects directly into the Wollert to Wodonga pipeline and the outlet pipe work connects into the Wandong to Kyneton pipeline.

2.2.17 Iona City Gate

The Iona pressure reduction station has been designated as P10-03. This facility can be operated in either one of the following two operational modes:

- (a) Uni-directional flow of unregulated gas from the 150mm North Paaratte to Iona pipeline (Licence 227, T100, 150mm) to South West Pipeline (Licence 231, T92, 500mm); and

- (b) Pressure reduction of gas flowing from the South West Pipeline into the 150mm North Paaratte to Iona pipeline.

Site plan 4630-MA-001 shows the general layout of this City Gate installation. P&ID drawings 4630-PB-001, 4630-PB-004, 4630-PB-005, 4630-PB-006, and 4630-PB-011 show the details of the control and instrumentation system of this City Gate.

The facility shares a common RTU with other facilities in the Iona station complex to allow remote set-point control of the active regulators and remote operation of the slam-shut valves in all runs. The RTU also performs other local control, flow calculation and monitoring functions as shown on the P&ID drawings.

The complete City Gate facility is an above ground assembly installed within the security fenced enclosure of the Iona station complex and includes:

- (a) the station pipe work connecting to the South West Pipeline and the North Paaratte to Iona pipeline;
- (b) a three valve assembly for future installation of a water bath heater;
- (c) a bi-direction single path ultrasonic flow meter to provide indicative flow measurement and provision to implement flow control;
- (d) a City Gate regulating station with two regulator runs [one 100mm (Run 1) and one 150mm (Run 2)] with slam-shut valves and a by-pass line with over-pressure protection;
- (e) an ESD valve (UV-71) on the line to the WUGS Custody Metering Station;
- (f) a Pig Launcher/Receiver at the end of the Iona-Lara Pipeline (SWP);
- (g) a Pig Launcher/Receiver at the end of the Iona-North Paaratte Pipeline; and
- (h) station isolation valves for the Iona Compressor Station.

Each regulator run consists of an upstream actuated slam-shut block valve to provide overpressure protection and two independent regulator valves in series to provide pressure control. The upstream regulator is known as the *Monitor Regulator* and the downstream regulator is known as the *Active Regulator*. A check valve is located downstream of the regulators, followed by a manual isolation valve at the end of the run.

2.2.18 Brooklyn (BLP) City Gate

Brooklyn (BLP) City Gate was designed to supply gas from the Port Campbell gas fields and underground gas storage facility (WUGS) into the Brooklyn to Corio pipeline:

This pressure reduction station has been designated as P10-04. The station provides pressure reduction of gas flowing from the Brooklyn to Lara Pipeline (Licence 266-T112, 500mm 10,200 kPa(g) MAOP) into the Brooklyn to Corio Pipeline (Licence 81-T24, 350mm 7390kPa(g) MAOP), the BCP City Gate facility or the BBP City Gate facility.

Brooklyn BLP City Gate consists of a regulator station containing five regulator runs [i.e. one small run (Run 1) and four larger runs of equal size (Runs 2, 3, 4 & 5)] with inlet isolation (slam-shut) valves and a by-pass line with over-pressure protection. A bi-directional flowmeter and two water bath heaters (each heater having one burner) are located in the common line upstream of the BLP CG regulator station, the BBP PRS and Qenos Meter Station.

Site plan 1221-MA-001 shows the general layout of this City Gate installation. P&ID drawings 1222-PB-001 through 1221-PB-014 show the details of the control and instrumentation system of this City Gate. Instrument air is shown on 1200-PB-190.

The Brooklyn BLP City Gate RTU provides remote set-point control of the active regulators and remote operation of the inlet isolation slam-shut valves and heaters. The station safety PLC also performs other local control, flow calculation and monitoring functions as shown on the P&ID drawings. The RTU also provides control for the adjacent BBP PRS, BCP City Gate and heaters, and BCP bypass run.

The complete City Gate facility is an above ground assembly installed within the Brooklyn site security fence enclosure.

Each regulator in runs one to five consists of an upstream actuated slam-shut block valve to provide overpressure protection and a single *Active* regulator valve to provide pressure control. A check valve is located downstream of the regulators, followed by a manual isolation valve at the end of the run.

All actuated valves (with the exception of the BLP station inlet valve) operate on instrument air which is generated by the compressor station instrument air system. A dedicated instrument air dry gas receiver is shared between the Brooklyn (BLP and BCP) City Gates and BBP PRS.

2.2.19 Euroa Pressure Reduction Station

This pressure reduction station has been designated as P10-7. The facility provides pressure reduction of gas flowing north from the Wollert to Euroa pipeline (Licence 101, T74, 300mm 8800 kPa(g) MAOP) into the Euroa to Wodonga pipeline (Licence 101, T74,

300mm 7400 kPa(g) MAOP). The facility also provides control for the two line-valves which permit southerly flow

Site plan 1600-MA-001 shows the general layout of this pressure reduction station.

P&ID drawing 1600-PB-001 shows the details of the control and instrumentation system.

The facility has an RTU, which allows fixed set-point control of the single cut regulator and remote operation of the run isolation valve. The RTU also performs automated and manual control functions for the operation of the two line valves and associated loading valves, plus other local control, flow calculation and monitoring functions as shown on the P&ID drawing.

The complete pressure reduction station is an above ground assembly installed within a security fence enclosure and includes inlet and outlet pipe work that connects directly into the Wollert to Wodonga pipeline.

2.2.20 Plumpton PRS

This pressure regulator station has been designated as P10-08. The facility provides pressure reduction of gas flowing from the Truganina to Plumpton pipeline (Licence 122, T118, 500 mm 10,200 kPa(g) MAOP) into the Derrimut to Sunbury pipeline (Licence 122, T62, 150mm 7,390 kPa(g) MAOP).

Site plan 2650-MA-001 shows the general layout of this pressure reduction station.

P&ID drawings 2650-PB-001 and 2650-PB-002 show the details of the control and instrumentation system.

The facility has an RTU, which provides monitoring of the fixed pressure regulators and remote operation of the run isolation valve as shown on the P&ID drawing.

The complete pressure reduction station is an above ground assembly installed within a concrete enclosure and includes inlet and outlet pipe work that connects directly into the T62 Derrimut to Sunbury pipeline.

2.3 Compressor Stations

The assets under this category are installed within the APA GasNet System. The engines and compressors at each facility are identified in the Compressor Stations Key Data Plan No. A1-301-1.

The compressor stations provide appropriate gas pressures and inventory control utilising the transmission pipeline system as detailed in this document.

The asset reference number, a Key Plan drawing number, and relevant P&IDs are identified in Appendix 3.

Compressor unit staging and gas turbine facilities are also identified in the Compressor Stations Key Data Plan A1-301-1 as amended by the parties from time to time.

2.3.1 Gooding Compressor Station

The compressor station provides gas compression on the Longford-Dandenong 750 mm diameter MAOP 6890 kPa(g) pressure pipeline at the location of Line valve 5, under Licence 75, T60.

The compressor station is fitted with four (4) “Centaur” gas turbine driven centrifugal compressors manufactured by Solar Turbines of the U.S.A. Each compressor set is rated at a Nominal Power of 2850 kW. The four machines are housed in a solid brick sound attenuated building with the compressor control room, electrical switch room, staff amenities and maintenance workshop located in the annex adjacent to the compressor building.

The compressor station facilities include underground inlet station pipe work connecting to four compressor suction liquid separators (one dedicated to each machine) with associated inlet and outlet header pipe work, connecting into the Longford-Dandenong pipeline system. Other features of the facility include station inlet and outlet pipe work blowdown manifolds and blowdown stack, condensate collection pipe work and storage vessels, lubricating oil coolers, lubricating oil storage facilities, gas turbine fuel gas supply system with redundant electric immersion heaters, station capacity control valve, instrument air system, station and compressor unit controls and SCADA facilities to the AEMO Operations Centre.

The complete facility is enclosed within an inner and outer security chain wire fence and locked security gates.

2.3.2 Wollert Compressor Station

The compressor station provides gas compression from the Pakenham-Wollert outer ring main being a 750 mm diameter MAOP 6890 kPa(g) pressure pipeline and delivering into the APA GasNet System for Shepparton, Echuca, Albury and the inter-connect to New South Wales.

The compressor station ‘B’ has two (2) Centaur gas turbine driven centrifugal compressors manufactured by Solar Turbines of the U.S.A. The compressor sets are rated at a Nominal Power of 4550 kW. The two packages each incorporate a sound attenuated enclosure. Unit controls and associated DC supply are housed within an adjacent Control Room which has fire suppression fitted. Station safety controls are located within the Station ‘A’ building with the compressor control room, electrical switch room, staff amenities, and maintenance workshop located in the annexe adjacent to the compressor building for Station ‘A’.

Station 'A' has three (3) Saturn compressor sets with Nominal ISO Power of between 850 and 950 kW. The packages are housed in a sound-attenuated solid brick compressor hall.

The compressor station 'B' facilities include above-ground inlet station pipe work connecting two (2) filter-separators with associated header pipe work and station outlet pipe work with gas after-coolers connecting into the Wollert/Albury pipeline system. Other features of the facility include station inlet and outlet pipe work, blowdown manifolds and blowdown stack, condensate collection pipe work, unit fin-fan coolers, station capacity control valve, station instrument air system, lubricating oil coolers, lubricating oil storage facilities, gas turbine fuel gas supply and conditioning system, station and unit controls and SCADA facilities to the AEMO Operations Centre.

The complete facility is installed within a site secured chain wire security fence with locked security gates.

2.3.3 Brooklyn Compressor Station

The compressor station provides gas compression from the 750 mm diameter MAOP 2760 kPa(g) South Melbourne to Brooklyn pipeline and delivers into the Brooklyn to Corio pipeline (Licence 81, 350mm diameter) and Brooklyn to Ballarat/Bendigo pipeline (Licence 78, 200mm and 150mm diameter).

The compressor station has two (2) Centaur and two (2) Saturn gas turbine driven centrifugal compressors rated at 3350 kW, 2850 kW 950 kW and 850 kW per unit respectively. The Centaur compressors are fitted with "dry seals" which are supported by redundant air compression facilities. The two Centaur and two Saturn compressor sets are packaged skid mounted assemblies.

Unit isolating valves for the Saturn compressor sets allow connection between various combinations of inlet and outlet headers. Similarly, the unit discharge isolating valves for the Centaur compressor sets allow connection between either the Geelong or Ballarat discharge headers. The station logic is managed by a Triconex control system.

The compressor control rooms, electrical switch rooms, staff amenities, stand-by power generator room and maintenance workshop are located in adjacent buildings.

The compressor station facilities include underground inlet station pipe work connecting to compressor suction liquid separators (one dedicated to each machine) with associated inlet header pipe work. Each compressor set has its own dedicated gas after cooler. The gas after-coolers for units 8, 9 & 12 are a fin-fan cooler and after-coolers for units 10 & 11 utilise dedicated water cooling towers (one per unit). The station outlet headers with pipe work connect into the APA GasNet System for Geelong and Ballarat.

Other features of the facility include station inlet and outlet pipe work blowdown manifolds and blowdown stack, condensate collection pipe

work, lubricating oil coolers, lubricating oil storage facilities, gas turbine fuel gas supply system, station and unit controls, and SCADA facilities to the AEMO Operations Centre.

The facility is installed within a site secured chain wire security fence with locked security gates.

2.3.4 Springhurst Compressor Station

The assets more particularly described in this Schedule as the Springhurst Compressor (“Springhurst Compressor”) were originally installed by or on behalf of APA GasNet under an accelerated schedule to meet the requirements of the Winter 99 Project initiated by the Victorian State Government. As a result, the parties to this Agreement acknowledge and agree paragraphs (i) to (v) of clause 2.3.4 do not apply to any equipment or plant of the Springhurst Compressor that was modified or upgraded at any time following operational handover to AEMO of the Winter 99 Project:

- (i) the design of the Springhurst Compressor may not have occurred in accordance with Good Practice;
- (ii) the Springhurst Compressor may perform with diminished capability and with little or no in-built redundancy capable of allowing the Springhurst Compressor to continue to operate at an acceptable level in the event of a failure of any part of the assets which comprise the Springhurst Compressor;
- (iii) the Springhurst Compressor may not have undergone a comprehensive testing and commissioning program;
- (iv) deleted
- (v) if the capacity or potential capacity of an Extension and/or an Expansion is affected by the operational capability or functionality of the Springhurst Compressor, then for the purposes of determining:
 - (A) the additional capacity made available by any Extension and/or Expansion under clause 5.1 of the Agreement;
 - (B) the extent of any failure by APA GasNet to provide the APA GasNet Service Envelope Capacity under clause 5.2 of the Agreement; or
 - (C) the amount of additional Authorised MDQ which may be made available as a consequence of that Extension and/or Expansion under clause 5.1 of the Agreement,

the parties must take into consideration the diminished capability of the assets as described in this paragraph 2.3.4.

The diminished capability of the Springhurst Compressor is set out as follows:

- No redundant capacity of the Springhurst Compressor is available;
- The Cooler capacity is undersized for the full weather spectrum expected at the Springhurst Compressor station. Its operating range is specified in clause 4.3.4.15 of this Schedule.

The Springhurst Compressor Station provides gas compression to boost the line pressure in the 300mm diameter MAOP 7400 kPa(g) Wodonga to Euroa pipeline. It can compress gas in a southward direction towards Melbourne into the APA GasNet System to Shepparton, Echuca, Ballarat and Wollert, or compress in a northward direction towards Wodonga and Culcairn.

The compressor station has one (1) "Centaur 50" gas turbine driven centrifugal compressor manufactured by Solar Turbines of the U.S.A. This compressor is rated at a Nominal Power of 4550 kW. The compressor is fitted with "dry seals" which is supported from the redundant instrument air facilities. The single machine is housed in a sound attenuated enclosure. A separate process control room (PCR) houses the unit and station control systems, switch room and battery systems. There is a diesel stand-by power generator.

The compressor station facilities include inlet station pipe work connecting to a suction filter separator with associated header pipe work and station outlet pipe work with fin fan gas after-cooler connecting into the Wollert/Albury pipeline system. An actuated linevalve and two sets of actuated station isolation valves provide the means of compressing either north or south, and permitting pipeline free flow. Other features of the facility include station inlet and outlet pipe work, blowdown manifolds and vent stack, station and unit controls and SCADA facilities to the AEMO Operations Centre. Auxiliary systems include the fuel gas custody meter, dual run fuel gas regulators and oily liquids separators.

The complete facility is installed within a site secured chain wire security fence with locked security gates.

2.3.5 Iona Compressor Station

The Iona Compressor Station is designed to compress natural gas from the 500mm diameter 10,000 kPa(g) Lara to Iona Pipeline into the 150mm diameter MAOP 7,400 kPa(g) North Paaratte to Iona Pipeline.

The facilities include two compressor/driver packages each housed in individual acoustic enclosures with associated process gas coolers, outlet and inlet scrubbers and unit vents. Each package has a Caterpillar reciprocating engine of nominal 298 kW power driving a single stage Gemini reciprocating compressor with integral load controller and recycle valve. One unit is required to meet 100% of the design capacity requirements with the other unit as standby. A common fuel gas system, control building, electrical supply and station control services both packages. The SCADA facilities to the AEMO Operations Centre utilise the same RTU as the Iona City Gate.

The complete compressor facility is an above ground assembly installed within the security fenced enclosure of the Iona station WUGS complex.

2.3.6 Euroa Compressor Station

The Euroa Compressor Station provides gas compression to boost the line pressure in the 300mm diameter MAOP 7400 kPa(g) Wodonga to Euroa pipeline and 8,800 kPa(g) Wollert to Euroa pipeline. It can compress gas in a southward direction towards Melbourne into the APA GasNet System to Wollert, or compress in a northward direction towards Wodonga and Culcairn.

The compressor station has one (1) "Centaur 50S" gas turbine driven centrifugal compressor manufactured by Solar Turbines of the U.S.A. This compressor is rated at a Nominal Power of 4550 kW. The compressor is fitted with "dry seals" which is supported from the redundant instrument air facilities. The single machine is housed in a sound attenuated enclosure. A separate process control room (PCR) houses the unit and station control systems, switch room and battery systems. There is a diesel stand-by power generator.

The compressor station facilities include inlet station pipe work connecting to a suction filter separator with associated header pipe work and station outlet pipe work with fin fan gas after-cooler connecting into the Wollert/Albury pipeline system. An actuated linevalve assembly and two sets of actuated station isolation valves provide the means of compressing either north or south, and permitting pipeline free flow. Other features of the facility include station inlet and outlet pipe work, blowdown manifolds and vent stack, station and unit controls and SCADA facilities to the AEMO Operations Centre. Auxiliary systems include the fuel gas custody meter, dual run fuel gas regulators and oily liquids separators.

Euroa Compressor pressure control system is interfaced with the Euroa PRS control system to ensure pipeline pressure integrity.

The complete facility is installed within a site secured chain wire security fence with locked security gates.

No redundant capacity of the Euroa Compressor is available.

2.4 Pipeline valves

The assets under this category within the APA GasNet System are identified as Line valves, Branch Valves, Pig Trap Valves, Pig Trap Kicker Valves and Blowdown Valves. The Line valves, Branch Valves and Blowdown Valves are located in accordance with the key plan drawings listed in Appendix 1.

The Pig Trap Valves and Pig Trap Kicker Valves are installed at the termination of each piggable pipeline to facilitate the pigging operation. APA GasNet will make drawings available to AEMO at the time of pigging.

Descriptions of each type of Pipeline Valves are listed as below:

2.4.1 Line valves

Line valves are provided in the APA GasNet System to isolate the pipeline in segments for maintenance, operation, repair and for protection of the environment and public in the event of loss of pipeline integrity. Usually, they have by-pass facilities and provision for “blowing down” the section of main upstream and downstream of the valve operators and blowdown assemblies. The line valves are usually located within a wire enclosure in cross country pipelines and in pits in built-up area. The Mainline valves are normally in an “Open” Position.

2.4.2 Remotely Actuated Line valves

Appendix 9 tabulates all the main line valves, which are remotely actuated from within the AEMO Operations Centre.

2.4.3 Branch Valves

Branch (offtake) Valves are installed at the branches of the pipeline to provide isolation between the offtake and the pipeline. Branch Valves are normally in an “Open” Position.

2.4.4 Pig trap valves

Pig trap valves are provided at the termination of each piggable transmission pipeline as part of pigging pipe works to isolate the pipeline and the pig trap. The Pig trap valves are normally in a “Close” position.

2.4.5 Pig trap kicker valves

Pig trap kicker valves are provided at pigging pipe works to facilitate the launching and receiving of the pig during pigging operation. The Pig trap kicker valves are normally in a “Close” position.

2.4.6 Blowdown valves

Blowdown valves are installed to facilitate pipeline blowdown, flaring, purging and pipeline pressure equalisation prior to line valve operation by providing a throttling facility. The bypass assembly enables the line valve to be operated to fully closed position for a short period and still maintain gas flow.

The valve status/position depends on its location in the pipeline system listed on the “APA GasNet’s Critical TP Valves” in Appendix 4. The valve positions shown reflect the initial setting. The parties agree that operational positions and the relevant AEMO database will be under AEMO control in accordance with the AEMO Valve Change Procedure, developed and maintained in consultation with APA GasNet.

2.5 Telemetry

The telemetry system provided under this Service Envelope includes Remote Telemetry Units (RTU’s) located at each compressor station, receipt points on the GNS, major valve installations, pressure limiters and City Gates. The communications diagrams A4-362-1, A4-362-3, A4-362-4, A4-362-5, A4-362-6 and RTU555 identify the relevant network topology, communications line reference numbers, baud rates, RTU addresses, control centres and other technical details necessary to identify the communication path between each RTU and AEMO. Each RTU shall be configured in accordance with a functional specification prepared specifically for the RTU.

The telemetry system is the primary means of monitoring and managing the capacity of APA GasNet assets by AEMO, and is designed to carry data for both AEMO and APA GasNet. Data interfaces, signal names, storage requirements, polling frequencies and alarm responses shall be specified by APA GasNet in the functional specification for each particular RTU as agreed by AEMO. Changes to this specification are managed under the APA GasNet change management procedure MAN 232 and are subject to agreement of both parties.

2.6 Odourisation

Natural gas is delivered by Esso from its Longford natural gas processing plant into the APA GasNet System via the Longford Metering Station. Odourant is injected by APA GasNet into the natural gas stream at the Longford Metering facility to achieve odourant concentration levels as required by the Gas Industry Act 2001 (Vic) and/or Gas Safety Act 1997 and/or relevant subordinate legislation.

The operation, maintenance and control of the Longford odourant installation is the responsibility of APA GasNet. AEMO will provide monitoring services to APA GasNet in line with the agreed functional specification.

The facility is located within the site of the Longford Metering station. The main components of the odourant plant includes two (2) stainless steel storage tanks each of 20,000 litres liquid capacity within a concrete wall bund, dual odourant injection pumps complete with controls to achieve odourant injection proportional to gas flow rate and in concentration required by relevant legislation. Monitoring of odourant dosing rate achieved by the

system is provided by an RTU supervisory system which provides data and alarms to the AEMO Operations Centre.

2.7 Pressure Transmitters at Embedded Meter Sites

APA GasNet have installed pressure transmitters at the embedded meter sites of Sale (M079), Corio (M065), Ballarat (M054), Bendigo (M057) and Castlemaine (M059). These pressure transmitters have been installed to enable AEMO to monitor the system pressures at these delivery points and data is available via the associated CTM RTU.

3 Design Capability

This section describes the capability of the APA GasNet assets in the Service Envelope with respect to operation of the system, and the specific design capability of these assets.

The system is made available for carriage of gas which meets the gas specification for transmission systems in the Gas Safety (Gas Quality) Regulations 2007 (Vic) or any other like applicable laws or regulations.

The design capability of the APA GasNet System requires that gas injected into the APA GasNet System is free from objectionable odours and from dust and other solid or liquid matters, waxes, gums or gum forming constituents which may interfere with its merchantability or cause injury to or interference with the proper operation of the pipelines, meters, regulators or other appliances through which it flows. Accordingly, AEMO will use its reasonable endeavours to ensure that, to the extent that it is within AEMO's reasonable power, gas injected into the APA GasNet System meets these standards.

3.1 Pipelines

To facilitate AEMO to operate the APA GasNet's transmission pipeline for transportation of natural gas to all defined transfer points within the APA GasNet System, the following key design parameters in relation to the pressure control of the pipeline system are determined.

- Maximum Allowable Operating Pressure (MAOP)
- Recorded Pipeline Length
- Pipeline Internal Diameter
- Internal Lining of the Pipeline (where applicable)

Pipeline capability presumes temperatures of operation between minus 20 degC and 45 degC. Details of the above design parameters for each licensed pipeline are summarised in the APA GasNet "Pipeline's Specifications" Appendix 5.

Good Practice for pipelines does not require redundant or stand-by pipeline assets.

3.2 Pressure Regulators

Regulator design capacities and over-pressure device set-points where applicable are provided in the “Regulator Capacity Table” in Appendix 6. These capacities are associated with a minimum inlet pressure below which the nominated capacity may be restricted.

Good Practice at these facilities comprises the number of duty runs and stand-by runs as designated in Appendix 6. The capability of each facility is that provided by the total of the duty runs.

3.2.1 Tyers Pressure Limiter

The pressure reduction station is designated as P9-003. The details of its design, construction and configuration are defined by drawing P9-3-8 and the details of its control and instrumentation systems are defined by drawing 2130-PB-001.

The design purpose of the facility is to defer the installation and operating costs associated with heaters when very low temperatures would otherwise be experienced as a result of the Joule-Thomson cooling at regulator stations. The assembly inlet and outlet valving and pipe work is designed as a Class 600 pressure rating system and hydrostatically tested for M.A.O.P. of 6890 kPa(g).

The pressure reduction station comprises a single 300 mm diameter Fisher control valve (Class 600) complete with pneumatic controllers and providing pressure control from an inlet pressure (maximum) of 6890 kPa(g) to the downstream gas pressure set point of 4400 (typical) kPa(g) or as determined by AEMO and adjusted by remote operation.

Good Practice at this facility comprises one duty run and no stand-by runs. An actuated by-pass is provided for the purposes of maintenance or breakdown.

3.2.2 Morwell City Gate

The pressure reduction station is designated as P8-013. The details of its design, construction and configuration are defined by drawing P8-13-5 and details of its control and instrumentation systems are defined by drawings 4205-PB-001 to 005.

The assembly inlet valving and pipe work up to and including the outlet pipe spool connecting to the outlet valve is designed as a Class 600 system MAOP 7070 kPa(g) and downstream from the outlet valve and downstream system being designed as a Class 300 system MAOP 2760 kPa(g).

The pressure reduction regulator assembly is arranged as a dual run system with 300 mm diameter “Fisher” Class 600 control valves in active and monitor configuration and providing a pressure reduction from 4400 (typical) kPa(g) inlet to 2760 kPa(g) outlet. Pressure is normally controlled from the site RTU.

In event of RTU failure, regulator control will revert to pneumatic control with a setpoint 2700 kPa(g).

The inlet valves to each of the two runs are fitted with pneumatic actuators for slamshut over pressure protection of the downstream system. The slamshut valves can be remotely operated. The slamshut valve will automatically slam shut when the sensed pressure exceeds the set point. The valves require manual intervention to re-open. Once tripped, remote operation function of the valve will be disabled until the high pressure condition has disappeared and the pressure fallen below a set point to reset the interlock.

The slamshut valves will also slam shut when the sensed pressure is less than 1,000 kPa(g).

3.2.3 Dandenong City Gate

The pressure reduction station is designated as P8-004. The details of its design, construction and configuration are defined by drawings Q31-3-41 and Q31-3-42 and details of its control and instrumentation systems are defined by drawing Q31-5-88.

The assembly inlet valving and pipe work up to and including the outlet pipe spool connecting to the outlet valve is designed as a Class 600 system MAOP 6890 kPa(g) and the outlet valve being designed as a Class 300 system connecting to the 750 mm Dandenong to West Melbourne pipeline system.

The pressure reduction regulator assembly is arranged as a multiple run system with seven (7) runs each with a 200 mm diameter "Jetstream" Class 600 regulator active 200 mm diameter Fisher V Ball Class 600 control valve in and monitor configuration for each run and providing a pressure reduction from 6890 (maximum) kPa(g) inlet to 2760 kPa(g) outlet. The inlet valves to each of the seven (7) runs are fitted with pneumatic actuators for slamshut over pressure protection of the downstream system.

3.2.4 Wollert City Gate

The pressure reduction station is designated as P8-016. The details of its design, construction and configuration are defined by drawing P8-16-1 Revision B and details of its control and instrumentation systems are defined by drawing P8-16-2 Revision B. The assembly inlet valving and pipe work up to and including the run inlet valves is designed as a Class 600 system MAOP 6890 kPa(g) and the downstream system being designed as a Class 300 system MAOP 2760 kPa(g). Regulator runs have been designed as a Class 600 system capable of 10,200 kPa(g).

