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# 1 OPERATION

### General Overview

Owned and operated by Jemena, EGP (Eastern Gas Pipeline) is a 797-km natural gas pipeline, spanning from Longford in Victoria, to Sydney NSW. EGP main trunkline is a 450-mm diameter (DN450) with the