A 3000 kW water-bath heater is located in the common gas supply line upstream of the regulator runs. It consists of a water-bath heat exchanger through which a number of tubes transport the gas to be heated. The heater includes a dual natural gas burner system comprising a main and pilot burner, burner management control

system, flame-tubes and flue stacks. Fuel gas is sourced from the compressor station custody transfer meter.

The pressure reduction regulator assembly is arranged as a multiple run system with four (4) runs each with a 250 mm diameter “Mascot” Class 600 regulator providing pressure reduction from 6890 (maximum) kPa(g) inlet to 2760 kPa(g) outlet. The inlet valves on each of the four (4) runs are fitted with pneumatic actuators for slamshut over pressure protection of the downstream system.

Regulator runs 1 and 2 have two remotely actuated inlet valves which are connected to common headers. One inlet valve of each of these two regulator runs are directly connected to the Pakenham to Wollert pipeline (upstream of Wollert pressure limiter P9-12) and the other is connected to the Wollert to Wodonga pipeline (downstream of the Wollert pressure limiter P9-12).

The inlet valve for Runs 3 and 4 do not have remote operation capability and are connected to the Pakenham to Wollert pipeline (upstream of the Wollert pressure limiter P9-12).

The assets which comprise the Wollert City Gate have been designed and installed with the intention that if gas supply from Longford is required:

- The slam-shut valve in the 300mm by pass run of the Wollert pressure limiter P9-12 may need to be opened; and
- Close inlet isolation valves connected to the Wollert to Wodonga pipeline of both Run 1 and Run 2; and
- Open inlet isolation valves connected to the Pakenham to Wollert pipeline of both Run 1 and Run 2.

The assets which comprise the Wollert City Gate have been designed and installed with the intention that if gas supply from Moomba is required:

- The Wollert pressure limiter P9-12 requires a set point to operate and the slam-shut valve in the 300mm by pass run of the Wollert pressure limiter needs to be closed; and
- Open the inlet isolation valve connected to the Wollert to Wodonga pipeline in either Run 1 or Run 2. The facility is designed to supply gas from Moomba through one regulator run only. The second run is a stand by run for gas supply from Moomba; and
- Close the inlet isolation valve connected to the Pakenham to Wollert pipeline of the selected run.

3.2.5 Wollert Pressure Limiter

The pressure reduction station is designated as P9-12. The facility can be operated in one of the following two operation modes:

- (a) Bi-directional flow of gas between the Pakenham to Wollert pipeline (Licence 141 T61, 750mm 6890 kPa(g) MAOP) and the Wollert to Wodonga pipeline (Licence 101, T74 300mm, 8800 kPa(g) MAOP); or
- (b) Pressure reduction of gas flowing from the Pakenham to Wollert pipeline into the Wollert to Wodonga pipeline and/or into the inlet of Wollert City Gate run 1 or 2.

The site plan 1321-MA-001 shows the layout of this City Gate installation.

The P&ID drawings 1312-PB-010, 1312-PB-011, 1312-PB-012, 1312-PB-014, and 1312-PB-015 show the details of the control and instrumentation system of this pressure limiter.

The facility comprises three parallel runs:

- one bi-directional unregulated by-pass run through which gas can flow to and from the Pakenham to Wollert pipeline and the Wollert to Wodonga pipeline;
- two uni-directional pressure regulator runs (one duty and one stand-by) which provide pressure reduction from the Pakenham to Wollert pipeline to the Wollert to Wodonga pipeline. A vortex flow meter is fitted in each regulator run to provide indicative flow measurement and provision to implement flow control.

The regulator outlet is connected to the inlet to Run 1 and Run 2 of the Wollert City Gate, and to the Wollert to Wodonga pipeline.

3.2.5.1 Station Pipe Work

All new station pipe work of the facility is designed as a Class 600 system MAOP 10200 kPa(g).

3.2.5.2 Bi-directional By-Pass Run

The bi-directional bypass run is equipped with three levels of over pressure protection to ensure that over pressurisation of the Pakenham to Wollert pipeline (MAOP 6890 kPa(g)) cannot occur from the Wollert to Euroa pipeline (MAOP 8,800 kPa(g)).

The valves for the first two levels (levels 1 & 2) of over pressure protection will automatically re-open once the over pressure condition disappears. The first and second levels of over pressure protection are set to automatically close the valves when the pressure in the

Wollert to Wodonga pipeline is above the high set points, and re-open when the pressure is below the low set points.

The final level of over pressure protection (slamshut level 3) once tripped to shut will require manual intervention to re-open. There are two slamshut valves. One is located in the 300 mm by pass run and the other is located in the regulator outlet header. The slam-shut valves can be remotely operated to close and re-open the by-pass run and to isolate/enable the limiter outlet header to the Wollert to Wodonga pipeline. The slam-shut valves shall not be re-opened when the differential pressure across the valve is greater than 200 kPa.

The slamshut valve UV-61 in the 300mm by-pass run must be closed for the regulators to operate.

3.2.5.3 Regulator Runs

The slamshut valve UV-61 in the 300mm by-pass run must be closed for the regulators to operate.

The regulator assembly is arranged as a dual run system with a single 200mm diameter Fisher globe type control valve in each run (one duty run and one standby). The regulator is electronically controlled by the RTU and therefore is dependent on power supply and RTU. The maximum allowable set point for the regulators is 6890 kPa(g) and can be remotely adjusted to suit operational requirements.

If the RTU fails, the backup pneumatic controller fitted to each regulator will control the regulator to a predetermined set point. The set point for the pneumatic controller can only be adjusted on site.

The inlet valves to each run are fitted with pneumatic actuators for remote operation.

A vortex flow meter is fitted in each regulator run to provide indicative flow measurement and provision to implement flow control.

3.2.5.4 Slamshut Valves

The slamshut valves can be remotely operated. The slamshut valve will automatically slam shut when the sensed pressure exceeds the set point. The valves require manual intervention to re-open. Once tripped, remote operation function of the valve will be disabled until the high pressure condition has disappeared and the pressure fallen below a set point to reset the RTU software interlock.

The slamshut valves will also slam shut when the sensed pressure is less than 1,000 kPa(g).

Slamshut valve UV-61 in the 300mm by-pass run must be closed for the regulators to operate.

3.2.6 Laverton North City Gate

The pressure reduction station is designated as P8-27. The details of its design, construction and configuration are defined by drawing P8-27-9 and details of its control and instrumentation systems are defined by drawing P8-27-3.

The assembly inlet valving and pipe work up to and including the outlet pipe spool and outlet valve is designed as a Class 600 system MAOP 7390 kPa(g) and the outlet downstream system being designed as a Class 300 system MAOP 2760 kPa(g).

The pressure reduction regulator assembly is a dual run system with 80 mm diameter "Gortor" Class 600 regulators in active and monitor (with monitor over-ride) configuration and providing pressure reduction to 2500 kPa(g) outlet. Each run comprises a manual isolation valve, a filter, an integral Gortor slam-shut/monitor regulator, an active Gortor regulator and a manual discharge isolation valve. The Gortor slamshut valve provides over-pressure and under-pressure protection of the downstream system.

3.2.7 Hopkins Road Pressure Limiter

Decommissioned.

3.2.8 Clunes Road Pressure Limiter

Decommissioned.

3.2.9 Toolamba Road Pressure Limiter

Decommissioned.

3.2.10 Dandenong Pressure Limiter (Lurgi Backup Regulator)

The pressure reduction station is designated as P8-007. The details of its design, construction and configuration are defined by drawings P8-7-1 and details of its control and instrumentation systems are defined by drawing P8-7-3.

The assembly inlet valving and pipe work up to and including the outlet pipe spool connecting to the outlet valve is designed as a Class 300 system MAOP 2760 kPa(g) and the outlet valve being designed as a Class 300.

The pressure reduction regulator assembly is arranged as a dual run system of 150 mm diameter Class 300 regulators in active only configuration for each run and providing pressure reduction from 2760 (maximum) kPa(g) inlet to typical 1700 kPa(g) outlet. Pressure is normally controlled from the site RTU.

In event of RTU failure, regulator control will revert to pneumatic control, setpoint 1700 kPa(g).

3.2.11 Clonbinane Pressure Limiter

Decommissioned

3.2.12 Lara City Gate

The pressure reduction station is designated as P10-01. The facility provides the following two operation modes:

1. Uni-directional bypass for flow of gas from Brooklyn to Corio pipeline (Licence 81, T24, 350mm 7390 kPa(g) MAOP) to South West Pipeline (Licence 231, T92, 500mm MAOP 10000 kPa(g)).
2. Pressure reduction of gas flowing from the South West Pipeline and into the Brooklyn to Corio pipeline.

The site plan 2631-MA-001 shows the layout of this City Gate installation. The P&ID drawings 2631-PB-001, 2631-PB-002, 2631-PB-003, and 2631-PB-004 show the details of the control and instrumentation system of this City Gate.

The station pipe work between the hot tap fitting on the Brooklyn to Corio pipeline to the South West Pipeline is designed as a Class 600 system MAOP 10000 kPa(g).

The uni-directional bypass run is equipped with three levels of over pressure protection (one non-return valve and two over pressure shut off valves) to ensure that over pressuring of the Brooklyn to Corio pipeline cannot occur from the higher pressure South West Pipeline. The non-return valve allows gas to automatically flow from the Brooklyn to Corio pipeline to the South West Pipeline when the pressure in the Brooklyn to Corio pipeline is higher than the pressure in the South West Pipeline.

The regulator assembly is arranged as a multiple run system with four (4) runs of 300mm diameter (three duty runs and one stand by run) and one (1) run of 200mm diameter Fisher EWD globe type control valves in active and monitor configuration. Each active regulator is electronically controlled by the RTU and therefore is dependent on the availability of power supply and the RTU. The four large runs are operated in parallel to avoid damage due to high flow through the basket filters.

The set point for the monitor regulators is controlled by the RTU to track the set point of the active regulators and will hold the last set point if the RTU fails. The intent of the set point tracking is to minimise the difference between the active and monitor regulators, to prevent or minimise sudden and significant surge of flow through the City Gate if the RTU fails and causes the active regulators to fail wide open. The inlet valves of each regulator run are fitted with pneumatic actuators for slamshut over pressure protection of the downstream system.

An upper limit of 7390 kPa(g) is placed on the outlet pressure set point to protect the downstream pipeline from overpressure. Similarly, the maximum limit on station flow set point to protect the filters is 400,000 sm³/h. The RTU has been designed to ramp the AEMO set points when changed to control the rate and extent of opening and closing of the regulators.

A 500 kW water-bath heater is located in the common gas supply line upstream of the regulator runs. It consists of a water-bath heat exchanger through which a number of tubes transport the gas to be heated. The heater includes a dual natural gas burner system comprising a main and pilot burner, burner management control system, flame-tubes and a flue stack and custody transfer meter for fuel gas.

The site has a single bi-directional single path ultrasonic flowmeter designed to indicate flow rates between 40,000 sm³/h and 400,000 sm³/h when in regulator run mode, and between 10,000 sm³/h and 100,000 sm³/h when in bypass mode. The flow readout figure should be used only as an indication of the flow rate.

3.2.13 Brooklyn (BCP) City Gate

The pressure reduction station is designated as P8-28. This facility provides pressure reduction of gas flowing from the Brooklyn to Corio pipeline (Licence 81-T24, 350mm 7390 kPa(g) MAOP) into the South Melbourne to Brooklyn pipeline (Licence 108-T33, 750mm, 2760 kPa(g) MAOP). The site plan 1221-MA-001 shows the layout of this City Gate installation. The P&ID drawings 1221-PB-001 and 1221-PB-008 show the details of the control and instrumentation system of this City Gate.

The station inlet pipe work between the hot tap fitting on the Brooklyn to Corio pipeline and including the regulator outlet isolation valves is designed as a Class 600 system MAOP 10,200 kPa(g). The station outlet pipe work between the regulator outlet isolation valves and the hot tap fitting on the South Melbourne to Brooklyn pipeline is designed as Class 300 MAOP (maximum operating pressure is currently 2,760 kPa(g)).

The regulator assembly is arranged as a multiple run system four (4) runs of 300mm diameter (three duty runs and one standby run) and one (1) run of 200mm diameter. Runs 1 to 4 comprise Fisher globe type control valves in active and monitor configuration and Run 5 comprises a Mascot globe type control valve.

Each active regulator is electronically controlled by the Station Safety PLC and therefore is dependent on the availability of power supply. The four large runs are operated to avoid damage due to high flow through the basket filters. The maximum allowable set point for the regulators is 2,760 kPa(g) and can be remotely adjusted to suit operational requirements. The monitor regulator is fully pneumatically operated and the set point is fixed to the value set at site. The inlet valves to each regulator run are fitted with pneumatic

actuators for slamshut over pressure protection of the downstream system.

An upper limit of 2,760 kPa(g) is placed on the outlet pressure set point to protect the downstream pipeline from overpressure. Similarly, the maximum limit on station flow set point to protect the filters is 400,000 sm³/h. The RTU has been designed to ramp the AEMO set points when changed to control the rate and extent of opening and closing of the regulators.

Two 2050 kW water-bath heaters are located in the common gas supply line upstream of the regulator runs. Each heater consists of a water-bath heat exchanger through which a number of tubes transport the gas to be heated. The heater includes a dual forced draft natural gas burner system comprising a main and pilot burner, burner management control system, flame-tubes and two flue stacks. Fuel gas is sourced from the compressor station custody transfer meter. The heater is required for the regulator station mode of operation only. The heater is controlled by the regulator station gas outlet temperature when gas is flowing.

The site has a single bi-directional single path ultrasonic flowmeter designed to indicate flow rates between 22,000 sm³/h and 500,000 sm³/h. The flow readout figure should be used only as an indication of the flow rate.

3.2.14 Brooklyn (BBP) PRS

The pressure regulator station (PRS) is designated as P10-05. The facility provides pressure reduction of gas flowing from the Brooklyn to Lara pipeline (Licence 266, T112, 500 mm 10,200 kPa(g) MAOP) into the Brooklyn to Ballan pipeline (Licence 78 T56, 200mm, 7390 kPa(g) MAOP). The site plan 1221-MA-001 shows the layout of this pressure regulator installation. The P&ID drawings 1221-PB-001 and 1221-PB-003 show the details of the control and instrumentation system of this PRS.

The station pipe work between the isolation valve on the BLP facility and the hot tap fitting on the Brooklyn to Ballan pipeline is designed as a Class 600 system MAOP 10,200 kPa(g).

The regulator assembly is arranged as a dual run system (one duty run and one stand by) with a single 80mm diameter Fisher globe type control valve in each run. The regulator is electronically controlled by the RTU and therefore is dependent on power supply and the RTU. The maximum allowable set point for the regulators is 7390 kPa(g) and can be remotely adjusted to suit operational requirements. If the RTU fails, the backup pneumatic controller fitted to each regulator will control the regulator to a predetermined set point of 4500 kPa(g). The set point for the pneumatic controller can only be adjusted on site.

The inlet valves to each run are fitted with pneumatic actuators for slamshut over pressure protection of the downstream system. The

slamshut valves can be remotely operated and will automatically slam shut when the sensed downstream pressure exceeds the set point. The valves require manual intervention to re-open. Once tripped, remote operation of the valve will be disabled until the downstream pressure falls below 6955 kPa(g) which resets the RTU software interlock. The slamshut valves will also slam shut when the sensed downstream pressure is less than 1,000 kPa(g).

3.2.15 Barnawartha City Gate

The pressure reduction station is designated as P10-02. The facility can be operated in one of the following two operation modes:

- (a) bi-directional flow of gas between the Interconnect (Barnawartha North to Culcairn) (Licence 178, T99, 450mm, 10,200 kPa(g) MAOP) and the Wollert to Wodonga pipeline (Licence 101, T74 300mm, 7400 kPa(g) MAOP); and
- (b) pressure reduction of gas flowing from the Interconnect pipeline (450mm Culcairn to Barnawartha North) into the Wollert to Wodonga pipeline.

The site plan 6650-MA-001 shows the layout of this City Gate installation. The P&ID drawings 6650-PB-001, 6650-PB-002, 6650-PB-003, 6650-PB-004 show the details of the control and instrumentation system of this City Gate.

The facility comprises of three parallel runs:

- one 300mm bi-directional un-regulated by-pass run through which gas can flow to and from the two pipelines; and
- two 100mm uni-directional pressure regulator runs (one duty and one stand-by) which provide pressure reduction from the Interconnect (Barnawartha North to Culcairn) 10200 kPa(g) MAOP pipeline to the Wollert-to-Wodonga 7400 kPa(g) MAOP pipeline.

The station pipe work, excluding the hot tap fitting on the Wollert to Wodonga pipeline, is designed as a Class 600 system MAOP 10200 kPa(g).

The bi-directional bypass run is equipped with three levels of over pressure protection to ensure that over pressurisation of the Wollert to Wodonga pipeline cannot occur from the higher pressurised Interconnect (Barnawartha North to Culcairn) pipeline. The bypass run is set to automatically close when the pressure in the Interconnect (Barnawartha North to Culcairn) pipeline is greater than 7400 kPa(g), and automatically re-open when the pressure falls below 6955 kPa(g). The slam-shut valve shall not be re-opened when the differential pressure across the valve is greater than 200 kPa.

The regulators are set to automatically come on line to regulate and limit the downstream pressure to a set point when the 300mm by pass

run is closed. The regulator assembly is arranged as a dual run system of 100mm diameter Fisher globe type control valves in active and monitor configuration. The active regulator is electronically controlled by the RTU and therefore is dependent on the availability of power supply and the RTU. The maximum allowable set point for the regulators is 7400 kPa(g) and can be remotely adjusted to suit operational requirements. The monitor regulator is fully pneumatically operated and the set point is fixed to the value set at site. The inlet valves to each run are fitted with pneumatic actuators for slam-shut over pressure protection of the downstream system.

The slamshut valves can be remotely operated and will automatically slamshut when the sensed pressure exceeds the set point. The valves require manual intervention to re-open. Once tripped, remote operation of the valve will be disabled until the pressure falls below 6955 kPa(g) which resets the RTU software interlock. The slamshut valves will also slamshut when the sensed pressure is less than 1,000 kPa(g).

A vortex flow meter is fitted in each regulator run to provide indicative flow measurement and provision to implement flow control.

3.2.16 Wandong PRS

The pressure reduction station is designated as P10-06. The facility provides pressure reduction of gas flowing from the Wollert to Wodonga pipeline (Licence 101, T74, 300mm 8800 kPa(g) MAOP) into the Wandong to Kyneton pipeline (Licence 143 T75, 300mm, 7390 kPa(g) MAOP). The site plan 2451-MA-001 shows the layout of this pressure limiter installation. The P&ID drawings 2451-PB-001 to 1312-PB-007 show the details of the control and instrumentation system of this pressure reduction station.

The facility comprises one heater and two parallel regulating runs:

- One 500 kW water bath heater
- Two unidirectional pressure regulator runs (one duty and one stand-by) which provide pressure reduction from the Wollert to Wodonga pipeline and supply gas into the Wandong to Kyneton pipeline.

The station pipe work between the hot tap fittings on the Wollert to Wodonga pipeline and the Wandong to Kyneton pipeline is designed as a Class 600 system MAOP 10,200 kPa(g).

A 500 kW water-bath heater is located in the common gas supply line upstream of the regulator runs. It consists of a water-bath heat exchanger through which a number of tubes transport the gas to be heated. The heater includes a dual natural draft gas burner system comprising a main and pilot burner, burner management control system, flame-tubes and a flue stack and custody transfer meter for fuel gas.

The regulator assembly is arranged as a dual run system with a single 150mm diameter globe type Fisher control valve regulator in each run. The regulator is electronically controlled by the RTU and therefore is dependent on power supply and RTU. The maximum allowable set point for the regulators is 7390 kPa(g) and can be remotely adjusted to suit operational requirements. If the RTU fails, the backup pneumatic controller fitted to each regulator will control the regulator to a predetermined set point of 6500 kPa(g). The set point for the pneumatic controller can only be adjusted on site. The inlet valves to each run are fitted with fail-closed pneumatic actuators for slam-shut over pressure protection of the downstream system.

The slamshut valves can be remotely operated and will automatically slam shut when the sensed pressure exceeds the set point. The valves require manual intervention to re-open. Once tripped, remote operation of the valve will be disabled until the pressure falls below 6955 kPa(g) which resets the RTU software interlock. The slamshut valves will also slam shut when the sensed pressure is less than 1,000 kPa(g).

A vortex flow meter is fitted in each regulator run to provide indicative flow measurement and provision to implement flow control.

3.2.17 Iona City Gate

The pressure reduction station is designated as P10-03. The facility provides one of the following two operation modes:

- (a) Uni-directional flow of unregulated gas from the 150mm North Paaratte to Iona pipeline to South West Pipeline (Licence 183, T92, 500mm, 10000 kPa(g) MAOP).
- (b) Pressure reduction of gas flowing from the South West Pipeline into the 150mm North Paaratte to Iona pipeline.

The site plan 4630-MA-001 shows the layout of this City Gate installation. The P&ID drawings 4630-PB-001, 4630-PB-004, 4630-PB-005, 4630-PB-006, and 4630-PB-011 show the details of the control and instrumentation system of this City Gate.

The station pipework is designed as a Class 600 system MAOP 10200 kPa(g).

The uni-directional bypass run is equipped with three levels of over pressure protection (one non-return valve and two over pressure shut off valves) to ensure that over pressurisation of the Iona to North Paaratte pipeline cannot occur from the South West Pipeline. The non-return valve (first level) allows gas to automatically flow from the North Paaratte to Iona pipeline to the South West Pipeline when the pressure in the North Paaratte to Iona pipeline is higher than the pressure in the South West Pipeline, provided the remote actuated slamshut valve (second level) in the bypass run is open. The final level of over pressure protection (slamshut level 3) once tripped to

shut will require manual intervention to re-open. The slam-shut valve can be remotely operated to close and re-open the by-pass run. The slam-shut valve shall not be re-opened when the differential pressure across the valve is greater than 200 kPa.

The regulator assembly is arranged as a dual run system with one (1) runs of 150mm diameter and one (1) standby run of 100mm diameter Fisher globe type control valves in active and monitor configuration. The active regulator is electronically controlled by the RTU and therefore is dependent on the availability power supply and RTU. The maximum allowable set point for the regulators is 7400 kPa(g) and can be remotely adjusted to suit operational requirements. The monitor regulator is fully pneumatically operated and the set point is fixed to the value set at the site. The inlet valves of each regulator run are fitted with pneumatic actuators for slamshut over-pressure protection of the downstream system.

If the slam-shut valve trips on high pressure, the ability to reopen in auto mode will be locked out until downstream pressure is reduced to a defined point below MAOP (eg. 94% of MAOP). Reopening requires a person on site to open the slam-shut bypass line to reduce differential pressure to less than 200 kPa across the valve. Therefore, remote closure of the slam-shut valve should be reserved for emergency situations or situations where there is a concern for safety.

When in manual mode, local manual control is enabled and remote control by AEMO is disabled. Manual mode is used when local shut down for maintenance is required.

All slam-shut valves are provided with a spring to close, gas to open, pneumatic actuator. This is to provide a "fail closed" valve for maximum safety. Any condition constituting a system failure, such as loss of power gas pressure, loss of (or low) sensed signal pressure, rupture of gas tubing, etc. will result in the slam-shut valve closing which is the "fail safe" position.

If a slam-shut valve has been closed or tripped shut, AEMO must notify APA GasNet.

Provision for a future connection of a gas heater is provided in the inlet pipe work to the regulator runs.

The site has a single bi-directional ultrasonic flowmeter located at the Iona-Lara Pipeline end of the Iona City Gate facility, downstream of the take-off to WUGS. The flowmeter is designed to indicate flow rates between 4,500 sm³/h and 45,000 sm³/h in either direction and should be used only for indicative purposes.

3.2.18 Brooklyn (BLP) City Gate

The pressure reduction station is designated as P10-04. This facility provides pressure reduction of gas flowing from Brooklyn Lara Pipeline (Licence 266-T112, 500mm 10,200 kPa(g) MAOP) into the Brooklyn to Corio pipeline (Licence 81-T24, 350mm 7390 kPa(g)

MAOP). The site plan 1222-MA-001 shows the layout of this City Gate installation. The P&ID drawings 1222-PB-001 to 1222-PB-008 show the details of the control and instrumentation system of this City Gate.

The station inlet pipe work between the fitting on the Brooklyn to Lara pipeline and including the station outlet isolation valve is designed as a Class 600 system MAOP 10,200 kPa(g) (maximum outlet operating pressure is currently 7,390 kPa(g)).

The regulator assembly is arranged as a multiple run system four (4) runs of 300mm diameter (three duty runs and one standby run) and one (1) run of 200mm diameter. Runs 1 to 5 comprise Mascot globe type control valves and also fitted with a liquids knock out drum with an actuated isolation and bypass valve.

Each active regulator is electronically controlled by the RTU and therefore is dependent on the availability of power supply and the RTU. All runs are controlled by the station controller (PLC) to limit flow in each run to avoid damage due to high flow through the strainers. The maximum allowable set point for the regulators is 7,390 kPa(g) and can be remotely adjusted to suit operational requirements. The inlet valves to each regulator run are fitted with pneumatic actuators for slamshut over pressure protection of the downstream system.

An upper limit of 7,390 kPa(g) is placed on the outlet pressure set point to protect the downstream pipeline from overpressure. Similarly, the maximum limit on station flow set point to protect the filters is 400,000 sm³/h. The PLC has been designed to ramp the AEMO set points when changed to control the rate and extent of opening and closing of the regulators.

Two 625 kW water-bath heaters are located in the common gas supply line upstream of the regulator runs. Each heater consists of a water-bath heat exchanger through which a number of tubes transport the gas to be heated. Each heater includes a forced draft natural gas burner system comprising a main and pilot burner, burner management control system, flame-tube and flue stack. Fuel gas is sourced from the compressor station custody transfer meter. The heater is required for the regulator station mode of operation only. The heater is controlled by the regulator station gas outlet temperature when gas is flowing.

The site has a single bi-directional dual path ultrasonic flowmeter designed to indicate flow rates between 22,000 sm³/h and 500,000 sm³/h. The flow readout figure should be used only as an indication of the flow rate.

3.2.19 Euroa Pressure Reduction Station

The pressure reduction station is designated as P10-07. The details of its design, construction and configuration are defined by drawing 1600-PB-001.

The design purpose of the facility is to prevent overpressure of the pipeline north of the facility when gas is flowing north. The assembly inlet and outlet valving and pipe work is designed as a Class 600 pressure rating system and hydrostatically tested for MAOP of 10,200 kPa(g). Instrumentation is designed and set to permit operation of the northern pipeline to the pipeline MAOP of 7,400 kPa(g).

The pressure reduction regulator is a single 250 mm diameter Valtek Mega Stream Mark 1 Class 600 unit complete with backup pneumatic controller and providing pressure control from an inlet pressure (maximum) of 8800 kPa(g) to the downstream gas pressure set point of 7400 kPa(g).

Good Practice at this facility comprises one duty run and no stand-by runs. The facility may be by-passed using the linevalves for the purposes of southerly flow, maintenance or breakdown, provided the pressure south of the station is less than 7400 kPa(g).

3.2.20 Plumpton PRS

The pressure regulator station is designated as P10-08. The details of its design, construction and configuration are defined by drawings 2650-MA-001 and 2650-MB-001 and details of its control and instrumentation systems are defined by drawings 2650-PB-001 and 2650-PB-002.

The assembly inlet valving and pipe work up to and including the outlet pipe spool connecting to the outlet valve is designed as a Class 600 system MAOP 10,200 kPa(g) and the outlet valve being designed as a Class 600.

The pressure reduction regulator assembly is arranged as a dual run system of 150 mm diameter Class 600 regulators in active and monitor configuration for each run and providing pressure reduction from 10,200 kPa(g) (maximum) inlet to typical 7,000 kPa(g) outlet. Each run has a slam shut over pressure valve for protection of the downstream system.

3.3 Compressor stations

The compressor stations are equipped with industrial gas engines with Nominal Power capabilities summarised as follows:

(a) Gooding Compressor Station - combined Nominal Power of 8550 kW at 15 deg. Celsius ambient (equivalent to 3 Centaur units).

(b) Brooklyn Compressor Station

Geelong - combined Nominal Power of 4650 kW at 15 deg. Celsius (equivalent to 1 Centaur and 2 Saturn units)

Ballarat - combined Nominal Power up to 2850 kW at 15 deg. Celsius (equivalent to 1 Centaur unit)

- (c) Wollert Compressor Station - combined Nominal Power of 9100 kW at 15 deg. Celsius (equivalent to 2 Centaur units)
- (d) Springhurst Compressor Station - Nominal Power of 4550 kW at 15 deg. Celsius (equivalent to 1 Centaur units), subject always to clause 2.3.4 of this Schedule 1
- (e) Iona Compressor Station - Nominal Power of 298 kW at 15 deg. Celsius or as required to compress gas from the Lara to Iona Pipeline into the North Paaratte to Iona pipeline.
- (f) Euroa Compressor Station – Nominal Power of 4550 kW at 15 deg. Celsius (equivalent to 1 Centaur units)

These Nominal Power capabilities will vary when operating conditions differ from standard conditions as specified in this Service Envelope Agreement and the attached schedules. Supplier references for compressor performance details are listed in Compressor Stations Key Data Plan No. A1-301-1. These factors include, but are not limited to, non-standard ambient air temperatures, pipeline service conditions, and in-service equipment wear and tear consistent with the approved maintenance schedule and supplier recommendations as determined from the manufacturer's proprietary engine and compressor performance evaluation software (Ref: Solar Centaur T4002 tcb2rev0.exe, Solar Centaur T6102 thd2rev1.exe, Solar Saturn T1302 tsc2rev0.exe and Solar Saturn T1202 tsb2rev0.exe) which is provided to AEMO. APA GasNet shall provide updates to the software under its change management system.

At each compressor station complex, good design practice comprises the provision of spare capacity equivalent to the largest duty unit in use (within the Service Envelope). It does not comprise of the provision of redundant common elements at each compressor station.

3.3.1 Gooding Compressor Station

The compressor sets are configured to operate in a parallel mode such that the total station flow is divided nominally equally among the operating machines. As Gooding Compressor Station is not fitted with a gas discharge after cooling system, recycling of gas through the compressors or station capacity control valve is limited due to the potential for recycled gas overheating.

The control system of the compressor unit allows initiation of gas recycle, if, due to the pipeline operating conditions, recycle is required to prevent surging of the compressor. Recycle is maintained as long as the temperature of gas, as sensed at the outlet of the unit, remains within allowable limits. At 99 °C a High Outlet Temperature alarm is raised, and at 110 °C the control system initiates shutdown of the unit. The station is designed that if the prevailing pipeline operating conditions dictate that recycling of gas through a compressor would be required to prevent surging, the operating compressor is automatically shut down by the unit anti-surge control logic in a non-lock out condition.

The maximum station discharge pressure and temperature at Gooding is 6895 kPa(g) and 45°C respectively. Gas discharge temperatures in excess of 50°C and pressures in excess of 7200 kPa(g) will initiate a shutdown of all compressor units operating. Units may be restarted, when the alarms have been reset by the operator and the station discharge pressure and temperature fall below respective maximum levels. Units are not available during these automatic shut-downs.

The station is fitted with remote compressor unit start, stop, discharge pressure set point and initiation of a station emergency shutdown via the AEMO Operations Centre. In addition, a remote “reset” function is available to reset the machine status to “ready” in the case of a compressor unit malfunction which shuts down the unit in a “non lock out” condition. Any machine that shuts down and “locks out” requires manual intervention at the station to enable a restart. If a unit lockout fault occurs, APA GasNet shall attend site within 3 hours of notification by AEMO. Also provided is a remotely operated gas turbine driver speed control for the station which allows the AEMO operator to control engine speed for the station from approx. 85% to 100%. The controls interface supports a 24-hr schedule of set points for engine speed, inlet pressure and outlet pressure.

The station is equipped with an Emergency Shutdown System. This system is designed as fail safe and is incorporated in the station control to minimise consequences of disastrous breakdowns or incidents, such as fire, gas leaks and control system failures. Activation of the Emergency Shutdown System initiates isolation of the station from the transmission pipeline and the blowdown of the station pipework. Re-pressurisation of the station and its return to the operational status is allowed after appropriate checks are performed on site by the APA GasNet authorised technical staff.

3.3.2 Brooklyn Compressor Station

The compressor station pipe work is configured such that all compressor units may draw gas from the station inlet header and discharge to the Geelong pipeline. The Saturn compressor sets may also draw gas from the station inlet header or the Geelong header and discharge to the Ballarat pipeline. The piping configuration allows for series (double staging) compression into the Ballarat pipeline. Alternate operating configurations are shown in Appendix 7, which provides combinations of units to achieve the objectives set out in clause 8.1(a)(viii) of the Agreement.

The compressor station discharge pipework into the Geelong pipeline and the Ballarat/Bendigo pipeline are connected with an actuated isolation “crossover” valve within the confines of the station pipework. With the crossover valve open the discharge pressure produced by the compressor sets is common to both discharge pipelines.

All compressor units at Brooklyn are fitted with a gas discharge after cooling system. As a result, recycling of gas through the compressors is permissible, although not desirable for periods exceeding half an

hour. If the prevailing pipeline operating conditions dictate that recycling of gas through the compressor(s) is required to prevent surging, AEMO must consider reducing the compressor power output from each of the compressor unit(s) operating to avoid any recycling of gas, else consider using a more suitable compressor for the planned conditions within 30 minutes.

The maximum station discharge pressure and temperature into both the Geelong pipeline and Ballarat/Bendigo pipeline is 7390 kPa(g) and 45°C respectively. Gas discharge temperatures in excess of 50°C and pressures in excess of 7390 kPa(g) will initiate a shutdown of all compressor units operating. Units may be restarted when the temperatures and pressures return within permissible limits.

Units are not available during these automatic plant shutdowns.

The station is fitted with remote compressor unit start, stop and initiation of a station emergency shutdown, via the AEMO Operations Centre. In addition, a remote “reset” function is available to rest the compressor unit status to “ready” in the case of a compressor unit malfunction which shuts down the unit in a “non lock out” condition and for which the fault condition no longer exists. This presumes the alarm, which shut the unit down in the first instance, can be cleared. Any compressor unit which shuts down and “locks out” requires manual intervention at the station to enable a restart.

At Brooklyn, one (1) Centaur is provided as spare capacity and may, as and when required, be shifted to other parts of the APA GasNet System or elsewhere in order to enhance the capacity of the APA GasNet System.

3.3.3 Wollert Compressor Station

The Compressor sets are configured to operate in parallel such that the total station flow is divided nominally equally among the operating machines.

As Wollert Compressor Station ‘B’ is fitted with a unit gas discharge after cooling system, recycling of cooled gas through the compressors via the station recycle valve is permissible. The station is designed that if the prevailing pipeline operating conditions dictate that recycling of gas through the compressor(s) is required to prevent surging, the compressor unit(s) anti-surge valves should not be required to operate.

The maximum station ‘B’ discharge pressure and temperature at Wollert is 8800 kPa(g) and 45°C respectively. Gas discharge temperature in excess of 50°C and pressures in excess of 8800 kPa(g) will initiate a shutdown of all compressor units operating. Units may be restarted when the temperatures and pressures return within permissible limits.

Units are not available during these automatic plant shut-downs.

Station 'A' is designed for maximum 7,400 kPa(g) discharge and must therefore be isolated at the Station "A" discharge valve to permit operation of Station 'B' above 7400 kPa(g).

The station is fitted with remote compressor unit start, stop, vent and initiation of a station emergency shutdown, via the AEMO Operations Centre. In addition, a remote "reset" function is available to reset the machine status to "ready" in the case of a compressor unit malfunction which shuts down the unit in a "non lock out" condition. Any compressor unit which shuts down and "locks out" requires manual intervention at the station to enable a restart. If a unit lockout fault occurs, APA GasNet shall attend site within 3 hours of notification by AEMO.

Wollert Station A and B is equipped with an Emergency Shutdown System. This system is designed as fail safe and is incorporated in the station control to minimise consequences of disastrous breakdowns or incidents, such as fire, gas leaks and control system failures. Activation of the Emergency Shutdown System initiates isolation of Wollert Station A and B from the transmission pipeline and the blowdown of both station's pipework. Re-pressurisation of the station and its return to the operational status is allowed after appropriate checks are performed on site by the APA GasNet authorised technical staff.

3.3.4 Springhurst Compressor Station

This clause 3.3.4 is subject to clause 2.3.4.

The Springhurst compressor station provides gas compression in the 300mm diameter MAOP 7400 kPa(g) Wodonga to Euroa pipeline and compressing gas in either a southward direction towards Melbourne into the APA GasNet System to Shepparton, Echuca, Ballarat and Wollert, or compressing northwards towards Wodonga and Culcairn.

As Springhurst Compressor Station is fitted with a gas discharge after cooling system, recycling of gas through the compressors is permissible, although not desirable. The station is designed that if the prevailing pipeline operating conditions dictate that partial recycling of gas through the compressor is required to prevent surging, the compressor unit may operate indefinitely in this mode.

The maximum station discharge pressure and temperature at Springhurst is 7400 kPa(g) and 45°C respectively. Gas discharge temperature in excess of 50°C and pressures in excess of 7400 kPa(g) will initiate a shutdown of the compressor unit. It may be restarted when the temperatures and pressures return within permissible limits.

It is not available during these automatic plant shut-downs.

The station is fitted with remote compressor unit start, stop, vent and initiation of a station emergency shutdown, via the AEMO Operations Centre. In addition, a remote "reset" function is available to reset the machine status to "ready" in the case of a compressor unit

malfunction which shuts down the unit in a “non lock out” condition. If the compressor unit shuts down and “locks out” this will require manual intervention at the station to enable a restart.

The unit and station actuated valves and control valves are operated using instrument air. The system includes an instrument air receiver capable of supporting the station for up to 2 hours in the event of loss of air compression (or site power), after which the unit and station will fail safe by isolating and venting. A separate air storage provided for the linevalve will ensure adequate air is available to re-open the linevalve.

The PCR and compressor enclosure are fitted with automated fire detection and suppression systems. The compressor enclosure is also fitted with gas detection and suppression systems.

Telemetry facilities support operator changes to set points for suction pressure, discharge pressure and suction flow within allowable limits.

3.3.5 Iona Compressor Station

The Iona Compressor Station provides gas compression from the 500mm diameter 10,000 kPa(g) Lara to Iona Pipeline at Iona into the 150mm diameter 7,400 kPa(g) Paaratte to Iona Pipeline, with a capability for compression from 3800 kPa(g) at the compressor suction to 5600 kPa(g) at the station discharge.

The two compressor sets are configured to operate in parallel, although one unit is the designated spare. The second unit may be started while one unit is online in order to facilitate planned changeover of the operating unit.

The control logic will shut down the compressor if the bypass valve is fully opened for more than half an hour.

The maximum station discharge pressure and temperature at Iona is 7400 kPa(g) and 45°C respectively. Gas cooler discharge temperature in excess of 55°C and compressor discharge pressure in excess of 7400 kPa(g) will initiate a shutdown of the operating compressor units. The unit may be restarted when the temperature and pressure return within permissible limits (up to 2 to 3 hours), and the alarms reset.

The station is fitted with remote compressor unit start, stop and initiation of a station emergency shutdown, via the AEMO Operations Centre. In addition, a remote “reset” function is available to reset the machine status to “ready” in the case of a compressor unit malfunction which shuts down the unit in a “non-lockout” condition. Any compressor unit which shuts down and “locks out” requires manual intervention at the station to enable a restart.

The station has been designed as a stop/start facility only and does not support the remote adjustment by AEMO of set points for suction pressure, discharge pressure and discharge temperature.

3.3.6 Euroa Compressor Station

The Euroa compressor station provides gas compression between the 300mm diameter MAOP 8800 kPa(g) Wollert to Euroa pipeline and 300mm diameter MAOP 7400 kPa(g) Euroa to Wodonga pipeline. The station can compress gas in either a southward direction towards Wollert, or compressing northwards towards Culcairn.

As Euroa Compressor Station is fitted with a gas discharge after cooling system, recycling of gas through the compressors is permissible, although not desirable. The station is designed that if the prevailing pipeline operating conditions dictate that partial recycling of gas through the compressor is required to prevent surging, the compressor unit may operate indefinitely in this mode.

The maximum station discharge pressure and temperature at Euroa is 7400 kPa(g) and 45°C respectively. Gas discharge temperature in excess of 50°C or pressures in excess of 7850 kPa(g) will initiate a shutdown of the compressor unit. The compressor may be restarted when the temperatures and pressures return within permissible limits.

The station is fitted with remote compressor unit start, stop, vent and initiation of a station emergency shutdown, via AEMO. In addition, a remote “reset” function is available to reset the machine status to “ready” in the case of a compressor unit malfunction which shuts down the unit in a “non lock out” condition. If the compressor unit shuts down and “locks out” this will require manual intervention at the station to enable a restart.

The unit and station actuated valves and control valves are operated using instrument air. The system includes an instrument air receiver capable of supporting the station for up to 2 hours in the event of loss of air compression (or site power), after which the unit and station will fail safe by isolating and venting. The linevalve is powered by natural gas to ensure adequate motive power is available to re-open the linevalve.

The process control room (PCR) and compressor enclosure are fitted with automated fire detection and suppression systems. The compressor enclosure is also fitted with gas detection and suppression systems.

Telemetry facilities support operator changes to set points for suction pressure, discharge pressure and suction flow within allowable limits defined in Appendix 7.

3.4 Pipeline valves

As part of the major facilities within the APA GasNet System, the following key operating parameters of the pipe line valves in relation to the pressure control of the pipeline system are determined.

- Maximum Allowable Operating Pressure (MAOP)
- Size and Class of the valve

- Recorded Valve location
- Type of the Valve such as ball valve or gate valve
- Status of each Valve, either “Open” position or “Close” position

Control of the Valve, either “remote control” or “manual control” and/or “Automatic Line Break”.

Details of the above operating parameters for each valve are summarised in the “APA GasNet’s - Critical TP Valves” in Appendix 4.

3.5 Telemetry

The telemetry system is designed to provide analog and digital data from APA GasNet System pressure locations, injection and delivery points, pipeline transfer points, remotely controllable valves and compressor stations, and to provide the means to control selected valves, compressors and regulators.

Details of RTU data points available for access by AEMO are listed in the functional specification prepared specifically for each RTU along with details of the defined minimum poll interval for each RTU. The definition of control point, analog and digital data signal names and alarm responses shall be set out in the functional specification for the RTU prepared by APA GasNet and agreed by AEMO.

The data will be for the following conditions:

	Pressure	Temperature	Flow (vol)
Fringe point	Yes	n/a	n/a
Supply point	Yes	Yes	yes ($\pm 1.5\%$)
Compressor stations	Yes	Yes	yes ($\pm 10\%$)

The data shall be fully in accordance with the provisions of the National Gas Rules, including but not limited to gas composition, hydrogen sulphide, total sulphur and moisture content for all supply injection points.

The minimum poll period is 10 seconds.

Valves remotely actuated from within AEMO’s Operations Centre are listed in Appendix 9.

APA GasNet have also installed pressure transmitters at the embedded meter sites of Sale (M079), Corio (M065), Ballarat (M054), Bendigo (M057) and Castlemaine (M059). These pressure transmitters have been installed to enable AEMO to monitor the system pressures at these delivery points.

3.6 Longford Odourisation

The design parameter for the odourant plants (at the facilities) is to achieve an odourant concentration level of 7 milligrams per standard cubic metre of

natural gas which has been established to meet the requirements of the Gas Safety (Gas Quality) Regulations 2007 (Vic) to ensure gas is detectable at one fifth of the Lower Explosive Limit (LEL). The odourant concentration level is that required by law under the Gas Industry Act 2001 (Vic) and/or the Gas Safety Act 1997 (Vic) and/or the Gas Safety (Gas Quality) Regulations 2007 (Vic) or any other like applicable laws or regulations.

Storage capacity is designed to permit receipt of odourant stock without interruption to gas supply.

Pumps have been designed with redundancy to permit continuous operation in event of pump failure or planned maintenance. Power gas supply is provided by regulators in a redundant configuration from the meter station outlet header and gas is vented to the continuous flare.

The facility is designed to comply with the relevant codes of practice governing the storage and handling of hazardous materials and relevant environmental rules.

Monitoring is achieved by telemetry of the odourant plant operation to the AEMO Operations Centre where alarms for plant failures that may lead to excursions of concentration outside APA GasNet specified limits.

4 Operating Constraints

The availability of the APA GasNet System assets to AEMO shall be:

- (a) limited by the constraints detailed in the following clauses for each of the asset types, and
- (b) shall take into account the requirements of APA GasNet to undertake maintenance works on those assets in accordance with equipment suppliers recommendations, good practice and maintenance schedules developed by APA GasNet and approved by AEMO under this Service Envelope Agreement.

The specified operating constraints within the Service Envelope shall define the limits within which AEMO shall operate the assets in order to obtain the documented capability and availability of each asset.

4.1 Pipelines

The pipelines at various locations, as mentioned in section 2.1 are subject to operating constraints the details of which will be defined in this Schedule to ensure AEMO has all relevant information available to correctly and safely operate the pipelines in accordance with relevant legislative requirements and Codes of Practice and APA GasNet's requirements that apply to the pipelines.

Listed below is a compilation of operating constraints and guidelines that shall be complied with by AEMO in the operation of pipeline system.

- (a) AEMO shall operate the pipelines in compliance with applicable licence conditions.

- (b) The maximum operating pressure of the pipelines shall be limited to the Maximum Allowable Operating Pressure (MAOP) as specified in the pipeline licence condition.
- (c) The inlet pressure to any City Gate or APA GasNet pressure limiter, during periods of peak gas demand shall not fall below the design pressure specified in the “Regulator Capacity Tables” in Appendix 6.
- (d) The maximum flows (in actual cubic metres per hour or kilograms per hour) permitted to flow through any APA GasNet Custody Transfer Meter (CTM) delivery point is specified as Maximum Meter Capacity in the Transfer Point Plans A1-364-1 to 5 in Appendix 1.
- (e) The maximum and minimum allowable temperatures of the gas inside the pipeline shall be limited to 45°C and -10°C respectively, unless stated otherwise.
- (f) The APA GasNet System is not equipped with liquid removal facilities to enable the removal of liquids as may be injected into the system at either the GNS injection points or at each compressor station.

4.2 Pressure Regulators

The Pressure Limiters may be operated up to the maximum inlet pressure, which is the declared MAOP of the inlet pipeline.

The pressure regulator installations at the various locations, as tabulated in section 2.2, are subject to operating constraints, the details of which are defined in this document to ensure AEMO has all relevant information available to correctly and safely operate these facilities in accordance with the original design criteria for each facility and in accordance with the relevant legislative requirements and Codes of practice that apply to these facilities.

In addition, AEMO shall operate the pressure regulator facilities in such a manner that APA GasNet is able to conduct its activities to do with modification, upgrading, maintenance and testing of all of these installations in accordance with the relevant Statutory rules and Codes of practice that apply to these facilities. The operation of valves away from their “normal” operational settings shall require APA GasNet prior approval to avoid damage. The change of pressure regulator unit pressure set points shall require APA GasNet prior approval.

Details of design related constraints for each installation are provided in the “Regulator Capacity Tables” in Appendix 6.

In addition to these constraints, Appendix 9 provides a summary of station valves which are accessible for operation remotely via the AEMO Operations Centre.

4.2.1 Dandenong City Gate

1 off station valve; 7 off regulator run valves; 3 off regulators (set point).

4.2.2 Wollert City Gate

2 off station valves; 4 off regulator run valves; 4 off regulators (set point).

4.2.3 Longford Metering Station

2 off station valves.

4.2.4 Dandenong Pressure Limiter (Lurgi Backup Regulator)

2 off regulators (set point)

4.2.5 Tyers Pressure Limiter

2 off station valves, 1 off regulators (set point).

4.2.6 (Not used)

4.2.7 Wollert Pressure Limiter

Operation of this facility may require operation of inlet valves in Run 1 and Run 2 of the Wollert City Gate P8-016.

4.2.7.1 Regulator Runs

The allowable maximum set point for the regulators is 6890 kPa(g).

The minimum allowable set point (pressure) is governed by the requirement to maintain a minimum outlet temperature above -10°C. All City Gate sites downstream of this facility are to be maintained above a minimum inlet temperature of 2°C. Outlet temperature of the regulator runs shall not be allowed to fall below -10°C.

Gas can only flow in one direction through the regulator runs - from the Pakenham to Wollert pipeline into the Wollert to Wodonga pipeline.

The regulators are electronically controlled by the station safety PLC. If the PLC fails, the backup pneumatic controller fitted to each regulator will control the regulator to a predetermined set point. The set point for the pneumatic controller can only be adjusted on site.

If the regulator in one of the runs fails open, the inlet valve can be remotely actuated to isolate that run. This will allow the other run to control pressure.

Flow control function is available at this site.

4.2.7.2 Slamshut Valves

The slamshut valves will automatically slam shut when the sensed pressure exceeds the set point. The valves require manual intervention to re open. Once tripped, remote operation function of the valve will be disabled by PLC until the high pressure condition

has disappeared and the pressure fallen below a set point to reset the PLC software interlock.

The slamshut valves will also slam shut when the sensed pressure is less than 1,000 kPa(g).

The slamshut valve UV-65 can be remotely operated but shall be restricted to the following operations:

- (a) Safety related operations,
- (b) Isolation of a faulty run, and
- (c) Reopening the slamshut valve after it has been accidentally tripped.

The slamshut valve UV-61 can be remotely operated but shall be restricted to the following operations:

- (a) Open and close the 300mm by pass run,
- (b) Safety related operations,
- (c) Isolation of a faulty run, and
- (d) Re-opening the slamshut valve after it has been accidentally tripped.

Other operations of the slam-shut valves at this facility shall be subject to APA GasNet approval.

The slamshut valves shall not be actuated from close to open position when the differential pressure across the valve is greater than 200 kPa. The pressure across the valve can be equalised by manipulating the regulator set point or sending a APA GasNet crew to site to equalise the pressure using the installed valve by-pass arrangement.

4.2.8 Lara City Gate

4.2.8.1 Regulator Runs

The allowable maximum outlet set point for the regulators is 7390 kPa(g). The allowable minimum upstream (SWP pipeline) set point is 4500 kPa(g).

The allowable minimum outlet set point (pressure) is governed by requirement to maintain a minimum outlet temperature above -10°C. All City Gate sites downstream of this facility are to be maintained above a minimum inlet temperature of 2°C. Outlet temperature of the regulator runs shall not be allowed to fall below -10°C.

The active regulators are electronically controlled via the RTU. The monitor regulators will take over control at a fixed and predetermined set point when the RTU fails to control.

If the regulator in one of the runs fails open, the inlet isolation valve can be remotely actuated to isolate that run. This will allow the other runs to control pressure.

Flow control function is available at this site.

4.2.8.2 Slamshut Valves

The slamshut valves can be remotely operated. The slamshut valve will automatically slam shut when the sensed pressure exceeds the set point. The valves require manual intervention to re open. Once tripped, remote operation function of the valve will be disabled by RTU until the high pressure condition has disappeared and the pressure fallen below a set point to reset the RTU software interlock.

The slamshut valves will also slam shut when the sensed pressure is less than 1,000 kPa(g).

The slamshut valves can be remotely operated but shall be restricted to the following operations:

- (a) Safety related operations,
- (b) Isolation of a faulty run, and
- (c) Re-opening the slamshut valve after it has been accidentally tripped.

Other operations of the slamshut valves at this facility shall be subject to APA GasNet approval.

The slamshut valves shall not be actuated from close to open position when the differential pressure across the valve is greater than 200 kPa. The pressure across the valve can be equalised by manipulating the regulator set point or sending a APA GasNet crew to site to equalise the pressure using the installed valve by-pass arrangement.

4.2.8.3 Requirement for Heating Gas

The minimum pipework design temperature limit is -10°C. Under no circumstance should this -10°C limit be breached. For delivery obligation reasons the regulator station outlet gas temperature should not fall below 2°C.

When the differential between the set point pressure and the station inlet pressure is expected to produce a temperature below the limit of 2°C, heating is required.

4.2.8.4 Overview of Heater Operation

The heater is automatically controlled by the RTU and does not normally require any action by AEMO, other than adjusting station outlet temperature set point and selecting the operating mode appropriate to transmission system operations. Modes are Off, Idle (only one burner available) and Run (both burners available). The

starting cycle comprises 5 minutes purge and 5 minutes to reach idle. In Idle mode, the maximum heater firing rate, and hence water warm up rate and gas flow heating capacity, are about half that of the full rate with both burners.

The water bath temperature set point is controlled by the regulator station gas outlet temperature. The main burners will automatically modulate, including switch on or switch off in order to achieve the set point. If the heater water temperature is low and the heater may soon be required for expected gas flows (eg. for the next peak demand), AEMO can force the heater to fire up to increase the water temperature, in readiness for the heating load, by temporarily increasing the regulator station outlet gas temperature set point until the water has heated to the desired temperature, then re-setting the gas temperature set point to the normally required value.

4.2.8.5 Operating Envelope

The amount of heat available for heating the gas is limited to the 500kW design capacity of the heater. Therefore, the station must be operated within an operating envelope defined by the heater capacity.

4.2.8.6 (Not used)

4.2.8.7 Emergency Shutdown

In an emergency shutdown of the Lara SWP City Gate:

- AEMO should reduce the pressure set point to force the active regulators to close.
- AEMO should then close each of the slam-shut valves if tight shut-off is required.

4.2.8.8 Loss of Electrical Power

Electrical power is required for the RTU and the heater burner management system. The normal 24 Vdc power supply has a battery back-up. It is estimated that the battery back-up will provide at least 14 hours of electrical power (based on demand from both the heater and the RTU. Note: Heater battery load is approximately 80% of total demand).

AEMO must notify APA GasNet upon loss of electrical power. If electrical power is expected to be off for an extended length of time, APA GasNet will arrange for an alternate electrical power source (eg. mobile generator).

4.2.8.9 Loss of Power Gas

Each valve has its own individual power gas supply taken from the main process gas flow. Loss of a power gas connection will only affect the specific valve that the connection supplies. Loss of power gas will have one of the following effects:

- Failure of an active regulator in the open position. In this case, the monitor regulator will begin controlling at its set point (i.e. slightly above the station set point).
- Failure of a monitor regulator in the open position. In this case, the active regulator will continue to control.
- Failure of the heater bypass valve in last position.
- Failure of a slam-shut valve in the closed position.
- Failure of shut-off valve in open position.

4.2.8.10 Loss of RTU Function

Loss of RTU function will result in AEMO losing all communications with site. Upon loss of RTU function AEMO must notify APA GasNet.

Upon loss of RTU function:

- Monitor regulators will begin controlling at their last registered set points (i.e. approximately 100 kPa above the station set point at time of failure).
- Slam-shut valves will continue to provide overpressure protection.
- Heater will shut down.

Note: When the RTU is powered up again, the RTU will automatically select the station set point pressure equal to the downstream station pressure. AEMO must then change the set point to suit their requirements.

4.2.8.11 APA GasNet Lock-out

- APA GasNet, on approval from AEMO, can isolate one or more regulator runs via a switch in the RTU cabinet. In this case, remote control of the chosen regulator run/s by AEMO is disabled.
- APA GasNet, on approval from AEMO, can switch a slam-shut valve to manual mode at its site located slam-shut panel. In this case, remote control of the chosen slam-shut valve by AEMO is disabled.

4.2.8.12 Safety Critical Operations

- Minimum mechanical design temperature of -10°C must not be breached. This can cause brittle fracture, resulting in catastrophic failure of the pipework.

4.2.9 Brooklyn (BCP) City Gate

4.2.9.1 Regulators Runs

The allowable maximum downstream set point for the regulators is 2760 kPa(g). The allowable minimum upstream (BCP pipeline) set point is 3000 kPa(g).

The allowable minimum downstream set point (pressure) is governed by requirement to maintain a minimum outlet temperature above minus 10°C. All City Gate sites downstream of this facility are to be maintained above a minimum inlet temperature of 2°C. Outlet temperature of the regulator runs shall not be allowed to fall below minus 10°C.

The active regulators of runs 1 to 4 are electronically controlled via the station safety PLC. The monitor regulators will take over control at a fixed and predetermined set point of 2870 kPa(g) when the active control valve or PLC fail to control.

If the regulator in one of the runs fails open, the inlet isolation valve can be remotely actuated to isolate that run. This will allow the other runs to control pressure.

Run 5 is directly controlled by the station safety PLC. If this regulator fails the run will be automatically forced closed.

Flow control function is available at this site.

4.2.9.2 Slamshut Valves

The slamshut valves can be remotely operated. The slamshut valve will automatically slamshut when the sensed pressure exceeds the set point. The valves require manual intervention to re open if they have automatically closed. Once tripped, remote operation function of the valve will be disabled by PLC until the high pressure condition has disappeared and the pressure fallen below a set point to reset the PLC software interlock.

The slamshut valves will also slam shut when the sensed downstream pressure is less than 1,000 kPa(g).

The slamshut valves can be remotely operated but shall be restricted to the following operations:

- (a) Safety related operations,
- (b) Isolation of a faulty run, and
- (c) Re-opening the slamshut valve after it has been remotely activated.

Other operations of the slam-shut valves at this facility shall be subject to APA GasNet approval.

No slamshut valve shall be actuated from close to open position when the differential pressure across the valve is greater than 200 kPa, as measured across the station. The pressure across the valve can be equalised by manipulating the regulator set point or sending a APA GasNet crew to site to equalise the pressure using the installed valve by-pass arrangement.

4.2.9.3 Flow Measurement

The flow meter is designed to provide flow measurement through the City Gate and provide station flow control.

The PLC also calculates estimated flow through the BCP City Gate. The selected station flow rate is used for the purposes of flow control.

4.2.9.4 Requirement for Heating Gas

The minimum pipework design temperature limit is minus 10°C. Under no circumstance should this minus 10°C limit be breached. For delivery obligation reasons the regulator station outlet gas temperature should not fall below 2°C.

Heating is required when the differential between the set point pressure and the station inlet pressure is expected to produce a temperature below the limit of 2°C.

4.2.9.5 Overview of Heater Operation

The heater is automatically controlled by the PLC and does not normally require any action by AEMO, other than adjusting minimum waterbath temperature setpoint, station outlet temperature set point and stopping or re-starting burners. The starting cycle comprises about 5 minutes purge and 5 minutes to reach "low fire". In "low fire", the heater firing rate, and hence water warm up rate and gas flow heating capacity, is about 10% that of the full rate with both burners.

The water bath temperature is controlled by the regulator station gas outlet temperature. The main burners will automatically modulate, including switch on or switch off in order to achieve the set point. If the heater water temperature is low and the heater may soon be required for expected gas flows (e.g. for the next peak demand), AEMO can force the heater to fire up to increase the water temperature, in readiness for the heating load, by temporarily increasing the minimum waterbath temperature set point until the water has heated to the desired temperature, then re-setting the waterbath temperature set point to the normally required value.

4.2.9.6 Operating Envelope

The amount of heat available for heating the gas is limited to the 2050kW design capacity of each heater. Therefore, the station must be operated within an operating envelope defined by the heater capacity.

4.2.9.7 (Not used)

4.2.9.8 Emergency Shutdown of the City Gate Station

In an emergency shutdown of the Brooklyn BCP City Gate Regulator Station:

- AEMO should reduce the regulator station flow set point and the pressure set point to force the active regulators to close.
- AEMO should then close each of the regulator station slam-shut valves to ensure tight shut-off.

4.2.9.9 Loss of Electrical Power

Electrical power is required for the heater combustion air fans and the instrument air compressors and driers. The RTU and PLC are supplied from the secure 24 Vdc batteries in the compressor and city gate areas respectively. The city gates instrument air dry gas receiver will support the city gates for 30 minutes.

Upon loss of electrical power, the compressor station emergency generator will automatically start-up. This is not expected to take longer than a minute to start-up.

The heater will shut down upon loss of electrical power. It may be reset and restarted once the emergency compressor station generator is running.

AEMO must notify APA GasNet upon loss of electrical power.

4.2.9.10 Loss of Power Gas or Instrument Air

Each valve in runs 1 to 4 has its own individual instrument air supply taken from the main process gas flow. Loss of an instrument air connection will only affect the specific valve that the connection supplies. Loss of instrument air will have one of the following effects:

- Failure of a monitor regulator in the open position. In this case, the active regulator will continue to control.
- Failure of a slam-shut valve in the closed position.

Each valve in run 5, the active control valve in each run 1 – 5, the bypass run, station inlet valves, heater isolation and bypass valves and the heater burner actuator use the station instrument air supply taken from the compressor station instrument air system. The city gates instrument air dry gas receiver will support the city gates for 30 minutes. Partial or total loss of instrument air will have one or more of the following effects:

- (Runs 1 to 4): Failure of an active control valve in the open position. In this case, the monitor control valve will assume operation and raise an alarm.

- (Run 5): Failure of an active regulator in the fail-safe closed position. In this case, the station safety PLC will detect that the valve is faulty if it is not in the correct control position, will close the run inlet valve and raise an alarm.
- Failure of the heater bypass or isolation valve in last position.
- Failure of any slam-shut valve in the closed position.
- Failure of station actuated (Brooklyn – Corio Pipeline) inlet isolation valve in last position.
- Failure of the heater.

4.2.9.11 Loss of RTU Function

Loss of BLP RTU (RBKN1) function will result in AEMO losing all communications with BLP site, BCP site and BBP site.

Upon loss of BLP RTU (RBKN1) function AEMO must notify APA GasNet.

Upon loss of RTU (RBKN1) function, AEMO will not be able to control or monitor

- BCP City Gate heaters or actuated valves,
- BCP/BLP station inlet valve BV03C,
- BCP bypass run
- BCP regulator runs,

but the local control system will continue to operate normally using the station safety PLC.

Loss of safety PLC function will result in safe shutdown of both heaters. The monitor regulators for runs 1 – 4 will operate pneumatically using their individual pneumatic controllers. The active regulator for run 5 will operate pneumatically using the station pneumatic controller at the predetermined setpoint of 2000 kPa(g). Upon loss of PLC function AEMO must notify APA GasNet.

4.2.9.12 APA GasNet Lock-out

- APA GasNet, on approval from AEMO, can isolate one or more regulator runs via a switch in the RTU cabinet. In this case, remote control of the chosen regulator run/s by AEMO is disabled.
- APA GasNet, on approval from AEMO, can switch a slam-shut valve to manual mode at its site located slam-shut panel. In this case, remote control of the chosen slam-shut valve by AEMO is disabled as well as the overpressure control.

- APA GasNet, on approval from AEMO, can switch one or both pressure limiter runs to manual mode at the RTU. In this case, remote control of the chosen pressure limiter run/s by AEMO is disabled.
- APA GasNet, on approval from AEMO, can switch a cross over pressure limiter inlet isolation valve to manual mode at its site located valve panel. In this case, remote control of the chosen inlet isolation valve by AEMO is disabled.

4.2.9.13 Safety Critical Operations

- Minimum design metal temperature of minus 4°C must not be breached. This can cause brittle fracture of the BCP heater inlet header, resulting in catastrophic failure of the pipework.

4.2.10 Brooklyn (BBP) PRS

4.2.10.1 Regulators Runs

The allowable maximum set point for the regulators is 7390 kPa(g).

The allowable minimum set point (pressure) is governed by requirement to maintain a minimum outlet temperature above minus 10°C. All City Gate sites downstream of this facility are to be maintained above a minimum inlet temperature of 2°C. Outlet temperature of the regulator runs shall not be allowed to fall below minus 10°C.

Gas can only flow in one direction through the regulator runs - from the Brooklyn to Lara pipeline to the Brooklyn to Ballan pipeline.

The regulators are electronically controlled by the station safety PLC. If the PLC fails, the backup pneumatic controller fitted to each regulator will control the regulator to a predetermined set point of 4500 kPa(g). The set point for the pneumatic controller can only be adjusted on site.

Note: When the PLC is powered up again, the PLC will automatically select the regulator station set point pressure equal to the downstream regulator station pressure. AEMO must then change the set points to suit their requirements.

If the regulator in one of the runs fails open, the inlet isolation valve will automatically isolate that run and raise a regulator fault alarm. This will allow the other run to control pressure. Flow control function is used to limit excessive flowrate through the station.

4.2.10.2 Slamshut Valves

The slamshut valves can be remotely operated. The slamshut valve will automatically slam shut when the sensed pressure exceeds the set point. The valves require manual intervention to re-open if they have automatically closed. Once tripped, remote operation function of the valve will be disabled by PLC until the high pressure condition has

disappeared and the pressure fallen below a set point to reset the PLC software interlock.

The slamshut valves will also slam shut when the sensed downstream pressure is less than 1,000 kPa(g).

The slamshut valves can be remotely operated but shall be restricted to the following operations:

- (a) Safety related operations,
- (b) Isolation of a faulty run, and
- (c) Re-opening the slamshut valve after it has been remotely activated.

Other operations of the slam-shut valves at this facility shall be subject to APA GasNet approval.

No slamshut valve shall be actuated from close to open position when the differential pressure across the valve is greater than 200 kPa, as measured across the station. The pressure across the valve can be equalised by manipulating the regulator set point or sending a APA GasNet crew to site to equalise the pressure using the installed valve by-pass arrangement.

4.2.10.3 Flow Measurement

The flow meter is dedicated to this PRS. It is designed to limit excessive flowrate through the station.

In addition, estimated flow through each run and the Pressure Regulator station is calculated from regulator position and process conditions for indicative purposes only.

4.2.10.4 Emergency Shutdown of the BBP PRS

In an emergency shutdown of the Brooklyn BBP PRS:

- AEMO should reduce the pressure regulator station outlet pressure set point to force the pressure regulators to close.
- AEMO should then close each of the actuated inlet isolation valves.

4.2.11 Barnawartha City Gate

4.2.11.1 Regulators Runs

The allowable maximum set point for the regulators is 7400 kPa(g).

The allowable minimum set point (pressure) is governed by the requirement to maintain a minimum outlet temperature above -10°C. All City Gate sites downstream of this facility are to be maintained

above a minimum inlet temperature of 2°C. Outlet temperature of the regulator runs shall not be allowed to fall below -10°C.

Gas can only flow in one direction through the regulator runs - from the Interconnect (Barnawartha North to Culcairn) pipeline to the Wollert to Wodonga pipeline.

The active regulators are electronically controlled via the RTU. The monitor regulators will take over control at a fixed and predetermined set point when the RTU fails to control. Note: When the RTU is powered up again, the RTU will automatically select the regulator station set point pressure equal to the downstream regulator station pressure. If the active regulator in one of the runs fails open, the slam-shut valve can be remotely actuated to isolate that run. This will allow the second run to control pressure.

Flow control function is not available for operation at this stage.

4.2.11.2 Slamshut Valves

The slamshut valves will automatically slamshut when the sensed pressure exceeds the set point. The valves require manual intervention to re open. Once tripped, remote operation function of the valve will be disabled by RTU until the high pressure condition has disappeared and the pressure fallen below a set point to reset the RTU software interlock.

The slamshut valves can be remotely operated but shall be restricted to the following operations:

- (a) Safety related operations,
- (b) Isolation of a faulty run, and
- (c) Re-opening the slamshut valve after it has been accidentally tripped.

Other operations of the slam-shut valves at this facility shall be subject to APA GasNet approval.

The slamshut valves shall not be actuated from close to open position when the differential pressure across the valve is greater than 200 kPa. The pressure across the valve can be equalised by manipulating the regulator set point or sending a APA GasNet crew to site to equalise the pressure using the installed valve by-pass arrangement.

The slamshut valves will also slamshut when the sensed pressure is less than 1,000 kPa(g).

4.2.12 Wandong PRS

4.2.12.1 Regulators Runs

The allowable maximum set point for the regulators is 7390 kPa(g).

The allowable minimum set point (pressure) is governed by requirement to maintain a minimum outlet temperature above minus 10°C. All city gate sites downstream of this facility are to be maintained above a minimum inlet temperature of 2°C. Outlet temperature of the regulator runs shall not be allowed to fall below minus 10°C.

Gas can only flow in one direction through the regulator runs - from the Wollert to Wodonga pipeline into the Wandong to Kyneton pipeline.

The regulators are electronically controlled by the RTU. If the RTU fails, the backup pneumatic controller fitted to each regulator will control the regulator to a predetermined set point of 6500 kPa(g). The set point for the pneumatic controller can only be adjusted on site.

If the regulator in one of the runs fails open, the inlet valve can be remotely actuated to isolate that run. This will allow the other run to control pressure. Flow control function is not available for operation at this stage.

4.2.12.2 Slam Shut Valves

The slamshut valves will automatically slam shut when the sensed downstream pressure exceeds the set point as specified in Appendix 6. The valves require manual intervention to re-open. Once tripped, remote operation function of the valve will be disabled by RTU until the high pressure condition has disappeared and the pressure fallen below a set point to reset the RTU software interlock.

The slamshut valves can be remotely operated but shall be restricted to the following operations:

- (a) Safety related operations,
- (b) Isolation of a faulty run, and
- (c) Re-opening the slamshut valve after it has been remotely activated.

Other operations of the slamshut valves at this facility shall be subject to APA GasNet approval.

No slamshut valves shall be actuated from close to open position when the differential pressure across the valve is greater than 200 kPa, as measured across the station. The pressure across the station can be equalised by manipulating the station outlet pressure set point or sending an APA GasNet crew to site to equalise the pressure using the installed valve by-pass arrangement.

The slam shut valves will also slam shut when the sensed downstream pressure is less than 1,000 kPa.

4.2.12.3 Requirement for Heating Gas

The minimum pipeline design metal temperature limit is minus 10°C. Under no circumstance should this minus 10°C limit be breached. For delivery obligation reasons the regulator station outlet gas temperature should not fall below 2°C.

When the differential between the set point pressure and the station inlet pressure is expected to produce a temperature below the limit of 2°C, heating is required.

4.2.12.4 Overview of Heater Operation

The heater is automatically controlled by the RTU and does not normally require any action by AEMO, other than adjusting station outlet temperature set point. Modes are On-line (controlling on station outlet gas temperature when flowrate is above 3 kscm/h) and Off-line (controlling water bath temperature when flowrate is below 3 kscm/h). The starting cycle comprises 5 minutes purge and 5 minutes to reach idle. In Idle mode, the maximum heater firing rate, and hence water warm up rate and gas flow heating capacity, are about half that of the full rate with both burners.

The water bath temperature set point is controlled by the regulator station gas outlet temperature when flowing or by the station dp and outlet temperature setpoint when the station flow is low. The main burners will automatically modulate, including switch on or switch off in order to achieve the set point. Provided the burners are operating, the RTU will maintain sufficient water bath temperature for station start-up and operation without operator intervention.

4.2.12.5 Operating Envelope

The amount of heat available for heating the gas is limited to the 500kW design capacity of the heater. Therefore, the station must be operated within an operating envelope defined by the heater capacity.

4.2.12.6 Loss of Electrical Power

Electrical power is required for the RTU and the heater burner management system. The normal 24 Vdc power supply has a battery back-up. The battery back-up will provide at least 14 hours of electrical power (based on demand from both the heater and the RTU. Note: Heater demand is approximately 80% of total demand).

AEMO must notify APA GasNet upon loss of electrical power. If electrical power is expected to be off for an extended length of time, APA GasNet will arrange for an alternate electrical power source (e.g. mobile generator).

4.2.12.7 Loss of Power Gas

Each valve has its own individual power gas supply taken from the main process gas flow. Loss of a power gas connection will only

affect the specific valve that the connection supplies. Loss of power gas will have one of the following effects:

- Failure of a regulator in the open position.
- Failure of the heater fuel gas control and isolation valve in closed position.
- Failure of a slam-shut valve in the closed position.

4.2.12.8 Loss of RTU Function

Loss of RTU function will result in AEMO losing all communications with site. Upon loss of RTU function, AEMO must notify APA GasNet.

Upon loss of RTU function:

- Regulators will begin controlling using the pneumatic controller predetermined setpoint of 6500 kPa(g).
- Slam-shut valves will continue to provide overpressure protection.
- Heater will shutdown.

Note: When the RTU is powered up again, the RTU will automatically select the station set point pressure equal to the downstream station pressure. AEMO must then change the station outlet pressure set point to suit their requirements.

4.2.12.9 APA GasNet Lock-out

- APA GasNet, on approval from AEMO, can isolate one or more regulator runs via a switch in the RTU cabinet. In this case, remote control of the chosen regulator run(s) by AEMO is disabled.
- APA GasNet, on approval from AEMO, can switch a slamshut valve to manual mode at its site located slamshut panel. In this case, remote control of the chosen slamshut valve by AEMO is disabled as well as the overpressure control.

4.2.12.10 Emergency Shutdown of the Station

In an emergency shutdown of the Wandong PRS:

- AEMO should reduce the regulator station pressure set point to zero to force the active regulators to close.
- AEMO should then close each of the regulator station slam-shut valves to ensure tight shut-off.

4.2.13 Iona City Gate

4.2.13.1 Regulators Runs

The allowable maximum set point for the regulators is 7400 kPa(g).

The allowable minimum set point (pressure) is governed by requirement to maintain a minimum outlet temperature above - 10°C. All City Gate sites downstream of this facility are to be maintained above a minimum inlet temperature of 2°C. Outlet temperature of the regulator runs shall not be allowed to fall below - 10°C.

The active regulators are electronically controlled via the RTU. The monitor regulators will take over control at a fixed and predetermined set point when the RTU fails to control.

If the regulator in one of the runs fails open, the inlet isolation valve can be remotely actuated to isolate that run. This will allow the other runs to control pressure.

Flow control function is not available for operation at this stage.

4.2.13.2 Slamshut Valves

The slamshut valves can be remotely operated. The slamshut valve will automatically slamshut when the sensed pressure exceeds the set point. The valves require manual intervention to re open. Once tripped, remote operation function of the valve will be disabled by RTU until the high pressure condition has disappeared and the pressure fallen below a set point to reset the RTU software interlock. The slamshut valves will also slamshut when the sensed pressure is less than 1,000 kPa(g).

The slamshut valves can be remotely operated but shall be restricted to the following operations:

- (1) safety related operations,
- (2) isolation of a faulty run, and
- (3) re opening the slamshut valve after it has been accidentally tripped.

Other operations of the slam-shut valves at this facility shall be subject to APA GasNet approval.

The slamshut valves shall not be actuated from close to open position when the differential pressure across the valve is greater than 200 kPa. The pressure across the valve can be equalised by manipulating the regulator set point or sending a APA GasNet crew to site to equalise the pressure using the installed valve by-pass arrangement.

4.2.13.3 Emergency Shutdown

In an emergency shutdown of the Iona City Gate:

- AEMO should reduce the pressure set point to force the active regulators to close.
- AEMO should then close each of the slam-shut valves to ensure tight shut-off.

4.2.13.4 Loss of Electrical Power

Electrical power is required for the RTU. The normal power supply has a battery back-up. It is estimated that the battery back-up will provide at least 4 hours of electrical power.

AEMO must notify APA GasNet upon loss of electrical power. If electrical power is expected to be off for an extended length of time, APA GasNet will arrange for an alternate electrical power source (eg. mobile generator).

4.2.13.5 Loss of Power Gas

Each valve has its own individual power gas supply taken from the main process gas flow. Loss of a power gas connection will only affect the specific valve that the connection supplies. Loss of power gas will have one of the following effects:

- Failure of an active regulator in the open position. In this case, the monitor regulator will begin controlling at its local set point.
- Failure of a monitor regulator in the open position. In this case, the active regulator will continue to control.
- Failure of a slam-shut valve in the closed position.
- Failure of shut-off valve in open position.

4.2.13.6 Loss of RTU Function

Loss of RTU function will result in AEMO losing all communications with site. Upon loss of RTU function AEMO must notify GasNet.

Upon loss of RTU function:

- Monitor regulators will begin controlling at their local set point.
- Slam-shut valves will continue to provide overpressure protection.

Note: When the RTU is powered up again, the RTU will automatically select the station set point pressure equal to the downstream station pressure. AEMO must then change the set point to suit their requirements.

4.2.13.7 APA GasNet Lock-out

- APA GasNet, on approval from AEMO, can isolate one or more regulator runs via a switch in the RTU cabinet. In this case, remote control of the chosen regulator run/s by AEMO is disabled.
- APA GasNet, on approval from AEMO, can switch a slam-shut valve to manual mode at its site located slam-shut panel. In this case, remote control of the chosen slam-shut valve by AEMO is disabled.

4.2.13.8 Description of Facilities for Gas Flow To / From WUGS

Emergency Shutdown Valve UV-71

Normal Operation of UV-71

UV-71 is part of the WUGS emergency shutdown system. Normally UV-71 is fully open.

The site located run/test panel has a run/test selector hand valve. Run mode is the normal operating mode. Test mode is only available to APA GasNet on approval by AEMO. The actuated valve will remain open during test mode.

Shutdown of UV-71

Remote closure of UV-71 by AEMO should be reserved for emergency situations or situations where there is a concern for safety.

UV-71 will close automatically when activated by the WUGS emergency shutdown system. AEMO also have the ability to remotely close UV-71.

UV-71 can only be reopened locally by a WUGS operator. AEMO do not have the ability to reopen UV-71. Therefore, remote closure of UV-71 by AEMO should be reserved for emergency situations or situations where there is a concern for safety.

4.2.13.9 Loss of Power Gas

Each valve has its own individual power gas supply taken from the main process gas flow. UV-71 will fail in the closed position upon loss of its dedicated power gas supply.

4.2.13.10 Loss of RTU Function

Loss of RTU function will result in AEMO losing all communications with site. Upon loss of RTU function AEMO must notify APA GasNet.

Upon loss of RTU function, AEMO will lose the ability to close UV-71. However, the valve position will remain unchanged and UV-71

will continue to function as part of the WUGS emergency shutdown system (due to hard wiring).

4.2.13.11 APA GasNet Lock-Out

APA GasNet, on approval from AEMO, can switch UV-71 to test mode at its site located run/test panel. In this case, remote closure of UV-71 by AEMO is disabled.

4.2.13.12 Safety Critical Operations

- MAOP (Maximum Allowable Operating Pressure) must not be breached. If MAOP is breached, catastrophic failure of the pipework can occur.
- Minimum mechanical design temperature of -10°C must not be breached. This can cause brittle fracture, resulting in catastrophic failure of the pipework.

4.2.13.13 Pig Launcher/Receivers

The pig launcher/receivers are normally isolated. When line pigging is required, APA GasNet will advise AEMO, and the pig launcher/receivers will be operated locally by GasNet.

4.2.14 Brooklyn (BLP) City Gate

4.2.14.1 Regulators Runs

The allowable maximum set point for the regulators is 7390 kPa(g) (discharge). The allowable minimum upstream (BLP pipeline) set point is 4500 kPa(g).

The allowable minimum outlet set point (pressure) is governed by requirement to maintain a minimum outlet temperature above minus 10°C . All city gate sites downstream of this facility are to be maintained above a minimum inlet temperature of 2°C . Outlet temperature of the regulator runs shall not be allowed to fall below minus 10°C into the BCP pipeline, or minus 4°C into the BCP CG heaters.

The regulators of runs 1 to 5 are electronically controlled via the station safety PLC.

The station does not use monitor regulators but instead utilises diagnostic monitoring of the active regulator to provide discrimination at a run level. If the regulator in one of the runs fails open, the inlet isolation valve (slamshut) will be automatically actuated to isolate that run. This will allow the other runs to control pressure.

Flow control function is available at this site.

4.2.14.2 Slamshut Valves

The slamshut valves can be remotely operated. The slamshut valve will automatically slam shut when the sensed pressure exceeds the set point 7830 kPa(g). The valves require manual intervention to re-open. Once tripped, remote operation function of the valve will be disabled by PLC until the high pressure condition has disappeared and the pressure fallen below a set point to reset the PLC software interlock.

The slamshut valves will also slam shut when the sensed pressure is less than 1,000 kPa(g) (downstream).

The slamshut valves can be remotely operated but shall be restricted to the following operations:

- (a) Safety related operations,
- (b) Isolation of a faulty run, and
- (c) Re-opening the slamshut valve after it has been remotely activated.

Other operations of the slam-shut valves at this facility shall be subject to APA GasNet approval.

The slamshut valves shall not be actuated from close to open position when the differential pressure across the valve is greater than 200 kPa. The pressure across the valve can be equalised by manipulating the regulator set point or sending an APA GasNet crew to site to equalise the pressure using the installed valve by-pass arrangement.

4.2.14.3 Flow Measurement

The flow meter is designed to provide flow measurement through the BLP pipeline. BLP CG flow is calculated by deducting the offtake meter values from the BBP PRS and Qenos Meter Station.

The PLC also calculates estimated flow through the BLP City Gate. The selected station flow rate is used for the purposes of flow control.

4.2.14.4 Requirement for Heating Gas

The minimum pipework design temperature limit is minus 10°C. Under no circumstance should this minus 10°C limit be breached. For delivery obligation reasons the regulator (BLP City Gate) station outlet gas temperature should not fall below 2°C.

When the differential between the set point pressure and the station inlet pressure is expected to produce a temperature below the limit of 2°C, heating is required.

Additionally, the minimum allowable temperature at the BCP waterbath heaters inlet is minus 4°C. Each heater is protected with a lolo temperature trip which will close the associated isolation valve if

this limit is reached. To avoid unwanted trips, BLP City Gate has discharge temperature controls which will start to limit flow rate through the station between minus 2 and minus 4°C.

4.2.14.5 Overview of Heater Operation

The heater is automatically controlled by the PLC and does not normally require any action by AEMO, other than adjusting minimum waterbath temperature setpoint, station outlet temperature set point and stopping or re-starting burners. The starting cycle comprises about 5 minutes purge and 5 minutes to reach "low fire". In "low fire", the heater firing rate, and hence water warm up rate and gas flow heating capacity, is about 20% that of the full rate.

The water bath temperature is controlled by the regulator station gas outlet temperature from one of the three offtake stations, BLP CG, BBP PRS or Qenos Meter Station. The main burners will automatically modulate, including switch on or switch off in order to achieve the set point. If the heater water temperature is low and the heater may soon be required for expected gas flows (e.g. for the next peak demand), AEMO can force the heater to fire up to increase the water temperature, in readiness for the heating load, by temporarily increasing the minimum waterbath temperature set point until the water has heated to the desired temperature, then re-setting the waterbath temperature set point to the normally required value.

4.2.14.6 Operating Envelope

The amount of heat available for heating the gas is limited to the 625kW design capacity of each heater. Therefore, the station must be operated within an operating envelope defined by the heater capacity.

Bath temperature not to exceed 85 degC, flow not to exceed 375 kscm/h per heater. Gas outlet temperature setpoint 2 to 20 degC.

4.2.14.7 (Not used)

4.2.14.8 Emergency Shutdown of the City Gate Station

In an emergency shutdown of the Brooklyn BLP City Gate Regulator Station:

- AEMO should reduce the regulator station flow and pressure set points to force the active regulators to close.
- AEMO should then close each of the regulator station slam-shut valves to ensure tight shut-off.

4.2.14.9 Loss of Electrical Power

Electrical power is required for the heater combustion air fan and the instrument air compressors and driers. The RTU and PLC are supplied from the secure 24Vdc batteries in the compressor and city gate areas respectively. The city gates instrument air dry gas receiver will support the city gates for up to 30 minutes.

Upon loss of electrical power, the compressor station emergency generator will automatically start-up. This is not expected to take longer than a minute to start-up.

The heater will shut down upon loss of electrical power. It may be reset and restarted once the emergency compressor station generator is running. A maximum of three consecutive remote reset attempts are possible.

AEMO must notify APA GasNet upon loss of electrical power.

4.2.14.10 Loss of Power Gas or Instrument Air

Power gas is only used in BLP City Gate on the station inlet isolating valve UV62011. Loss of power gas will leave the valve in its last position and raise an alarm. This valve also has a storage bottle permitting up to three valve strokes, even in absence of the power gas connection.

Each valve in runs 1-5, the bypass run, station inlet valves, heater isolation and bypass valves and the heater burner actuator use the station instrument air supply taken from the compressor station instrument air system. The city gates instrument air dry gas receiver will support the city gates for up to 30 minutes. Partial or total loss of instrument air will have one or more of the following effects:

- Failure of an active regulator in the fail-safe closed position. In this case, the station safety PLC will detect that the valve is faulty if it is not in the correct control position, will close the run inlet valve and raise an alarm.
- Failure of the heater bypass or isolation valve in last position.
- Failure of any slam-shut valve in the closed position.
- Failure of station actuated (Brooklyn – Corio Pipeline) isolation valve 1221UV62001 in last position.
- Failure of the heaters.

4.2.14.11 Loss of RTU or PLC Function

The BLP City Gate automated infrastructure is controlled and monitored through BLP_PLC and BLP RTU (RBKN1) respectively. The infrastructure includes 2 heaters, regulator runs 1 to 5, and the bypass run.

Loss of BLP RTU (RBKN1) function will result in AEMO losing all communication with BLP CG. Upon loss of BLP RTU (RBKN1) function AEMO must notify APA GasNet.

Upon loss of BLP RTU (RBKN1) AEMO will not be able to control or monitor:

- BLP City Gate heaters,

- BLP Regulator runs 1-5,
- BCP City Gate heaters,
- BCP Regulator runs 1-5,
- BLP Station actuated valves,
- BCP Station actuated valves,
- BBP PRS Regulator runs 1-2

The local control system will continue to operate normally (based on the last setpoint) using the station PLC.

When the RTU is reinstated, AEMO will need to confirm setpoints.

Loss of safety PLC function will result in safe shutdown of both heaters. The active regulator for runs 1 to 5 will operate pneumatically using the station pneumatic controller. Upon loss of PLC function AEMO must notify APA GasNet.

When the PLC is reinstated, AEMO will need to confirm setpoints, manually re-open any closed runs and re-start heaters.

4.2.14.12 APA GasNet Lock-out

- APA GasNet, on approval from AEMO, can isolate one or more regulator runs. In this case, remote control of the chosen regulator run/s by AEMO is disabled.
- APA GasNet, on approval from AEMO, can switch a slamshut valve to manual mode at its site located slamshut panel. In this case, remote control of the chosen slamshut valve by AEMO is disabled as well as the overpressure control.

4.2.14.13 Safety Critical Operations

- Minimum design metal temperature of minus 4°C must not be breached. This can cause brittle fracture of the BCP heater inlet header, resulting in catastrophic failure of the pipework.

4.2.15 Euroa Pressure Reduction Station

4.2.15.1 Regulator Run

- The allowable maximum set point for the regulators is 7400 kPa(g).
- The discharge pressure set point is fixed to maintain a minimum outlet temperature above -10°C. All City Gate sites downstream of this facility are to be maintained above a minimum inlet temperature of 2°C. Outlet temperature of the regulator runs shall not be allowed to fall below -10°C.

- Gas can only flow in one direction through the regulator runs - from the Wollert to Euroa (8800 kPa(g) MAOP) pipeline to the Euroa to Wodonga (7400 kPa(g) MAOP) pipeline.
- The active regulator is electronically controlled via the RTU. The pneumatic pressure controller will take over control at a fixed and predetermined set point when the RTU fails to control.
- If the active regulator fails open, the slam-shut valve can be remotely actuated to isolate that run. The linevalves bypassing the station may be remotely opened when the pipeline pressure south of the station falls below 7400 kPa(g).

4.2.15.2 Slamshut Valves

- The slamshut valve will automatically slamshut when the sensed pressure exceeds the set point. The valve requires manual intervention to re-open. Once tripped, remote operation function of the valve will be disabled by RTU until the high pressure condition has disappeared and the pressure fallen below a set point to reset the RTU software interlock.
- The slamshut valves can be remotely operated but shall be restricted to the following operations:
 - (a) Safety related operations,
 - (b) Isolation of a faulty run, and
 - (c) Re-opening the slamshut valve after it has been accidentally tripped.
- Other operations of the slam-shut valves at this facility shall be subject to APA GasNet approval.
- The slamshut valve shall not be actuated from close to open position when the differential pressure across the valve is greater than 200 kPa. The pressure across the valve can be equalised by manipulating the regulator set point or sending an APA GasNet crew to site to equalise the pressure using the installed valve by-pass arrangement.
- The slamshut valve will also slam shut when the sensed pressure is less than 1,000 kPa.

4.2.15.3 Line Valves and Loading Valves

- The line valves and loading valves will automatically close when the sensed pressure exceeds the set point set at MAOP + 2%. The valves require manual intervention to re-open. The valves should be re-opened in response to a pressure differential reaching 200 kPa (northern pressures higher) to permit southerly flows, but should be remotely closed by AEMO if Wollert CS station B compressors are operating above 7400 kPa(g).

4.2.16 Plumpton PRS

4.2.16.1 Regulator Runs

- The allowable maximum set point for the active regulators is 7390 kPa(g).
- The discharge pressure set point is fixed to maintain a minimum outlet temperature above minus 10°C. All City Gate sites downstream of this facility are to be maintained above a minimum inlet temperature of 2°C. Outlet temperature of the regulator runs shall not be allowed to fall below minus 10°C.
- Gas can only flow in one direction through the regulator runs - from the Brooklyn to Lara (10,200 kPa(g) MAOP) pipeline to the Derrimut to Plumpton (7390 kPa(g) MAOP) pipeline.
- The active regulator for run 1 is set to 7,000 kPa(g) and the active regulator for run 2 is set to 6,800 kPa(g).
- If either active regulator fails open, the monitor regulator will limit the downstream pressure to 7,200 kPa(g).
- The station is designed to operate with inlet pressure as low as 4500 kPa(g). Under inlet conditions less than regulator set pressure, the active regulator will fail open and monitor regulators will operate to maintain demand. Operation of monitor regulators in this condition is normal.

4.2.16.2 Slamshut Valves

- The slamshut valve in run 1 is set to 8,000 kPag, and the slamshut valve in run 2 is set to 8,050 kPag. The slamshut valve will automatically slam shut when the sensed downstream pressure exceeds the set point. The valve requires manual intervention to re-open.
- The slamshut valve will also slam shut when the sensed downstream pressure is less than 1,000 kPa.
- The slamshut valve can be remotely actuated to isolate that run. In the event that both runs are isolated, a "station isolated" alarm is generated by the site RTU.

4.2.16.3 Emergency Response

- APA GasNet maintains remote control capability over the actuated Rockbank branch valve T056-BV03 on the T62 Derrimut to Sunbury pipeline. As there is no protection against valve damage due to operation under high differential pressure, AEMO do not have routine operational control over this valve. Emergency supply of gas into the Derrimut to Sunbury pipeline from the T56 Brooklyn to Ballan pipeline will be available through the normally open T056-BV03 and non-return valves located in the pig-trap pipework.
- The T056-BV03 branch valve is normally open and AEMO can remotely close under abnormal operating conditions. At AEMO's direction, APA

GasNet can reopen branch valve T056-BV03 subject to valve differential pressure less than 300 kPag.

4.3 Compressor Stations

AEMO shall operate each compressor within the manufacturer's published compressor performance curves and engine performance data identified in the Compressor Stations Key Data Plan in Appendix 3.

Compressors within the Service Envelope will be available to AEMO within the meaning of availability as defined in clause 1.2 of this schedule.

AEMO shall be responsible for determining the actual compressor driver (turbine) power required for each site. However the actual gas supply capacity of the compressor stations shall be limited by the site specific conditions at the time of operation, but within the recommended equipment suppliers specifications referenced in this agreement and available to AEMO. These conditions include, but are not limited by, such factors as site elevation, inlet and outlet pressure losses, turndown, fuel gas specification, friction, non-ideal compression and expansion and typical ambient atmospheric conditions.

All Saturn compressor packages are fitted with wet seals and from time to time these seals permit the release of oil into the APA GasNet System.

The average annual compressor utilisation rate is less than 10%. Accordingly unit and station reliability may be less than optimal after long periods of shut down.

APA GasNet reserves the right to relocate, replace, substitute, modify or re-stage compressor equipment and associated drivers, control systems or any other systems affecting compressor performance provided the capability of Nominal Power and associated compressor performance (deduced from compressor performance curves) are not reduced below the declared levels for each station as specified within this Agreement.

The redundant unit which is provided at each compressor station (except for Springhurst) may be operated in place of a unit provided within the design capability of each station, when the operating unit fails to perform to the required capability. However the compressor stations are not designed to allow a redundant unit to be operated in addition to the units within the design capability. Operation of the redundant unit in this way may lead to failure of the entire station and the Service Envelope Capacity will be reduced accordingly.

4.3.1 Gooding Compressor Station

Listed below is a compilation of operating constraints and guidelines that shall be complied with by AEMO unless express stated to be APA GasNet's obligation, in which case APA GasNet must comply with the specified obligation, in the operation of Gooding Compressor Station:

4.3.1.1 The station should be operated below the maximum operating pressure of 6895 kPa(g). The overpressure protection system

of the compressor unit will raise an alarm, if the discharge pressure exceeds 6895 kPa(g), and will shut down the unit, if the discharge pressure exceeds 7200 kPa(g).

- 4.3.1.2 (a) The minimum station inlet gas pressure should not be allowed to drop below 3,500 kPa(g).
- (b) The under pressure protection system of a compressor station will raise an alarm, if the suction pressure falls below 4500 kPa(g), and will shutdown that any operating unit if the suction pressure falls below 1380 kPa(g).
- (c) For the avoidance of doubt a unit, and not the station, will shut down where the suction pressure of that unit is below 1700 kPa(g).

4.3.1.3 (a) The maximum station discharge gas temperature shall be limited to 45°C. Gas discharge temperatures in excess of 50°C will initiate a shutdown on all compressor units operating.

(b) For the avoidance of doubt the Gooding compressor station is not fitted with a discharge gas cooling system.

4.3.1.4 Whenever gas compression is deemed to be required, a minimum of one (1) compressor unit and a maximum of three (3) compressor units shall be operated on a continuous basis. The fourth available compressor unit shall remain on standby status such that three (3) machines only are available for operation within the service envelope.

4.3.1.5 The time interval between starting successive compressor units shall be a minimum of two (2) minutes. Compressor units may be stopped at any time. The control system of the compressor unit allows for a cool down pre-shutdown period of time (3 minutes), which is initiated by activation of Normal Stop pushbutton of the respective unit. During this pre-shutdown period the engine speed is decreased to idle, and the unit is ready to be loaded again.

4.3.1.6 If a compressor unit shuts down via the station/compressor unit controls or is remotely stopped, a remote restart of the compressor unit must comply with the following:

<u>Time Period</u>	<u>AEMO Operator Action</u>
<u>After Shutdown</u>	
0-10 minutes	Remote restart may be initiated.
10 mins - 1 hour	Remote restart may not be initiated.
1 hour or more	Remote restart may be initiated.

4.3.1.7 Gooding is fitted with a station recycle valve under station control. Recycling of gas through the station recycle valve

shall be limited to a maximum of 30 minutes continuous recycle operation, otherwise the affected compressor units shall be shut down, or engine power reduced to minimum allowable loads. In addition, the control system of the compressor unit will allow initiation of gas recycle, if, due to the pipeline operating conditions, recycle is required to prevent surging of the compressor. Recycle is maintained as long as the temperature of gas, as sensed at the outlet of the unit, remains within allowable limits. At 99°C a High Temperature alarm is raised, and at 110°C the control system initiates shutdown of the unit.

4.3.1.8 If a gas compressor or a series of compressors are determined to be no longer required, the subject operating units shall be shut down within 15 minutes after this determination is made.

4.3.1.9 The compressor station discharge set point by agreement between APA GasNet and AEMO shall be set to match, as close as practicable, the pipeline operating requirements.

The compressor station is controlled by adjustment of the following station operational parameters:

- Suction pressure
- Discharge pressure
- Engine speed

Appropriate table is provided on the control screen for the operator to enter set points for the above parameters for every hour of the day. The control system will only allow inputting values within permissible range.

These parameters are used by the control system to calculate required engine speed signal, which is sent to the compressor units, operating at the time.

4.3.1.10 AEMO operators must allow at least eight (8) minutes for completion of the cold start sequence of a compressor unit from compressor start initiation to the point where the unit is on line and compressing gas.

4.3.1.11 Pressure differential across the compressor units of more than 700 kPa is required to ensure satisfactory seal gas differential pressures exist within the compressor. AEMO shall shut down any unit operating with less than 300 kPa (or as agreed from time to time) for a period of 15 minutes (or as agreed from time to time).

4.3.1.12 APA GasNet will ensure that each compressor unit at Gooding is fitted with an inlet liquids knock out drum or separator with an automatic liquid dump control to a station liquid storage tank maintained in accordance with APA

GasNet procedures. If the separator liquid storage reservoir reaches a pre-determined maximum level then this condition will initiate a compressor unit shutdown.

4.3.1.13 AEMO shall ensure that compressors are not required to operate outside the manufacturer's published performance curve, including an allowance for surge control margin (as agreed from time to time). The surge margin setpoint on the station recycle valve is 15%. The unit anti-surge valve setpoint is 10%.

4.3.1.14 The control system of the compressor unit will limit the minimum engine speed of the unit if the power turbine speed falls below 10,000 rpm (64.5% NPT).

4.3.2 Wollert Compressor Station

Listed below is a compilation of operating constraints and guidelines that shall be complied with by AEMO and APA GasNet, as appropriate, in the operation of Wollert Compressor Station:

4.3.2.1 The maximum station discharge gas pressure shall be limited to 8800 kPa(g). The overpressure protection system of the Compressor Station controller will raise an alarm, if the discharge pressure exceeds 8,880 kPa(g), and will shut-down any running units, if the discharge pressure exceeds 9,240 kPa(g).

4.3.2.2 (a) The minimum station inlet gas pressure should not be allowed to drop below 3,000 kPa(g).

(b) The under pressure protection system of the Compressor Station Controller will raise an alarm, if the suction pressure falls below 3,000 kPa(g), and will shut-down any running units if the station suction pressure falls below 2,760 kPa(g).

4.3.2.3 The maximum station discharge gas temperature shall be limited to 45°C. The temperature control system shall limit outlet temperature by reducing engine speed and therefore flow throughput when outlet temperature exceeds the control setpoint of 45 degC. The outlet setpoint is not operator adjustable but will increase to 50 degC in high ambient temperatures. To permit periodic operation up to the 50 degC trip limit under unusually hot conditions, the temperature trip switch shall operate only if the limit is exceeded on a continuous basis for several minutes.

4.3.2.4 . APA GasNet allow AEMO unrestricted access to operate one or both units as required by system conditions.

4.3.2.5 The time interval between starting successive compressor units shall be a minimum of two (2) minutes. Compressor units may be stopped at any time.

4.3.2.6 If a compressor unit shuts down via the station/compressor unit controls or is remotely stopped, a remote restart of the compressor unit must comply with the following:

<u>Time Period</u>	<u>AEMO Operator Action</u>
<u>After Shutdown</u>	
0-10 minutes	Remote restart may be initiated.
10 mins - 1 hour	Remote restart may not be initiated.
1 hour or more	Remote restart may be initiated.

4.3.2.7 Wollert is fitted with a discharge gas cooling system. Recycling of gas through the station recycle valve is permitted. APA GasNet allow AEMO unrestricted use of recycle to meet system requirements.

4.3.2.8 If a gas compressor or a series of compressors are determined to be no longer required, the subject operating units shall be shut down within 15 minutes after this determination is made.

4.3.2.9 The compressor station discharge set point by agreement between APA GasNet and AEMO shall be set to match, as close as practicable, the pipeline operating requirements.

4.3.2.10 AEMO operators must allow at least eight (8) minutes for completion of the cold start sequence of a compressor unit from compressor start initiation to the point where the unit is on line and compressing gas.

4.3.2.11 AEMO must close Euroa PRS line valves LV13A and LV13B and the respective loading valves LV13AB and LV13BC prior to starting any of the compressors at Wollert compressor station B. In the event line valves cannot be operated remotely at the Euroa PRS, APA GasNet site attendance is required.

4.3.2.12 Pressure differential across the compressor units of more than 700 kPa is required to ensure satisfactory buffer gas differential pressures exist within the compressor. AEMO shall shut down any unit operating with less than 300 kPa (or as agreed from time to time) for a period of 15 minutes (or as agreed from time to time).

4.3.2.13 Wollert Compressor Station 'B' is fitted with two (2) filter-separators located in the station inlet header each with a manual liquids dump system. Each filter is nominally sized for one compressor.

4.3.2.14 AEMO shall ensure that compressors are not required to operate outside the manufacturer's published performance curve, including an allowance for surge control margin (as agreed from time to time).

- 4.3.2.15 Wollert Compressor Station 'A' (comprising 3 Saturn compressor sets) is inhibited and locked out with the station 'A' outlet valve closed when Station 'B' operates above 7400 kPa(g) discharge pressure.
- 4.3.2.16 In the event Station 'B' is unavailable, APA GasNet may operate Station 'A' at the request of AEMO on a best endeavours basis.

4.3.3 Brooklyn Compressor Station

Listed below is a compilation of operating constraints and guidelines in the remote operation of Brooklyn Compressor Station by AEMO:

- 4.3.3.1 The maximum station discharge gas pressure shall be limited to 7390 kPaG in both the Ballarat/Bendigo pipeline and the Geelong pipeline. The overpressure protection system of the Compressor Station Controller will raise an alarm, if the discharge pressure exceeds 7,390 kPa(g), and will shut-down any running units, if the discharge pressure exceeds 7,640 kPa(g).
- 4.3.3.2 (a) The minimum station inlet gas pressure shall not be allowed to fall below 1800 kPa(g).
- (b) The under pressure protection system of the Compressor Station Controller will raise an alarm, if the suction pressure falls below 1800 kPa(g), and will shut-down any running units if the station suction pressure falls below 1200 kPa(g) .
- 4.3.3.3 The maximum station discharge gas temperature shall be limited to 45°C.
- 4.3.3.4 The operation by AEMO of the compressors will be in accordance with configurations as set out in Appendix 7.
- 4.3.3.5 The time interval between starting successive compressor units shall be a minimum of two (2) minutes. Compressor units may be stopped at any time.
- 4.3.3.6 If a compressor unit, either a Saturn or Centaur, shuts down via the station/compressor unit controls or is remotely stopped, a remote restart of the compressor unit must comply with the following:

<u>Time Period</u>	<u>AEMO Operator Action</u>
<u>After Shutdown</u> 0-10 minutes	Remote restart may be initiated.
10 mins - 1 hour	Remote restart may not be initiated.
1 hour or more	Remote restart may be initiated.

- 4.3.3.7 Each compressor set at Brooklyn is fitted with a discharge gas cooling system. Recycling of gas through any of the

operating gas compressors shall be limited to a maximum of 30 minutes continuous 100% recycle operation, otherwise the affected compressor units shall be shut down.

- 4.3.3.8 As Compressor #12 is fitted with a gas discharge after cooling system, recycling of gas through the compressors is permissible, although not desirable. The compressor is designed that if the prevailing pipeline operating conditions dictate that partial recycling of gas through the compressor is required to prevent surging, the compressor unit may operate indefinitely in this mode
- 4.3.3.9 If a gas compressor or a series of compressors are determined to be no longer required, the subject operating units shall be shut down within 15 minutes after this determination is made.
- 4.3.3.10 The compressor station discharge set point by agreement between APA GasNet and AEMO shall be set to match, as close as practicable, the pipeline operating requirements.
- 4.3.3.11 AEMO operators must allow at least eight (8) minutes for completion of the cold start consequence of a compressor unit from compressor start initiation to the point where the unit is on line and compressing gas.
- 4.3.3.12 Pressure differential across the compressor units of more than 300 kPa is required to ensure satisfactory buffer gas differential pressures exist within the Saturn compressor sets to prevent seal oil leakage into the compressor. Pressure differential across the Centaur compressor units of more than 700 kPa is required to ensure satisfactory seal gas differential pressures exist within the Centaur compressor sets. AEMO shall shut down any unit operating with less than 300 kPa (or as agreed from time to time) for a period of 15 minutes (or as agreed from time to time).
- 4.3.3.13 Each compressor unit at Brooklyn is fitted with an inlet liquids separator with a manual liquids dump system maintained by APA GasNet in accordance with APA GasNet procedures.
- 4.3.3.14 AEMO shall ensure that compressors are not required to operate outside the manufacturer's published performance curve, including an allowance for surge control margin (as agreed from time to time).
- 4.3.3.15 Compressor #11 has been fitted with unit discharge pressure controls designed to prevent premature failure of bearings due to rotodynamic instability which may occur in "series" mode. Maximum discharge pressure (P2) is a function of inlet pressure

(P1) described by the function $P2*(P2-P1) < 47.6$ MPa² where P1 and P2 are expressed in MPaA.

- 4.3.3.16 When compressor #11 is operating in “series” mode under rotodynamic pressure control, and with compressor #12 in conjunction, station controls will limit compressor #12 engine speed to achieve load sharing.
- 4.3.3.17 Compressors are inhibited from starting if the outlet pressure is materially lower than the inlet pressure.

4.3.4 Springhurst Compressor Station

This section 4.3.4 is subject to section 2.3.4.

Listed below is a compilation of operating constraints and guidelines that shall be complied with by AEMO in the remote operation of Springhurst Compressor Station:

- 4.3.4.1 The maximum station discharge gas pressure shall be limited to 7400 kPa(g). The overpressure protection system of the Compressor Station controller will raise an alarm, if the discharge pressure exceeds 7,400 kPa(g), and will shut-down the running unit, if the discharge pressure exceeds 7,650 kPa(g).
- 4.3.4.2 (a) The minimum station inlet gas pressure should not be allowed to drop below 2,300 kPa(g).

(b) The under pressure protection system of the Compressor Station Controller will raise an alarm, if the suction pressure falls below 2,300 kPa(g), and will shut-down the running unit if the station suction pressure falls below 2,100 kPa(g).
- 4.3.4.3 The maximum station discharge gas temperature shall be limited to 45°C.
- 4.3.4.4 Whenever gas compression is “on line”, the main line valve on the Wollert to Wodonga pipeline at Springhurst is automatically closed. Following compression, the valve will be automatically re-opened upon pressure equalisation (< 350 kPa). In the event system conditions do not permit equalisation, AEMO will need to dispatch APA GasNet to site to manually equalise.
- 4.3.4.5 The compressor unit may be started at any time and may be stopped at any time.
- 4.3.4.6 If the compressor unit shuts down via the station/compressor unit controls or is remotely stopped, a remote restart of the compressor unit must comply with the following:

Time Period

AEMO Operator Action

After Shutdown

0-10 mins Remote restart may be initiated.

10 mins - 1 hour Remote restart may not be initiated.

1 hour or more Remote restart may be initiated.

- 4.3.4.7 The Springhurst compressor is fitted with a discharge gas cooling system. Recycling of gas through any of the operating gas compressors shall be limited to a maximum of 30 minutes continuous 100% recycle operation, otherwise the affected compressor units shall be shut down, or process parameters (outlet pressure, inlet pressure or inlet flow) adjusted to reduce or avoid recycle..
- 4.3.4.8 If a gas compressor is deemed to be no longer required, the subject operating unit shall be shut down within 15 minutes after this determination is made.
- 4.3.4.9 The compressor station discharge set point, by agreement between APA GasNet and AEMO, shall be set to match as close as practicable the pipeline operating requirements.
- 4.3.4.10 AEMO operators must allow at least fifteen (15) minutes for completion of the cold start sequence of a compressor unit from compressor start initiation to the point where the unit is on line and compressing gas.
- 4.3.4.11 Pressure differential across the compressor unit of more than 700 kPa is required to ensure satisfactory buffer gas differential pressures exist within the compressor. AEMO shall shut down any unit operating with less than 300 kPa (or as agreed from time to time) for a period of 15 minutes (or as agreed from time to time).
- 4.3.4.12 Springhurst Compressor Station is fitted with a single liquids filter-separator located in the unit inlet header with a manual hydrocarbon drain.
- 4.3.4.13 AEMO shall ensure that compressors are not required to operate outside the manufacturer's published performance curve, including an allowance for surge control margin (as agreed from time to time).
- 4.3.4.14 Springhurst Compressor Station is fitted with two station isolation skids to support compression either north or south. AEMO shall maintain a default station mode of North flow unless the compressor station needs to be configured for South flow.
- 4.3.4.15 The oil and gas fin-fan cooler has been designed for an ambient temperature of 30 degC to achieve 50 degC outlet temperature. The control system shall limit outlet temperature by reducing engine speed and therefore flow throughput when outlet temperature exceeds the control

setpoint of 45 degC. The outlet setpoint is not operator adjustable but will increase to 50 degC in high ambient temperatures. To permit periodic operation up to the 50 degC trip limit under unusually hot conditions, the temperature trip switch shall operate only if the limit is exceeded on a continuous basis for several minutes.

4.3.5 Iona Compressor Station

Listed below is a compilation of operating constraints and guidelines in the remote operation of Iona Compressor Station by AEMO:

- 4.3.5.1 The maximum station discharge gas pressure shall be limited to 7400 kPa(g).
- 4.3.5.2 The minimum design station inlet gas pressure is 3800 kPa(g). If the suction pressure falls below this value, the performance of the unit may not be achieved.
- 4.3.5.3 The minimum unit engine speed is 1260 rpm.
- 4.3.5.4 The maximum station discharge gas temperature shall be limited to 45°C.
- 4.3.5.5 The time interval between starting successive compressor units shall be a minimum of fifteen (15) minutes. Compressor units may be stopped at any time. The unit may not be able to be re-started for 2 to 3 hours following a stop since a high engine temperature alarm will inhibit unit reset.
- 4.3.5.6 Two units may be run in parallel for up to 30 minutes only to facilitate unit changeover.
- 4.3.5.7 Under certain pipeline operating conditions, i.e. relatively low flow and high head, recycling of gas through the compressor may be required. The control system of the compressor unit will allow initiation of gas recycle, if, due to the pipeline system demand, recycle is required to prevent excessive discharge pressure. Excessive recycling of gas will typically cause the station discharge temperature to increase and, if allowed to continue, will result in the unit tripping at 55°C.
- 4.3.5.8 If a gas compressor is determined to be no longer required, the subject operating units shall be shut down within 15 minutes after this determination is made.
- 4.3.5.9 deleted.
- 4.3.5.10 AEMO operators must allow at least eight (8) minutes for completion of the cold start sequence of a compressor unit from compressor start initiation to the point where the unit is on line and compressing gas.
- 4.3.5.11 Pressure differential across the compressor units of more than 300 kPa is required to ensure satisfactory lubrication of the

compressor rod bearings. AEMO shall shut down any unit operating with pressure differential less than 300 kPa for a period of 15 minutes.

- 4.3.5.12 Each compressor unit at Iona is fitted with an inlet liquids separator and discharge coalescer with a manual liquids dump system maintained by APA GasNet in accordance with APA GasNet procedures.
- 4.3.5.13 AEMO shall ensure that compressors are not operated with unit alarms active unless authorised by GasNet.
- 4.3.5.14 Refer to Cause and Effects drawings 1700-JC-001 and 1700-JC-002 (as amended by the parties from time to time), for details of alarm and trip settings.

4.3.6 Euroa Compressor Station

Listed below is a compilation of operating constraints and guidelines that shall be complied with by AEMO in the remote operation of Euroa Compressor Station:

- 4.3.6.1 The maximum station discharge gas pressure shall be limited to 7400 kPa(g). The overpressure protection system of the Compressor Station controller will raise an alarm, if the discharge pressure exceeds 7,400 kPa(g), and will shut-down the running unit, if the discharge pressure exceeds 7,700 kPa(g).
- 4.3.6.2 (a) The minimum station inlet gas pressure should not be allowed to drop below 3,200 kPa(g).

(b) The under pressure protection system of the Compressor Station Controller will raise an alarm, if the suction pressure falls below 3,000 kPa(g), and will shut-down the running unit if the station suction pressure falls below 2,000 kPa(g).
- 4.3.6.3 The maximum station discharge gas temperature shall be limited to no more than 50°C.
- 4.3.6.4 Whenever gas compression is “on line”, the main line valves on the Wollert to Wodonga pipeline at Euroa is automatically closed. When compression is stopped, the adjacent Euroa PRS and linevalves will be automatically restored upon pressure equalisation (< 350 kPa). In the event system conditions do not permit equalisation, AEMO will need to dispatch APA GasNet to site to manually equalise.
- 4.3.6.5 The compressor unit may be started at any time (subject to clause 4.3.6.6) and may be stopped at any time.
- 4.3.6.6 If the compressor unit shuts down via the station/compressor unit controls or is remotely stopped, a remote restart of the compressor unit must comply with the following:

Time Period After Shutdown	AEMO Operator Action
0-10 mins	Remote restart may be initiated.
10 mins - 1 hour	Remote restart may not be initiated.
1 hour or more	Remote restart may be initiated.

- 4.3.6.7 The Euroa compressor is fitted with a discharge gas cooling system. Recycling of gas through the operating gas compressor(s) shall be limited to a maximum of 30 minutes continuous 100% recycle operation, otherwise the affected compressor units shall be shut down, or process parameters (outlet pressure, inlet pressure or inlet flow) adjusted to reduce or avoid recycle.
- 4.3.6.8 If a gas compressor is deemed by AEMO to be no longer required, the subject operating unit shall be shut down within 15 minutes after this determination is made.
- 4.3.6.9 AEMO operators must allow at least fifteen (15) minutes for completion of the cold start sequence of a compressor unit from compressor start initiation to the point where the unit is on line and compressing gas.
- 4.3.6.10 Pressure differential across the compressor unit of more than 700 kPa is required to “arm” the seal gas protections system and to ensure satisfactory buffer gas differential pressures exist within the compressor. The unit may safely operate down to 300 kPa (or as agreed from time to time).
- 4.3.6.11 Euroa Compressor Station is fitted with a duty and standby liquids filter-separator located in the station inlet header with a manual hydrocarbon drain.
- 4.3.6.12 AEMO shall ensure that compressors are not required to operate outside the performance curve provided to AEMO by APA GasNet, including an allowance for surge control margin (as agreed from time to time).
- 4.3.6.13 Euroa Compressor Station is fitted with two station isolation skids to support compression either north or south.
- 4.3.6.14 The gas fin-fan cooler has been designed for an ambient temperature of 40 degC to achieve 50 degC outlet gas temperatures. The control system shall limit outlet gas temperature by reducing engine speed and therefore flow throughput when outlet gas temperature exceeds the control setpoint of 45 degC. The outlet gas temperature setpoint is not operator adjustable. The unit will immediately trip at 50 degC.

4.4 Pipeline valves

The pipeline valves at various locations, as mentioned in section 2.5 are subject to operating constraints the details of which are defined in this document to ensure AEMO has all relevant information available

to correctly and safely operate the pipeline system in accordance with relevant Statutory rules and Codes of practice and the APA GasNet's requirements that apply to the pipeline valves. Listed below is a compilation of operating constraints and guidelines that shall be complied with by AEMO operators in the operation of pipeline system.

- 4.4.1 AEMO shall operate the pipeline valves in compliance with applicable licence conditions, APA GasNet procedures (as in Appendix 2) and the requirements of Australian Standard AS2885. The licence conditions and APA GasNet requirements will precede the Australian Standard. The maximum operating pressure of the pipeline valves shall be limited to the Maximum Allowable Operating Pressure (MAOP) as specified in the pipeline licence condition.

The valve status/position depends on its location in the pipeline system listed on the "APA GasNet's Critical TP Valves" in Appendix 4. The valve positions shown reflect the initial setting. The parties agree that operational positions and the relevant AEMO database will be under AEMO control in accordance with the AEMO Valve Change Procedure, a copy of which will be developed and maintained in consultation with APA GasNet.

Additional description of operational parameters for remotely controlled on off line valves:

- 4.4.2 Operation of manually controlled valves within the APA GasNet System shall be performed only by personnel approved by APA GasNet.
- 4.4.3 Line valves and line valve bypass valve at Ballan - may be closed at any time to facilitate AEMO's operation of the pipeline system. However, opening of the line valve shall only be allowed with the pressure differential across the valve less than or equal to 350 kPa. The transmission pipeline from Morwell to Dandenong (Pipeline T01, namely "Lurgi Line") may be manually opened anytime. There is no restriction on the 80mm bypass valve at Ballan.
- 4.4.4 Branch valves - may not be opened with pressure differential more than 350 kPa unless approved by APA GasNet.
- 4.4.5 Pig trap valves - may not be opened when the pressure differential is more than 350 kPa unless approved by APA GasNet.
- 4.4.6 Pig trap kicker valves - may be opened or closed to facilitate the pigging operation.
- 4.4.7 Blow down valves - may be opened or closed to facilitate pipeline blowdown, flaring, purging and pipeline equalisation prior to main line valve operation.
- 4.4.8 Tie Valves - may not be opened with pressure differential more than 350 kPa unless approved by APA GasNet.

4.5 Telemetry

4.5.1 The AEMO Gas Transmission Operations Centre receives data on the status of systems including designated regulator stations and City Gates, compressor stations, Longford Metering Station and Odourant Facilities from the APA GasNet communications system.

4.5.2 The communications system availability is 99.5% on annual basis.

4.5.3 The following are critical sites:

4.5.3.1 Compressor Stations

- Brooklyn Compressor Station
- Euroa Compressor Station
- Gooding Compressor Station
- Iona Compressor Station
- Springhurst Compressor Station
- Wollert Compressor Station B

4.5.3.2 Injection Points into the GNS

- BassGas
- Culcairn
- Iona (WUGS)
- Longford
- LNG
- SEAGas/Otway/Mortlake
- VicHub

4.5.3.3 Fringe Points in the GNS

- Ballarat
- Bendigo
- Brooklyn
- Carisbrook
- Dandenong Terminal Station (Lurgi)
- Corio (Geelong)
- Portland
- Shepparton
- Sunbury

4.5.3.4 Pressure Regulating Stations

- Brooklyn BBP PRS
- Brooklyn BCP City gate
- Brooklyn BLP City Gate
- Barnawartha City Gate
- Dandenong City Gate
- Iona City Gate
- Lara SWP City Gate
- Morwell City Gate
- Plumpton PRS
- Tyers Pressure Limiter
- Wandong PRS
- Wollert City Gate

- Wollert Pressure Limiter

4.5.3.5 Gas Powered Generation

- Jeeralang
- Laverton North
- Loy Yang B
- Newport Power Station
- Somerton

4.6 Longford Odourisation

The operating constraints for the Longford facility are stated as follows for the purpose of AEMO information and monitoring of odourant injection operations through data telemetered to the AEMO Operations Centre.

The odourant injection dose rate set point is 7 milligrams of odourant per standard cubic metre of natural gas with a process variance of +/- 1 milligram. The odourant is a blend of 70% tetrahydrothiophene (THT) and 30% tertiary butyl mercaptan (TBM).

The process operation has alarm settings for dose rates of < 6 milligrams and > 8 milligrams per cubic metre of natural gas. AEMO shall monitor and advise APA GasNet when average hourly concentrations exceed these limits.

The availability of the system is 99.9% with a maximum of 10 hours non-availability per annum and a single event non-availability not exceeding 3 hours.

Appendix 1 – Key Plan Drawings

Drawing No	Title
A4-363-1	APA GasNet System: Longford - Dandenong - Wollert Key Plan
A4-363-2	APA GasNet System: 750 Dandenong - West Melbourne - Brooklyn Key Plan
A4-363-3	APA GasNet System: Brooklyn - Geelong Key Plan
A4-363-4	APA GasNet System: Ballarat - Bendigo Key Plan
A4-363-5	APA GasNet System: Wollert - Albury - Echuca - Koonoomoo - Culcairn Key Plan
A4-363-6	Western Transmission System: Paaratte - Allansford - Portland, Cobden and Hamilton Key Plan
A4-363-7	APA GasNet System: South West Pipeline 500mm Lara - Iona - Nth Paaratte Key Plan
A4-364-1	APA GasNet System: Longford - Dandenong - Wollert Transfer Point Plan
A4-364-2	APA GasNet System: 750 Dandenong - West Melbourne - Brooklyn Transfer Point Plan
A4-364-3	APA GasNet System: Brooklyn - Geelong Transfer Point Plan
A4-364-4	APA GasNet System: Ballarat - Bendigo Transfer Point Plan
A4-364-5	APA GasNet System: Wollert - Albury - Echuca - Koonoomoo - Culcairn Key Plan
A4-364-6	APA GasNet System: Paaratte - Allansford - Portland, Cobden and Hamilton Transfer Point Plan
A4-364-7	APA GasNet System: South West Pipeline 500mm Lara - Iona - Nth Paaratte Transfer Point Plan

Appendix 2 – APA GasNet Operational Procedures Index

This list is a set of APA GasNet procedures that are available to AEMO to ensure security and safe operation of the APA GasNet System, and compliance with APA GasNet's and AEMO's obligations under the National Gas Rules and National Gas Law and the Service Envelope Agreement.

Company Manuals

Document Number	Document Name
Health & Safety Manual	
SP-APAT-101-OP-0003	Isolation and Tagging Procedure
SP-APAT-101-OP-0001	Gas Transmission Permit to Work Procedure
OHS400	Hazard Reporting
OHS217	Safety Inspection Procedure
OHS239	Protective Clothing and Equipment
OHS240	Confined Spaces Entry Procedures
Environment Manual	
ENV014	Purging & Venting Natural Gas
ENV015	Fuel Handling
ENV348	Waste Disposal
Management Manual	
MAN232	Change Management
EME020	Emergency Management
MAN368	Safety Case
MAN297	Management of Incidents

Departmental Manuals

Document Number	Document Name
Engineering Services	
CSP326	Operational Guidelines For Standby Generator
EME286 Att A	Emergency Evacuation & Bomb Threat
CSP335	Fire Services
CSP336	Security Guard And Patrol Services*
CSP337	Operating Guidelines For Mobile Telephones
MAN368 att 1	Facility Description

MAN621	Security Plan
PIP181	Transmission Pipeline Damage Management
PIP181wi 01	Field Defect Assessment
PIP250	Purging And Commissioning TP Pipeline Policy
PIP254	Development of Fracture Control Plan for Pipelines
ESD296	Project Hand Over Documentation
PIP299	Purging & Commissioning TP Pipelines
PIP300	Pipeline Marking
PIP342	Pipeline Design and Construction Standard
PIP346	Connections to APA GasNet Assets
PIP357	Pipeline Integrity Monitoring Plan
PLA380	Purging of Gas Plant
FAC202	Supply/Install of Mechanical Plant & Equipment
SEC189	Security Fencing
STD027	Selection and Installation of Electrical Equipment
STD222	Standard for Pressure Regulating Facility - Design & Construction
STD246	Cable Installation and Wiring
VLV352	Control Valves
VLV387	Valve Numbering System

Operations

Document Number	Document Name
BCS544	Brooklyn Compressor Station Operators Manual
GCS023	Gooding Compressor Station operating and Maintenance Manual
LNG230	LNG Facility Process Summary
LNG288	De-Pressurisation & Purging of 2800 & 700 kPa Natural Gas Pipelines From BOC
LNG289	LNG Facility Programmable Electronic System (PES) Operations
LNG344	PLC Software Change Management

LNG Facility Dandenong

Document Number	Document Name
LNG353	CITECT System Technical Reference Manual
MEA001	Measuring Agency Laboratory Quality Manual
EME004	Longford Metering Agency Emergency Plan
MEA006	Longford Measuring Agency Manual
MEA245	Custody Transfer Metering - Accuracy Verification Testing

ODO001	Odorant Handling
ODO002	Odorant Storage, Handling, Safety & Fire Fighting
ODO003	Maintenance of Odorant Equipment
ODO004	Natural Gas Odourisation
OHS198	Site Visitors Compliance Orientation
OHS242	Safety Rules For Contractors and Consultants
PIP197	Transmission Pipeline valve Positions
PPL231	External Interference Protection Pipelines
PPL231wi01	Processing 'One Call' Notifications
PIP268	Pipe line valves - Inspection, Operation and Maintenance
PIP268wi01	Pipe line valves - Inspection, Operation and Maintenance
PIP269	Regulator & Over Pressure Protection Systems Inspection, Operation & Maintenance
PIP269wi01	Regulator & Over Pressure Protection Systems Inspection, Operation & Maintenance
PIP270	Pipeline Syphons - Inspection, and Liquid Withdrawal
PIP270wi01	Pipeline Syphons - Inspection, and Liquid Withdrawal
PIP271	Heaters - Inspection, Operation and Maintenance
PIP271wi01	Heaters - Inspection, Operation and Maintenance
PIP272	Pipeline Maintenance Compliance Audit
PIP273	Pipeline Excavation
PIP274	Public Awareness
WCG276	Wollert Compressor Station - Operating and Maintenance Manual

Appendix 3 – Compressor Stations

Drawing A1-301-1 lists all Compressor units within each Compressor Station, illustrating the power, capability and capacity of each unit when operated remotely by AEMO.

The following list of installations identifies each facility by an asset reference number and a Key Plan drawing number, and identifies relevant P&IDs.

ASSET TITLE	Reference Number	Key Plan Drawing No.	P&ID Drawing No.
Brooklyn CS	CI-0-39	A4-363-2 A4-363-3	1200-PB-006 to 1200-PB-026
Gooding CS	C4-2-4	A4-363-1	1100-PB-001 to 1100-PB-010
Wollert CS	C7-0-23	A4-363-1	1300-PB-120 to 1300-PB-187
Iona CS	N/A	N/A	4630-PB-001, 4630-PB-004, 4630-PB-005, 4630-PB-006, and 4630-PB-011
Springhurst CS	N/A	A4-363-5	1600-PL-001 1600-PB-001 to 1600-PB-006
Euroa CS	N/A	A4-363-5	1400-PB-120 to 1400-PB-143

Appendix 4 – APA GasNet’s Critical TP Valves

Note: Only APA GasNet valves are shown on this list. At shared sites the positions of Distribution Company valves **are not** shown.

By Pass Valves: Unless stated otherwise, where bypass valves are fitted, and the bypass pipework is connected, both bypass valves are open.

Cross Tie Valves: Unless stated otherwise, where cross tie valves are installed, and the pipeline is duplicated, the cross tie valves are open. Where cross tie valves are installed, but the pipeline is not duplicated, the cross tie valves are shut.

Custody Transfer Meter Valves: Unless stated otherwise, the bypass valve for the meter skid/pit and the bypass valve on the skid, in or near the pit and the proving valves are shut. Refer to the appropriate flow diagram for full details.

Embedded sites are described below.

A4.1 Longford - Dandenong TP

Crosstie Valves -

Line valve 1 Upstream Closed

By Pass Valves	Northern Pipeline		Southern Pipeline	
	Upstream	Downstream	Upstream	Downstream
Line valve 3B	N/A	N/A	Open	Shut
Line valve 5	Shut	Open	N/A	N/A
Line valve 7	Shut	Open	N/A	N/A

A4.1.1 Sale City Gate

Valves 5, 8, 9, 10, 11, 801 & 802 are closed. Refer to flow diagram 4105-PA-001 for full details.

Melway: 528 F7 Vicroads: 99 B5

A4.1.2 Tyers Pressure Limiter

The 300 mm branch valve (T060-BV04N on flow diagram, the supply from the northern pipeline to Tyers PL) is closed. This valve was closed as it was thought that pipeline liquids may be present in the off take from the northern pipeline.

Valves 1, 2, 3, 362 & 364 are also shut. Refer to flow diagram 2130-PA-001 for full details.

Melway: 528 D7 Vicroads 98 A4

A4.1.3 Line valve 4 - Yallourn North

Valves 402, 404, 411, 412, 413, 421, 422, 423, 452, 471, 472 & 473

are shut. Refer to flow diagram 5104-PA-001 for full details.
Melway: 528 D7 Vicroads: 97 J4

A4.1.4 Gooding Compressor Station

LV05N and the downstream by pass valve 05NB are both closed. A non-return valve must open to permit normal gas flow via the two (2) 600 mm branch valves. Refer to flow diagram 1100-PA-002 for full details.

Melway: 528 C7 Vicroads: 97 F4

A4.1.5 Pakenham T060-LV09 Dore Rd

Valves 09NA, 921, 922, 924, 936, 954, 095A, 961, 963, 965 & 966 are shut. Refer to flow diagram 5109-PA-001 for full details.

Melway: 318 E4 Vicroads: 96 A2

A4.2 Morwell - Dandenong TP

A4.2.1 Morwell Regulating Station and Pig Trap Station

Valves 1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 15, 17, 18, 20, 802, 804, 805, T001-BV21 & T001 - BV22, T005-BV01 & T005-BV02 are shut. Refer to flow diagrams 4205-PA-001 and 5200-PA-001 for full details.

Melway: 528 C7 Vicroads: 97 H6

A4.2.2 Dandenong Terminal Station

Valves 4, 6, 8, 9, 11, 18, 19, 38, 63, 64, 65A, 65B, 70, 72, 73, 75, 93, 94, 95, 97, 802, 804, 805, 813, 814, 823, 821, 822 and T016-BV02 are all shut. Refer to 3241-PA-001 for full details.

Melway: 95 C3 Vicroads 95 E2

A4.3 Dandenong - West Melbourne / Brooklyn TP

A4.3.1 Dandenong Terminal Station

Refer to the entry under Morwell - Dandenong TP.

A4.3.2 Dandenong Henty St

T065-LV02 is shut. T018-LV01 and both bypasses T018-01A & T018-01B are shut. T018-LV01 is the meter bypass for M003. Refer to flow diagram 4303-PA-001 for full details.

Melway: 91A C4 Vicroads: 79 E9

A4.3.3 Melbourne Queenswharf Rd

T016-BV21 and valves 804 & 805 are shut. T06-BV21 is the meter bypass for M011. Refer to flow diagram 4345-PA-001 for full details.

Melway: 1A B11 Vicroads: 78 H7

A4.3.4 Metering Station Docklands

Valves 3, 4, 7, 8, 10, 11, 802 & 822 are shut. Refer to flow diagram 4348-PA-002 for full details.

Melway: 2E H7 Vicroads: 78 H7

A4.3.5 Spotswood

T033-BV08 (on T33) is shut. This valve is the meter bypass for

M013. Refer to flow diagram 4360-PA-001 for full details.
Melway: 41 H12 Vicroads: 78 F7

A4.3.6 Brooklyn Compressor Station

Refer to the entry under Brooklyn - Corio (A4.5.1).

A4.4 Brooklyn-Ballarat-Bendigo TP

A4.4.1 Brooklyn Compressor Station

Refer to the entry under Brooklyn - Corio (A4.5.1).

A4.4.2 Rockbank Offtake Hopkins Rd

Valves 3, 4, 5 and the bypass valves T062-01B and T062-BV02 are shut. Actuated branch valve T056-BV03 is normally open with a non-return valve preventing flow from T062 to T056. Refer to flow diagram 5560-PA-001 and 5561-PA-001 for full details.

Melway: 511 H2 Vicroads: 78 D6

A4.4.3 Sunbury City Gate

Valves 9, 10, 11, 12, 802, 804, 805 & 814 are shut. Refer to flow diagram 4558-PA-001 for full details.

Melway: 382 C6 Vicroads: 78 D3

A4.4.4 Melton City Gate

Valves 1, 802, 804 & 805 are shut. Refer to flow diagram 4562-PA-001 for full details.

Melway: 511 G2 Vicroads: 78 C6

A4.4.5 Ballan Bifurcation

T056-LV07 & the downstream bypass T056-07B. Valves 1, 2, 3, 4, 8, 10, 11, 12, 13 and 16 are shut. Refer to flow diagram 5510-PA-001 for full details.

Melway: 511 D1 Vicroads: 77 D3

A4.4.6 Ballarat City Gate

Valves 3, 4, 5, 6, 8, 11, 13, 14, 15 & 16 are shut. Refer to flow diagram 4574-PA-001 for full details.

Melway: 509 A12 Vicroads: 79 G3

A4.4.7 Guildford - Offtake

At the Guildford Offtake, valves 1, 2, 3 & 4 are shut. Refer to flow diagram 5550-PA-001 for full details.

Melway: 509 C8 Vicroads: 59 D4

A4.4.8 Clunes Rd

At Clunes Rd, line valve 3 & both bypass valves 3A & 3B are Open. Branch valves 1 & 2 are shut. This bypasses the decommissioned pressure limiter. Refer to flow diagram 5553-PA-001 for full details.

Melway: 520 K11 Vicroads: 58 G3

A4.4.9 Maryborough City Gate

T067-LV04 and both bypasses T067-04A & T067-04B, & valves 3, 5, 6, 7, 802, 804 & 805 are shut. Refer to flow diagram 4588-PA-001 for full details.

Melway: 520 K11 Vicroads: 58 F2

A4.4.10 Castlemaine City Gate

Valves 14, 27, 804 & 805 are shut. Refer to flow diagram 4582-PA-001 for full details.

Melway: 509 C7 Vicroads: 59 D2

A4.4.11 Bendigo City Gate

Valves 4, 5, 6, 8, 11, 17, 18, 25, 26 & 27 are shut. Refer to flow diagram 4586-PA-001 for full details.

Melway: 509 D4 Vicroads: 44 E7

A4.4.12 Ballan Actuated Valve

At the Ballan Actuated Valve Station, line valve T070-LV02W and both bypass valves T070-02WA and T070-02WB are all shut. Refer to flow diagram 5522-PA-001 for full details.

Melway: N/A Vicroads: 59 B9

A4.5 Brooklyn - Corio TP

A4.5.1 Brooklyn Compressor Station

Valves 2, 3, 5, 6, 12, 14, 15, 17, 6228, 6229, 6230, 6232, 6234, 6234, 6236, 6237, 6238, 6201, 6203, 802, 804 & 805 are shut. Refer to flow diagram 1200-PA-005 for full details.

Melway: 40 H9 Vicroads: 78 F7

A4.5.2 Corio City Gate

Valves 2, 18, 19, 20, 21, 25, 26, 28, 29, 31, 32, 33, 34 & 35 are shut. Refer to flow diagram 4544-PA-001 for full details.

Melway: 224 G5 Vicroads: 93 H3

A4.5.3 Brooklyn City Gates

Valves 50, 51, 53, 60, 61, 63, 64, 65, 66, 69, 71, 72, 74, 75, 77, 78, 79, 80, 81, 82, 83, 84, 85, 91, 92, 93, 94, 95, 96, 98, 99, 101, 102, 106 and 108, 116, 201, 201, 203, 204, 120, 158, 160, 258, 260, 358, 360, 458, 460, 558, 560, 658, 660, 662, 653, 755, 766, 902, 919 are all shut. Refer to flow diagram 1222-PA-001 for details.

Melway: 40 H10 Vicroads: N/A

A4.6 Wollert - Wodonga - Echuca TP

A4.6.1 Keon Park

T018-LV15B & T018-LV16, both branch valves T018-BV40 & T018-BV41 & both bypasses T018-16A & T018-16B are shut. These are the meter bypasses for M115 (LV15B) and M116 (LV16). Refer to flow diagram 4415-PA-001 for full details.

Melway: 7 K10 & 8 B11 Vicroads: 78 H5

A4.6.2 Wollert (City Gate)

Line valves T074-LV02 & both bypasses (on T74) 02A & 02B, valves 7, 11, 19, 21, 29, 30, 31, 42, 43, 52, 53, 55, 56, 59, 61, 64, 66, 72, 75, 76, 122A, 122B, 222A, 222B, 322A, 322B, 422A, 422B, 401, 402, 507, 510, 511, 514, 537, 631, 633, 952, 954 & 955 are shut. Refer to diagram 1321-PA-001 for full details.

Melway: 512 C1 Vicroads: 98 H3

A4.6.3 Euroa City Gate

Valves 1, 2, 3, 4, 5, 6, 9, T074-09A, T074-09B, 10, 12, 12A, 12B 13, 15, 16, 18, 19, T074-BV11, T074-11A, T074-BV12, T074-12A, 802, 804 & 805 are all shut. Refer to flow diagram 4442-PA-001 for full details.

Melway: 510 R3 Vicroads: 47 A5

A4.6.4 Euroa P R S

All valves are actuated. Refer to flow diagram 1400-PA-122 for full details.

Melway: 510 R3 Vicroads: 47 A5

A4.6.5 Shepparton City Gate

Valves 6, 7, 802, 804 & 805 are shut. Refer to flow diagram 4470-PA-001 for full details.

Melway: 521 J7 Vicroads: 32 H8

A4.6.6 Toolamba Rd

LV4 is open. Both bypass valves are open.

Melway: 521 H6 Vicroads: 32 F7

A4.6.7 Kyabram City Gate

Valves 1, 7, 8, 10, 15, 16, 17, 18, 802, 804, 805 & T071-BV07 are shut. Refer to flow diagram 4476-PA-001 for full details.

Melway: 521 H6 Vicroads: 32 B7

A4.6.8 Echuca City Gate

Valves 1, 2, 6, 7, 13, 802, 804 & 805 are shut. Refer to flow diagram 4480-PA-001 for full details.

Melway: 521 F6 Vicroads: 31 E5

A4.6.9 Wodonga City Gate

Valves 2, 3, 7, 13, 14, 15, 802, 804 & 805 are shut. Refer to flow diagram 4465-PA-001 for full details.

Melway: 522 E5 Vicroads: 35 D3

A4.6.10 Wandong PRS

Branch valve T074-BV04 and valves 1, 2, 3, 6, 15, 16, 17, 19 and 20 are all shut. Refer to flow diagram 2451-PA-001 for full details.

Melway: 510 M Vicroads: 61 B7

A4.6.11 Wollert Compressor Station. Valves 7, 11, 12, 402, 561, 562, 564, 565, 802, 804 and 805 are all shut. Refer to flow diagram 1300-PA-010 for full details.

Melway: 510 M Vicroads: 61 B7

A4.6.12 Barnawartha City Gate And Offtake Station

Branch valve T074-BV16E and valves 2, 20, 30, 42, 43, 44, 112, 113, 114, 115, 200, 202, 203, 205, 206, 207, 210 and 211 are all shut.

Refer to flow diagram 6650-PA-001 for full details.

Melway: N/A Vicroads: 315

A4.7 Murray Valley (Chiltern - Koonoomoo)

A4.7.1 Chiltern Valley Offtake

Valves 1, 2, 4, 5 & 6 are shut. Refer to flow diagram 5470-PA-001 for full details.

Melway: 522 E6 Vicroads: 35 A4

A4.7.2 Rutherglen City Gate

Valves 802, 804 and 805 are closed. Refer to flow diagram 4486-PA-001 for full details.

Melway: 522 D6 Vicroads: 34 J3

A4.7.3 Yarrawonga City Gate

Valves 802, 804 and 805 are closed. Refer to flow diagram 4488-PA-001 for full details.

Melway: 522 B6 Vicroads: 34 B2

A4.7.4 Cobram City Gate

Valves 802, 804 and 805 are closed. Refer to flow diagram 4490-PA-001 for full details.

Melway: 521 K5 Vicroads: 23 B9

A4.7.5 Koonoomoo City Gate

Valves 1, 2, 3, 5, 802, 804 and 805 are closed. Refer to flow diagram 4492-PA-001 for full details.

Melway: 521 K4 Vicroads: 23 B7

A4.8 Interconnect (Barnawartha - Culcairn)

Line valves are fitted with Automatic Line Break detection (ALB). Both bypass valves are closed.

A4.9 South West Pipeline (Lara To Iona)

A4.9.1 Iona City Gate and Compressor Station

Valves 2, 3, 4, 5, 6, 7, 9, 14, 15, 17, 20, 21, 24, 25, 27, 30, 32, 33, 35, 36, 37, 38, 41, 42, 43, 44, 45, 47, 48, 50 and 51 are all shut. Refer to flow diagram 4630-PA-001 for full details.

Melway: N/A Vicroads: N/A

A4.9.2 Lara (SWP) City Gate (Hovells Creek Reserve)

Valves T112-04A, 112-04B, 3, 4, 10, 11, 15, 16, 18, 19, 21, 22, 24, 25, 27, 28, 30, 32, 34, 35, 37, 38, 42, 43, 45, 47, 53, 54, 55, 57, 60, 802, 830, 831, 832 are all shut. Refer to flow diagram 92631-PA-001 for full details.

Melway: 221 D10 Vicroads: 93 H2

A4.9.3 Brooklyn (BLP) City Gate (Jones Road)

See A.5.4.3. Refer to flow diagram 1222-PA-001 for full details.

Melway: 221 D10 Vicroads: 93 H2

A4.9.4 Truganina to Plumpton Pipeline Offtake (Hopkins/Middle Road)

Refer to flow diagrams 5560-PA-001 and 5561-PA-001 for full details.

Melway: 511 H2 Vicroads: 78 D6

Appendix 5 – APA GasNet Pipelines Specifications Summary

Pipeline Licence No.	DWG No.	Licence Name	Line Name	Recorded Length (km)	Pipe Dia. O.D. (mm)	MAOP (kPa(g))	Coating	Steel Grade	Wall Thickness	
									Min	Max
36	T16	Dandenong to West Melbourne	Dandenong to West Melbourne	36.2	762.0	2760	C.T.E.	API 5L Grade X42	9.52	9.52
36	T15	Dandenong to West Melbourne	Princes Hwy to Regent St.	0.8	219.1	2760	C.T.E.	API 5L Grade A	6.40	6.40
50	T1	Morwell to Dandenong	Morwell to Dandenong	127.0	457.0	2760	Bitu.	SAA A.33 Class D	7.94	9.94
50	T1	Morwell to Dandenong	Supply to Jeeralang	0.4	323.9	2760	P.E.	API 5L Grade B	6.35	6.35
67	T37	Maryvale	Supply to APM Maryvale	5.4	168.3	6890	C.T.E.	API 5L Grade B	6.35	6.35
68	T38	Pakenham	Healesville-Koo-Wee-Rup Road	1.2	88.9	2760	C.T.E.	API 5L Grade B	5.48	5.48
68	T38	Pakenham	Healesville-Koo-Wee-Rup Road	0.7	168.3	2760	P.E..	API 5L Grade X42	7.11	7.11
68	T38	Pakenham	Healesville-Koo-Wee-Rup Road	0.5	168.3	2760	DLFBE.	API 5L Grade X42	5.48	5.48
75	T60	Longford to Dandenong	Longford to Dandenong	174.2	762.0	6890	C.T.E.	API 5L Grade X60	10.31	12.7
78	T56	Brooklyn-Ballarat-Bendigo	Brooklyn to Ballan	66.6	219.1	7390	C.T.E.	API 5L Grade B	6.35	7.04
78	T57	Brooklyn-Ballarat-Bendigo	Ballan to Ballarat	22.7	168.3	7390	C.T.E.	API 5L Grade B	4.78	6.35
78	T70	Brooklyn-Ballarat-Bendigo	Ballan to Bendigo	90.8	168.3	7390	C.T.E.	API 5L Grade B	4.78	6.35

Pipeline Licence No.	DWG No.	Licence Name	Line Name	Recorded Length (km)	Pipe Dia. O.D. (mm)	MAOP (kPa(g))	Coating	Steel Grade	Wall Thickness Min	Wall Thickness Max
81	T24	Brooklyn to Corio	Brooklyn to Corio	50.7	350.0	7390	C.T.E.	API 5L Grade X60	5.56	6.35
91	T44	Warragul	Supply to Anderson St., Warragul	4.8	114.3	2760	C.T.E.	API 5L Grade B	6.02	6.02
101	T74	Melbourne-Wodonga-Shepparton	Wollert to Euroa PRS	124.2	323.9	8800	P.E.	API 5L Grade X46	6.35	7.55
101	T74	Melbourne-Wodonga-Shepparton	Euroa PRS to Wodonga	145.2	323.9	7400	P.E.	API 5L Grade X46	6.35	7.55
101	T74	Melbourne-Wodonga-Shepparton	Keon Park to Wollert	14.1	610.0	2760	P.E.	API 5L Grade X42	7.92	7.92
101	T59	Melbourne-Wodonga-Shepparton	Euroa to Shepparton	34.5	219.1	7400	P.E.	API 5L Grade X42	5.59	5.59
107	T32	Clyde North	Pound Rd. to Tuckers Rd.	2.0	114.3	2760	P.E.	API 5L Grade B	6.02	6.02
108	T33	South Melbourne to Brooklyn	South Melbourne to Brooklyn	12.8	762.0	2760	C.T.E.	API 5L Grade X42	9.52	9.52
117	T60	Rosedale to Tyers	Rosedale to Tyers	34.3	762.0	7070	C.T.E.	API 5L Grade X60	10.9	13.1
120	T60	Longford to Rosedale	Longford to Rosedale	30.5	762.0	7070	C.T.E.	API 5L Grade X60	10.9	13.1
121	T63	Tyers to Morwell	Tyers to Morwell	15.7	508.0	7070	C.T.E.	API 5L Grade X60	8.72	10.59
122	T62	Derrimut to Sunbury	Derrimut to Sunbury	24.0	168.3	7390	P.E.	API 5L Grade B	6.35	6.35
122	T118	Truganina to Plumpton	Truganina to Plumpton	8.4	508	10,200	FBE	API 5L Grade X70	7.9	11.1
124	T64	Newport	Newport Power Station	1.0	457.0	2760	P.E.	API 5L Grade X42	7.90	9.70
125	T67	Maryborough	Guildford to Maryborough	31.4	168.3	7390	P.E.	API 5L Grade B	6.35	6.35
128	T66	Mt Franklin to Kyneton	Mt Franklin to Kyneton	24.5	323.9	7390	P.E.	API 5L Grade X46	6.35	7.55
129	T65	Dandenong to Princes Hwy	Dandenong to Princes Hwy	5.0	762.0	2760	C.T.E.	API 5L Grade X42	9.52	9.52
129	T65	Dandenong to Princes Hwy	Princes Hwy to Henty St	0.2	508.0	2760	P.E.	API 5L Grade B	7.92	7.92

Pipeline Licence No.	DWG No.	Licence Name	Line Name	Recorded Length (km)	Pipe Dia. O.D. (mm)	MAOP (kPa(g))	Coating	Steel Grade	Wall Thickness Min Max
131	T70	Mt Franklin to Bendigo	Mt Franklin to Bendigo	50.8	323.9	7390	P.E.	API 5L Grade X46	6.35 7.55
132	T71	Tatura	Shepparton to Tatura	16.2	219.1	7390	P.E.	API 5L Grade B	6.35 7.00
134	T57	Ballan to Ballarat	Ballan to Ballarat	22.8	323.9	7390	P.E.	API 5L Grade X46	6.35 7.6
135	T60	Bunyip to Pakenham	Bunyip to Pakenham	18.7	762.0	7070	C.T.E.	API 5L Grade X60	10.9 13.1
136	T71	Tatura to Kyabram	Tatura to Kyabram	21.3	219.1	7390	P.E.	API 5L Grade B	6.35 7.00
141	T61	Pakenham to Wollert	Pakenham to Wollert	93.1	762.0	6890	C.T.E.	API 5L Grade X60	10.6 12.7
143	T75	Wandong to Kyneton	Wandong to Kyneton	59.5	323.9	7390	P.E.	API 5L Grade X46	6.35 7.60
145	T81	Paaratte to Allansford	Western Transmission Pipeline (part)	33.3	168.3	7,400	P.E.	API 5L Grade B	4.80 6.35
152	T85	Kyabram to Echuca	Kyabram to Echuca	30.7	168.3	7390	P.E.	API 5L Grade B	4.80 6.35
155	T86	Allansford to Portland	Western Transmission Pipeline (part)	100.4	168.3	9,890	P.E.	API 5L Grade X42	4.80 6.35
162	T88	Laverton to BHP	Laverton to BHP	1.6	168.3	2760	P.E.	API 5L Grade X42	6.35 6.35
164	T89	Bay St to Unichema	Bay St to Unichema	0.4	168.3	2760	P.E.	API 5L Grade X42	6.35 6.35
168	T91	Curdievale to Cobden	Western Transmission Pipeline (part)	27.7	168.3	9,890	P.E.	API 5L Grade X42	4.8 6.35
171	T93	Codrington to Hamilton	Western Transmission Pipeline (part)	54.6	168.3	9,890	P.E.	API 5L Grade X42	4.8 6.35
176	T96	Chiltern to Rutherglen	Chiltern to Koonoomoo (part)	14.7	219.1	7400	P.E.	API 5L Grade X60	4.00 4.80
178	T99	Barnawartha Nth to Murray River	Barnawartha Nth to Culcairn (part)	5.5	457.0	10200	P.E.	API 5L Grade X70	6.80 9.70
NSW 24	T99	Murray River to Culcairn	Barnawartha Nth to Culcairn (part)	57.0	457.0	10200	P.E.	API 5L Grade X70	6.80 9.70

Pipeline Licence No.	DWG No.	Licence Name	Line Name	Recorded Length (km)	Pipe Dia. O.D. (mm)	MAOP (kPa(g))	Coating	Steel Grade	Wall Thickness		
									Min	Max	
182	T98	Rutherglen to Koonoomoo	Chiltern to Koonoomoo (part)	88.8	219.1	7400	P.E.	API 5L Grade X52 API 5L Grade X42	4.32 8.20	5.20 8.20	
202	T18	Dandenong to West Melbourne	Keon Park East - Keon Park West	0.6	457.0	2760	C.T.E.	API 5L Grade A	7.92	7.92	
231	T92	Iona to Lara	Iona to Lara	143.9	508	10,000	FBE	API 5L Grade X60 & X70	9.00	12.70	
227	T100	Iona to Paaratte North	Iona to Paaratte	7.8	168.3	7,400	P.E. and Heatshrink sleeves	API 5L Grade X52	5.5	7.11	
238	T102	Somerton Pipeline	Epping to Somerton	3.4	250	2,760	P.E.	API 5L Grade X42	6.40	6.40	
252	T109	Supply to Iluka Resources, Hamilton	Supply to Iluka Resources, Hamilton	1.1	114.3	9,890	P.E.	API 5L Grade B	6.00	8.60	
253	T110	Supply to Snowy Hydro Plant, Laverton North	Supply to Snowy Hydro Plant, Laverton North	1.6	355.6	10,200	Trilaminare	API 5L Grade X56	9.50	9.50	
266	T112	Brooklyn to Lara	Brooklyn to Lara	58.0	508	10,200	FBE	API 5L Grade X70	9.00	12.70	
Total Length (km)				2002.6							

Note: Morwell to Dandenong (Lic 50), Murray Valley (Lic 176 & 182) and Interconnect (Lic 178 & NSW 24) pipelines are internally unlined. All others are internally epoxy lined.

Service Envelope Agreement

Appendix 6 – Regulator Capacity Table

CONTENT

P10-002	Barnawartha City Gate
P10-005	Brooklyn BBP PRS
P8-028	Brooklyn BCP CG
P10-004	Brooklyn BLP CG
P8-004	Dandenong CG
P8-007	Dandenong PL (DTS to Lurgi backup)
P10-007	Euroa PRS
P10-003	Iona CG
P10-001	Lara CG
P8-013	Morwell CG
P8-027	Nth Laverton CG
P10-008	Plumpton PRS
P9-003	Tyers PL
P10-006	Wandong PRS
P8-016	Wollert CG
P9-012	Wollert Pressure Limiter

REGULATOR LOCATION

Regulator no	P10-02	Regulator Name	Barnawartha City Gate & Offtake Station
Location	Barnawartha - Howlong Road		
Suburb	Barnawartha	Melway	Vic Roads 315

DESIGN PARAMETERS

Design Inlet Pressure Range (kPa(g))	7,400 - 10,000
Design Outlet Pressure (kPa(g))	7,400
Outlet MAOP (kPa(g))	7,400
Design Capacity per run (scm/h)	60,000
Station Design Capacity (scm/h)	60,000
Number of "Standby" runs	1
Number of "Duty" runs	1

REGULATOR SET POINTS

Runs 1 & 2 Active set point	Adjustable up to 7,250 kPa(g)
Runs 1 & 2 Monitor set point	Fixed at 7,620 kPa(g)

SLAMSHUT CONTROL SET POINTS

Runs 1 & 2 Slamshut Valve Closes at low pressures of (kPa(g))	1,000
Runs 1 & 2 Slamshut Valve Closes at high pressures of (kPa(g))	8,065
Once tripped Slamshut valves are automatically reset for remote operation below a pressure of (kPa(g))	6,955
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C _g	C ₁
1 & 2	Active / Monitor	100mm	Fisher ET/657	6,050	35.8

REGULATOR LOCATION

Regulator no	P10-05	Regulator Name	Brooklyn BBP PRS
Location	Jones Road		
Suburb	Brooklyn	Melway	40 H10
		Vic Roads	N/A

DESIGN PARAMETERS

Design Inlet Pressure (kPa(g))	5,000 - 10,200
Design Outlet Pressure (kPa(g))	2,500 -4,500
Outlet MAOP (kPa(g))	7,390
Design Capacity per run (scm/h)	45,700
Station Design Capacity (scm/h)	30,000
Number of "Standby" runs	1
Number of "Duty" runs	1

REGULATOR SET POINTS

Runs 1 & 2 Active set point	Adjustable between
One set point for split range type control for all runs	2,500 -7,240 kPa(g)

SLAMSHUT CONTROL SET POINTS

Not Available	
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C _r	C ₁
1 & 2	Active	80	Fisher ED 3 W1, 657 SZ 40	3,700	38.1

REGULATOR LOCATION

Regulator no	P8-28	Regulator Name	Brooklyn BCP City Gate
Location	Jones Road		
Suburb	Brooklyn	Melway	40 H10
		Vic Roads	N/A

DESIGN PARAMETERS

Design Inlet Pressure Range (kPa(g))	3,000 - 7,390
Design Outlet Pressure Range (kPa(g))	2,000 - 2,760
Outlet MAOP (kPa(g))	2760
Design Capacity for run 1 (scm/h)	41,000
Design Capacity for runs 2,3, & 4 (scm/h)	118,000
Design Capacity for run 5 (scmh)	118,000
Station Design Capacity (scmh)	400,000
Number of "Standby" runs	1
Number of "Duty" runs	4

REGULATOR SET POINTS

Runs 1-5 Active set point pressure (kPa(g)) between	Adjustable
One set point for the split range type control being used on all the runs	2,000 & 2,760
Runs 1-4 Monitor set point pressure (kPa(g))	2898

SLAMSHUT CONTROL SET POINTS FOR ALL RUNS

Runs 1-5 Slamshut Valve Closes at low pressures of (kPa(g))	1,000
Runs 1-5 Slamshut Valve Closes at high pressures of (kPa(g))	2,925
Slamshut valves can be reset for remote operation at (kPa(g))	2,595
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C_r	C₁
1	Active / Monitor	200	Fisher EWD 8x6 W3, 471-16 SZ 60	10,400	29.8
2,3 & 4	Active / Monitor	300	Fisher EWD 12x8 W1, 657-4 SZ 70	31,900	31.9
5	Active	300	Mascot G-FLO 8x5	16,730	34.6

REGULATOR LOCATION

Regulator no	P10-04	Regulator Name	Brooklyn BLP City Gate
Location	Jones Road		
Suburb	Brooklyn	Melway	40 H10 Vic Roads N/A

DESIGN PARAMETERS

Design Inlet Pressure Range (kPa(g))	4500 - 10,200
Design Outlet Pressure Range (kPa(g))	2500 - 7,390
Outlet MAOP (kPa(g))	7390
Design Capacity for run 1 (scm/h)	40,000
Design Capacity for runs 2,3,4 & 5 (scm/h per run)	115,000
Station Design Capacity (scm/h)	400,000
Number of "Standby" runs	1
Number of "Duty" runs	4

REGULATOR SET POINTS

Runs 1-5 Active set point pressures	Adjustable between 2500 -
One set point for cascade type control for all runs.	7390 kPag

SLAMSHUT CONTROL SET POINTS FOR ALL RUNS

Slamshut Valve Closes at low pressures of (kPa(g))	1,000
Slamshut Valve Closes at high pressures of (kPa(g))	7,833
Slamshut Valves can be reset for remote operation at (kPa(g))	6,947
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C₂	C₁
1	Active	200	Mascot G-FLO, 6x4	6,493	35.1
2-5	Active	300	Mascot MEGAFLO, 8x5	17,087	34.2

REGULATOR LOCATION

Regulator no	P8-004A	Regulator Name	Dandenong City Gate (R1 & R2)
	P8-004C		(R3 & R4)
	P8-004E		(R5 & R6)
	P8-004G		(R7)
Location	Frankston Road		
Suburb	Dandenong	Melway	95 D4 Vic Roads

DESIGN PARAMETERS

Minimum Inlet Pressure (kPa(g))	3000
Minimum Outlet Pressure (kPa(g))	2700
Outlet MAOP (kPa(g))	2760
Design Capacity per run (scm/h)	177 x 10 ³
Total Station Capacity (scm/h) (At minimum inlet pressure)	1.062 x 10 ⁶
Number of "Standby" runs	1
Number of "Duty" runs	6

REGULATOR SET POINTS

Runs 1,3,4 Active set point	2760
Runs 2, 5, 7 Active set point	2760
Runs 1-7 Monitor (pneumatic) set point	2800
<i>Note: All runs have identical set points</i>	
<i>Set point shall not be changed without prior consultation with APA GasNet</i>	

SLAMSHUT CONTROL SET POINTS

Runs 1-7 Slamshut Close (kPa(g))	2900
Runs 1-7 Slamshut Open (kPa(g))	Manual Reset
Slamshut Valves can be reset for remote operation at (kPag)	
<i>Note: All seven runs have identical set points</i>	
Remote Set point Capability (Y/N)	N

REGULATOR DETAILS

LEG	MODE	SIZE	TYPE	C _R	C ₁
R1	Monitor	200	V25 Hiball	37,300	16
	Active	200	Jetstream J8-60 100%	23,390	16.4
(Note: All runs have identical regulators)					

REGULATOR LOCATION

Regulator no	P8-007	Regulator Name	Dandenong Pressure Limiter (DTS to Lurgi backup regs)
Location	Greens Road		
Suburb	Dandenong	Melway	95 C3 Vic Roads

DESIGN PARAMETERS

Minimum Inlet Pressure (kPa(g))	2700
Minimum Outlet Pressure (kPa(g))	1400
Outlet MAOP (kPa(g))	2760
Design Capacity per run (scm/h)	85,500
Total Station Capacity (scm/h) (At minimum inlet pressure)	85,500
Number of "Standby" runs	1
Number of "Duty" runs	1

REGULATOR SET POINTS

Runs 1-2 Active set point	1700
Runs 1-2 (pneumatic backup) set point	1700

Note: Set point shall not be changed without prior consultation with APA GasNet

SLAMSHUT CONTROL SET POINTS

Run 1 Slamshut Close (kPa(g))	None
Run 1 Slamshut Open (kPa(g))	None
Run 2 Slamshut Close (kPa(g))	None
Run 2 Slamshut Open (kPa(g))	None
Remote Set point Capability (Y/N)	N

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C _g	C ₁
1&2	Active	150	Valtek Megastream 100%	7,500	34.4

REGULATOR LOCATION

Regulator no	P10-07	Regulator Name	Euroa PRS
Location	Shepparton Road		
Suburb	Euroa	Melway	510 R3 Vic Roads 47 A5

DESIGN PARAMETERS

Design Inlet Pressure Range (kPa(g))	4,000 – 8,800
Design Outlet Pressure Range (kPa(g))	3,885 - 7,400
Outlet (North) MAOP (kPa(g))	7,400
Design Capacity per run (scm/h)	138,000
Station Design Capacity (scm/h)	138,000
Number of “Standby” runs	0
Number of “Duty” runs	1

REGULATOR SET POINTS

Run 1 Active set point (kPa(g))	Fixed at 7,400
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SLAMSHUT CONTROL SET POINTS

Run 1 Slamshut Close (kPa(g))	1,000 dec
Run 1 Slamshut Close (kPa(g))	7,830 inc
Once tripped Slamshut valves are automatically reset for remote operation below a pressure of (kPa(g))	7,400
Remote Set point Capability (Y/N)	N

REGULATOR DETAILS

LEG	MODE	SIZE	TYPE	C _R	C _I
1	Active	250	Valtek Mega Stream Mark 1	25,477	34.9

REGULATOR LOCATION

Regulator no	P10-03	Regulator Name	Iona City Gate
Location	Waarre Road		
Suburb	Iona	Melway	Vic Roads 100 B3

DESIGN PARAMETERS

Minimum Design Inlet Pressure (kPa(g))	6,000
Design Outlet Pressure (kPa(g))	Adjustable between 5,000 - 7,400
Outlet MAOP (kPa(g))	10,200
Design Capacity for run 1 (scm/h)	20,000
Design Capacity for run 2 (scm/h)	64,000
Station Design Capacity (scm/h)	20,000
Number of "Standby" runs	1
Number of "Duty" runs	1

REGULATOR SET POINTS

Runs 1 & 2 Active set point	Adjustable between 5,000 to 7,400 kPa(g)
Runs 1 & 2 Monitor set point	Fixed at 7,696 kPa(g)
One set point for the split range type control being used on all the runs	

SLAMSHUT CONTROL SET POINTS FOR ALL RUNS

Run 1 Slamshut Close (kPa(g))	1,000
Run 2 Slamshut Close (kPa(g))	7,844
Slamshut Valves can be reset for remote operation at (kPa(g))	
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C _g	C ₁
1	Active / Monitor	100mm	Fisher ED 4 600RF, 657 SZ 50	2,050	30
2	Active / Monitor	150mm	Fisher ED 6 W1 600RF, 657 SZ 50	11,000	32.5

OTHER OPERATIONAL LIMITATIONS

1	The 300mm station by-pass valve differential pressure limit on opening shall be less than 200 kPa.
2	Pressure control valve set point limits between 3002 kPa(g) and 5600 kPa(g).
3	Deadband of the pressure set point is about 1% of the set point pressure.

REGULATOR LOCATION

Regulator no	P10-01	Regulator Name	Lara SWP City Gate
Location	Hovells Creek Reserve		
Suburb	Lara	Melway	93 H2
		Vic Roads	221 D10

DESIGN PARAMETERS

Design Inlet Pressure Range (kPa(g))	4500 - 10,000
Design Outlet Pressure Range (kPa(g))	2500 - 7,390
Outlet MAOP (kPa(g))	7390
Design Capacity for run 1 (scm/h)	53,000
Design Capacity for runs 2,3,4 & 5 (SCHM per run)	133,000
Station Design Capacity (scm/h)	400,000
Number of "Standby" runs	1
Number of "Duty" runs	4

REGULATOR SET POINTS

Runs 1-5 Active set point pressures	Adjustable between 2500 -
One set point for cascade type control for all runs.	7390 kPa(g)
Runs 1-5 Monitor set point pressures	Variable between 2500 -
Variable and constantly tracking set point pressures of the active regulators	7686 kPa(g)

SLAMSHUT CONTROL SET POINTS FOR ALL LEGS

Slamshut Valve Closes at low pressures of (kPa(g))	1,000
Slamshut Valve Closes at high pressures of (kPa(g))	7,833
Slamshut Valves can be reset for remote operation at (kPa(g))	6,947
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C _g	C ₁
1	Monitor	200	Fisher EWD 8x6 W3, 471-16 SZ 60	10,400	29.8
1	Active	200	Valtek Megastream 8x3.5	10,599	34.6
2 to 5	Monitor	300	Fisher EWD 12x8 W1, 657-4 SZ 70	31,900	31.9
2 to 5	Active	300	Fisher EWD 12x8 W1, 657-4 SZ 70	31,900	31.9

REGULATOR LOCATIONRegulator no **P8-013** Regulator Name **Morwell City Gate**Location **Fifth Ave. (Gafcor Road)**Suburb **Morwell** Melway Vic Roads**DESIGN PARAMETERS**

Minimum Inlet Pressure (kPa(g))	3500
Minimum Outlet Pressure (kPa(g))	2700
Outlet MAOP (kPa(g))	2760
Design Capacity Run 1	300 x 10 ³
Run 2	300 x 10 ³
Total Station Capacity (scm/h) (At minimum inlet pressure)	300 x 10 ³
Number of "Standby" runs	1
Number of "Duty" runs	1

REGULATOR SET POINTS

Run 1 Active set point	2760
Run 1 Active (pneumatic backup) set point	2700
Run 1 Monitor (pneumatic) set point	2800
Run 2 Active (pneumatic backup) set point	2700
Run 2 Monitor(pneumatic backup) set point	2850

SLAMSHUT CONTROL SET POINTS

Run 1 Slamshut Close (kPa(g))	2900 inc
Run 1 Slamshut Close (kPa(g))	1000 dec
Run 2 Slamshut Close (kPa(g))	2950 inc
Run 2 Slamshut Close (kPa(g))	1000 dec
Slamshut Valves can be reset for remote operation at (kPa(g))	
Remote Set point Capability (Y/N)	N

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C _R	C _I
Run 1	Active	300	Fisher EWD WIII A3	28780	34.1
Run 1	Monitor	300	Fisher EWD WI	32099	32.1
Run 2	Active	300	Fisher EWD WIII A3	28780	34.1
Run 2	Monitor	300	Fisher EWD WI	32099	32.1

REGULATOR LOCATION

Regulator no	P8-027	Regulator Name	North Laverton City Gate (Fitzgerald Rd TP)
Location	Fitzgerald Road		
Suburb	Laverton	Melway	53 G2 Vic Roads

DESIGN PARAMETERS

Minimum Inlet Pressure (kPa(g))	2300
Minimum Outlet Pressure (kPa(g))	1900
Outlet MAOP (kPa(g))	2760
Design Capacity per run (scm/h)	11.7 x 10 ³
Total Station Capacity (scm/h) (At minimum inlet pressure)	11.7 x 10 ³
Number of "Standby" runs	1
Number of "Duty" runs	1

REGULATOR SET POINTS

Run 1 Active set point	2500
Run 1 Monitor set point	2650
Run 2 Active set point	2400
Run 2 Monitor set point	2650

SLAMSHUT CONTROL SET POINTS

Run 1 Slamshut Close, PSHH (kPa(g))	2850
Run 1 Slamshut Close, PSL (kPa(g))	1000
Run 2 Slamshut Close, PSHH (kPa(g))	2900
Run 2 Slamshut Close, PSL (kPa(g))	1000
Note: SSV cannot be re-opened remotely	
Remote Set point Capability (Y/N)	N

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C _r	C ₁
1,2	Monitor	80	Gortor R285	2346	34
1,2	Active	80	Gortor R100-SO	2800	34

(Note: All runs have identical regulators)

REGULATOR LOCATION

Regulator no	P10-008	Regulator Name	Plumpton PRS
Location	Taylor's Road		
Suburb	Plumpton	Melway	Vic Roads

DESIGN PARAMETERS

Minimum Inlet Pressure (kPag)	4500
Minimum Outlet Pressure (kPag)	4300
Outlet MAOP (kPa)	7390
Design Capacity per run (SCMH)	60 x 10 ³
Total Station Capacity (SCMH) (At minimum inlet pressure)	60 x 10 ³
Number of "Standby" runs	1
Number of "Duty" runs	1

REGULATOR SET POINTS

Run1 Active set point	7000
Run1 Monitor set point	7200
Run2 Active set point	6800
Run2 Monitor set point	7200

Note: Set point is fixed

SLAM SHUT CONTROL SET POINTS

Run1 Slam shut Close (kPag)	8000
Run2 Slam shut Close (kPag)	8050

Note: Slamshut can only be re-opened locally

Remote Set point Capability (Y/N)	N
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REGULATOR DETAILS

LEG	MODE	SIZE	TYPE	C _g	C ₁
1	Active	150	Gortor R100-SO	10100	34
1	Monitor	150	Gortor R100-M	10100	34
2	Active	150	Gortor R100-SO	10100	34
2	Monitor	150	Gortor R100M	10100	34

REGULATOR LOCATION

Regulator no	P9-003	Regulator Name	Tyers Pressure Limiter
Location	Tyers-Glengarry Road		
Suburb	Tyers	Melway	Vic Roads 98 J4

DESIGN PARAMETERS

Minimum Inlet Pressure (kPa(g))	4650
Maximum Outlet Pressure (kPa(g))	4460
Minimum Outlet Pressure (kPa(g))	3600
Outlet MAOP (kPa(g))	7070
Design Capacity per run (scm/h)	300 x 10 ³
Total Station Capacity (scm/h) (At minimum inlet pressure)	300 x 10 ³
Number of "Standby" runs	0
Number of "Duty" runs	1

Note: Bypass valve may be remotely opened and remotely closed

REGULATOR SET POINTS

Run 1 Active regulator set point	4400
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Note: Set point shall not be changed without prior consultation with APA GasNet

SLAMSHUT CONTROL SET POINTS

Run 1 Slamshut Close (kPa(g))	None
Run 1 Slamshut Open (kPa(g))	None
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C_g	C₁
1	Active	300	Fisher EUT WIII	47,273	36.9

(Note: All runs have identical regulators)

REGULATOR LOCATION

Regulator no	P10-06	Regulator Name	Wandong PRS
Location	Scanlons Road		
Suburb	Wandong	Melway	510 M10 Vic Roads 61 B7

DESIGN PARAMETERS

Design Inlet Pressure Range (kPag)	3,700 - 8,800
Design Outlet Pressure Range (kPa(g))	3,500 - 7,390
Outlet MAOP (kPa)	7,390
Design Capacity per run (scm/h)	60,000
Station Design Capacity (scm/h)	60,000
Number of "Standby" runs	1
Number of "Duty" runs	1

REGULATOR SET POINTS

Runs 1 & 2 Active set point (kPag)	Variable between 3,500 - 7,390
Runs 1-2 (pneumatic backup) set point (kPag)	6500

SLAMSHUT CONTROL SET POINTS

Run 1 Slamshut Close (kPag)	8065 inc
Run 1 Slamshut Close (kPag)	1000 dec
Run 2 Slamshut Close (kPag)	8065 inc
Run 2 Slamshut Close (kPag)	1000 dec
Slamshut Valves can be reset for remote operation at (kPag)	6,955
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C _g	C ₁
1 & 2	Active	150mm	Fisher ET W1 657	8,383	25.8

(Note: All runs have identical regulators)

REGULATOR LOCATIONRegulator no **P8-016** Regulator Name **Wollert City Gate**Location **Summerhill Road**Suburb **Wollert** Melway Vic Roads: 79 A3**DESIGN PARAMETERS**

Minimum Inlet Pressure (kPa(g))	3000
Minimum Outlet Pressure (kPa(g))	2700
Outlet MAOP (kPa(g))	2760
Design Capacity per run (scm/h)	183 x 10 ³
Total Station Capacity (scm/h) (At minimum inlet pressure)	549 x 10 ³
Number of "Standby" runs	1
Number of "Duty" runs	3

REGULATOR SET POINTS

Active set point	2760
Pneumatic backup set point	2400
<i>Note: All runs have identical set points</i>	
<i>Set point shall not be changed without prior consultation with APA GasNet</i>	
Outlet Pressure Set-point Range (Normal Operation)	2000 - 2760 kPa(g)

SLAMSHUT CONTROL SET POINTS

Slamshut Close (kPa(g))	2925
Slamshut Open (kPa(g))	2765
<i>Note: All four runs have identical set points</i>	
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

RUN	MODE	SIZE	TYPE	C _g	C ₁
1 to 4	Active	250	Mascot MEGAFLO	32,498	33.47
(Note: All runs have identical regulators)					

REGULATOR LOCATION

Regulator no	P9-12	Regulator Name	Wollert Pressure Limiter
Location	Summerhill Road		
Suburb	Wollert	Melway	Vic Roads 78 H3

DESIGN PARAMETERS

Design Inlet Pressure Range (kPa(g))	Adjustable between 3,200 & 6,890
Design Outlet Pressure Range (kPa(g))	Adjustable between 3,000 & 5,000
Outlet MAOP (kPa(g))	6,890
Design Capacity per run (scm/h)	150,000
Station Capacity (scm/h)	150,000
Number of "Standby" runs	1
Number of "Duty" runs	1

REGULATOR SET POINTS

Runs 1 & 2 Active set point	Variable between 3,000 to 6,890 kPa(g)
<i>Note: Set point shall not be changed without prior consultation with APA GasNet</i>	

SLAMSHUT CONTROL SET POINTS

Not Available	
Remote Set point Capability (Y/N)	Y

REGULATOR DETAILS

LEG	MODE	SIZE	TYPE	C _g	C ₁
1 & 2	Active	200mm	Fisher ET 8x6 W1 657	21,300	35.0

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Appendix 7 – Compressors Operational Data

Brooklyn - Melbourne to Geelong or Ballarat pipeline compression modes are,

Mode	Available Power	Compressors Required
Mode G1	0 to 500 kW	No compression required
Mode G2	500 to 900 kW	Any Saturn (8,9)
Mode G3	1000 to 1800 kW	Any 2 Saturns (8,9)
Mode G4	1400 to 2850 kW	Centaur 11 in parallel internally
Mode G5	1400 to 3750 kW	Centaur 11 in series internally or Centaur 12
Mode G6	1900 to 3750 kW	Centaur 11 in parallel internally and any Saturn (8,9)
Mode G7	2400 to 4650 kW	Centaur 11 in parallel internally and 2 Saturns (8,9)
Mode G8	2800 to 5700 kW	Centaur 12 and 11 in series internally

Which is to be reflected in the BCS418 BCS Automation Functional Specifications look up table as follows:

KW* / / kPa(g)**	<500 kW	>500 <900	>900 <1800	>1800 <2850	>2850 <3750	>3750 <4650	<5700
<7000 kPa(g)	G1	G1	G1	G5	G8	G8	G8
<6500	G1	G1	G1	G5	G8	G8	G8
<5500	G1	G1	G1	G5	G8	G8	G8
<4500	G1	G2	G3	G4	G6	G7	G8
<3500	G1	G2	G3	G4	G6	G7	G8
<2700	G1	G2	G3	G4	G6	G7	G8

* 4 hour averaged pipeline power set point

** Actual pipeline pressure

*** Assuming suction inlet pressure greater than 2100 kPa(g).

Brooklyn – Melbourne or Geelong to Ballarat pipeline compression modes are,

Mode	Available Power	Compressors Required
Mode B1	0 to 500 kW	No compression required, cross-over valve open or closed
Mode B2	500 to 900 kW	Any Saturn (8,9), cross-over valve closed, suction from Geelong
Mode B3	500 to 900 kW	Any Saturn (8,9), cross-over valve closed, suction from Melbourne
Mode B4	900 to 2850 kW	Any Centaur (11,12), crossover valve closed.

Which is to be reflected in the BCS418 BCS Automation Functional Specifications look up table as follows:

KW* / / kPa(g)**	<500 kW	>500 <900	>500 <900	>900 <2850
<7000 kPa(g)	B1	B2	B1	N/A
<6500	B1	B2	B1	N/A
<5500	B1	B2	B1	N/A
<4500	B1	B2	B3	N/A
<3500	B1	B2	B3	N/A
<2700	B1	B2	B3	B4

* 4 hour averaged pipeline power set point

** Actual pipeline pressure

Mode	Gooding	Brooklyn	Springhurst	Euroa	Wollert	Iona
Station Control						
Station ESD	Y	Y	Y	Y	Y	Y
Compressor Start	Y	Y	Y	Y	Y	Y
Compressor Stop	Y	Y	Y	Y	Y	Y
Compressor Vent	Y	Y,N	Y	Y	Y	N
Compressor Reset	Y	Y	Y	Y	Y	Y
Process Control						
Engine speed	S	S	N	N	N	S
Outlet Pressure	S	S	Y	Y	Y	S
Inlet Pressure	S	Y	Y	Y	Y	S
Outlet Temperature	N	N	N	N	N	N
Engine Power	N	N	N	N	N	N
Inlet Flow	N	N	Y	Y	Y	N
Design Parameters						
Min Inlet Pressure (kPa(g))	3500	1800	2300	3200	3000	3800
Max Outlet Pressure (kPa(g))	6890	7390	7400	7400	8800	7400
Outlet MAOP (kPa(g))	6890	7390	7400	7400	8800	7400
Min Inlet Temp (degC)	-10	-10	-10	-10	-10	-10
Max Outlet Temp (degC)	45	45	45	45	45	45
Seal system	Wet	Dry/Wet	Dry	Dry	Dry	Wet
Number of "standby" units	1 x C40	Nil	Nil	Nil	Nil	1 x R
Number of "duty" units	3 x C40	2 x C40, 2 x S10	1 x C50	1 x C50	2 x C50	1 x R
Station Design Limits						
Max Outlet Pressure (kPa(g))	6890	7390	7400	7400	8800	7400
Max Outlet Temp (degC)	50	50	50	50	50	55
Alarms						
Refer to relevant Cause & Effects Diagrams and P&IDs						

Legend:

Process Control	Engines
S = 24 hourly schedule of set points	S10 = Saturn turbine engine (T1202 or T1302)
Y = Control available to AEMO	C40 = Centaur turbine engine (T4002 or T4702)
N = Control not available to AEMO	C50 = Centaur turbine engine (T6102)
	R = Caterpillar reciprocating engine

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Appendix 8 – Regulators Drawing Index

The asset reference number, a Key Plan drawing number, and relevant P&IDs are identified below.

ASSET TITLE	Reference Number	Key Plan Drawing No.	Site Layout Drawing No.	Assembly Drawing No.	P&ID Drawing No.
Tyers Pressure Limiter Glengarry Road	P9-3	A4 - 363 - 1	P9-3-24	2130-MB-001 2130-MB-002	2130-PB-001 2130-PB-002
Morwell City Gate Porters Road	P8-13	A4 - 363 - 1	N3-076-6	4205-MA-001 4205-MB-001	4205-PB-001 4205-PB-002 4205-PB-003 4205-PB-004 4205-PB-005
Dandenong City Gate Frankston-Dandenong Road	Q31-3	A4 - 363 - 1 A4 - 363 - 2	Q31-3-29 Q31-3-36	Q31-3-5 Q31-3-22 Q31-3-26 Q31-3-27 Q31-3-40 Q31-3-41 Q31-3-42	3221-PB-001 3221-PB-002 3221-PB-003 3221-PB-004 3221-PB-005 3221-PB-006 3221-PB-007
Wollert City Gate and Pressure Limiter Summerhill Road	P8-16 P9-12	A3-363-1 A3-363-5	1321-MA-001 L1-37-25 L1-37-48	1321-MB-002 1321-MB-003 1321-MG-009 1321-MG-012 1321-MJ-001 1321-MJ-002	1321-PB-001 1321-PB-002 1321-PB-003 1321-PB-004 1321-PB-005 1321-PB-006 1321-PB-007 1321-PB-008 1321-PB-009 1321-PB-010 1321-PB-011 1321-PB-012 1321-PB-013 1321-PB-014
Laverton North City Gate Fitzgerald Road	P8-27	A4 - 363 - 3	L1-49-1 L1-49-4 N3-028-6	4510-MB-001	4510-PB-001 4510-PB-002 4510-PB-003 4510-PB-004 4510-PB-005
Dandenong Pressure Limiter, Greens Road (Morwell Backup Regulators)	P8-7	A4 - 363 - 1 A4 - 363 - 2	N3-005-2 N3-005-5 N3-005-26	P8-7-1	3241-PB-001
Lara SWP City Gate Princes Freeway, Lara	P10-01	A4 - 363 - 3	2631-MA-001	2631-MB-001 2631-MB-002 2631-MB-003 2631-MB-004 2631-MB-005	2631-PB-001 2631-PB-002 2631-PB-003 2631-PB-004
Brooklyn (BCP) City Gate Jones Road	P8-28	A4 - 363 - 3	1221-MA-001		1221-PB-001 1221-PB-002 1221-PB-003 1221-PB-004 1221-PB-005 1221-PB-006 1221-PB-007 1221-PB-008

ASSET TITLE	Reference Number	Key Plan Drawing No.	Site Layout Drawing No.	Assembly Drawing No.	P&ID Drawing No.
Brooklyn (BLP)City Gate Jones Road	P10-04	A4 - 363 - 3	1221-MA-001		1222-PB-001 1222-PB-002 1222-PB-003 1222-PB-004 1222-PB-005 1222-PB-006 1222-PB-007 1222-PB-008 1222-PB-012 1222-PB-013 1222-PB-014
Brooklyn Pressure Limiter Jones Rd	P9-11	A4-363-3			1223-PB-001 1223-PB-002
Barnawartha City Gate & Offtake Station Barnawartha-Howlong Road	P10-02	A4-363-5	6650-MA-001	6650-MB-002 6650-MB-003 6650-MB-004 6650-MB-009 6650-MB-012	6650-PB-001 6650-PB-002 6650-PB-003 6650-PB-004
Wandong PRS Scanlons Road	P9-13	A4 - 363 - 5	2451-MA-001 2451-MA-012	2451-MB-002 2451-MB-009 2451-MB-013 T75-11-71 T75-11-72	2451-PB-001 2451-PB-002 2451-PB-003
Iona SWP City Gate & WUGS Waarre Rd	P10-03	A4 - 363 - 7	25105-SKP-024	4630-MB-001 4630-MB-002 4630-MB-003 4630-MB-004	4630-PB-001 4630-PB-004 4630-PB-005 4630-PB-006 4630-PB-007 4630-PB-008 4630-PB-011
Euroa Pressure Regulator Station	P10-07	A4 - 363 - 5			1600-PB-001
Plumpton PRS, Taylors Rd, Plumpton.	P10-08	A4 - 363 - 3 A4 - 363 - 4	2650-MA-001	2650-MB-001	2650-PB-001 2650-PB-002

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Appendix 9 – Valves remotely actuated from within AEMO's Operations Centre

Location	Description	Open Control	Close Control	Comment
Ballan Line valve	UV04	Y	Y	High dp interlock on open
	UV08 Bypass	Y	Y	
Barnawartha	UV001 Line valve	Y	Y	
	UV055 Run 1	Y	Y	
	UV060 Run 2	Y	Y	
	UV053 Bypass	Y	Y	
Birregurra SWP	LV03	Y	Y	
Brooklyn Comp Station	CrossOver Valve	Y	Y	Auto sequences using the associated loading valve
Brooklyn BLP CG	UV62011 Inlet	N	Y	
	UV62904 KO drum	Y	Y	
	UV62001 KO bypass	Y	Y	
	UV62151 Run 1	Y	Y	
	UV62251 Run 2	Y	Y	
	UV62351 Run 3	Y	Y	
	UV62451 Run 4	Y	Y	
	UV62551 Run 5	Y	Y	
	UV62753 Bypass	Y	Y	
	UV62005 Htr bypass	Y	Y	
	UV62100 Htr#1	Y	Y	
	UV62200 Htr#2	Y	Y	
	BCP-UV62001 Station outlet	N	Y	
	Brooklyn BCP CG	UV62002 Inlet	N	
UV62055 Run 1		Y	Y	
UV62062 Run 2		Y	Y	
UV62069 Run 3		Y	Y	
UV62076 Run 4		Y	Y	
UV62551 Run 5		Y	Y	
UV62753 Bypass		Y	Y	
UV62054 Htr bypass		Y	Y	
UV62100 Htr#1		Y	Y	
UV62200 Htr#2		Y	Y	
Brooklyn BBP PRS	UV87 Run 1	Y	Y	
	UV90 Run 2	Y	Y	
Clonbinane PL	UV02 Run 1	Y	Y	
	UV03 Run 2	Y	Y	
	UV01 Bypass	Y	Y	
Dandenong CG	Reg 1	Y	Y	
	Reg 2	Y	Y	
	Reg 3	Y	Y	
	Reg 4	Y	Y	
	Reg 5	Y	Y	
	Reg 6	Y	Y	
	Reg 7	Y	Y	
V1101 Station Inlet	Y	Y		

Location	Description	Open Control	Close Control	Comment
Dandenong LNG	V324	N	Y	Valve closes on ESD
	V325	N	Y	Valve closes on ESD
	V477	N	Y	Valve closes on ESD
	V326	N	Y	Valve closes on ESD
Euroa PRS	LV-013A	Y	Y	Closes on high pressure
	LV-013B	Y	Y	Closes on high pressure
	UV13AC	Y	Y	Closes on high pressure
	UV13BC	Y	Y	Closes on high pressure
	UV62001	Y	Y	ESD on high pressure
Gherringhap SWP	LV01	Y	Y	
Iona CG	UV13 Run 1	Y	Y	
	UV31 Run 2	Y	Y	
	UV40 Bypass	Y	Y	
	UV71 TXUGS Branch	N	ESD	Valve closes on ESD
Iona SEAGas	UV04 Branch	N	ESD	Valve closes on ESD
Brooklyn Lara Pipeline	LV01	Y	Y	
	LV02	Y	Y	
	LV03	Y	Y	
	LV04	Y	Y	
Lara SWP	UV13 Run 1	Y	Y	
	UV31 Run 2	Y	Y	
	UV40 Run 3	Y	Y	
	UV49 Run 4	Y	Y	
	UV58 Run 5	Y	Y	
	UV09 Bypass	Y	Y	
	UV06 Heater bypass	Y	Y	
Longford	V030 North	Y	Y	
	V031 South	Y	Y	
Mirne SWP	LV02	Y	Y	
Pakenham BassGas	UV08 Branch	N	ESD	Valve closes on ESD
Pakenham LV9	BV932	Y	Y	
	BV931	Y	Y	
	LV901 North	Y	Y	
	LV951 South	Y	Y	
Tyers	Valve BV130 North	Y	Y	
	Valve BV131 South	Y	Y	
Wandong PRS	UV02 Run 1	Y	Y	
	UV04 Run 2	Y	Y	
Wollert CG	V503	-	-	
	-	Y	Y	
	V512 Inlet	-	-	
		Y	Y	
	V102 Run 1 inlet SSV	N	Y	
	V202 Run 2 inlet SSV	N	Y	
	V302 Run 3 inlet SSV	N	Y	
V403 Run 4 inlet SSV	N	Y		
Wollert PL	V2 Bypass	Y	Y	
	V111 Run 1 inlet	Y	Y	
	V112 Run 1 branch	Y	Y	
	V113 Run 2 inlet	Y	Y	
	V114 Run 2 branch	Y	Y	
	V61 Bypass	Y	Y	
Truganina (BLP LV01)	T118-BV01	Y	Y	Permissive to open Interlock < 350 kPa
Rockbank	T56-BV03	N	Y	APA have open control in emergency

Legend

Y = Remote control available to AEMO

N = not available to AEMO

ESD = Remote ESD close available to AEMO (and other affected parties)

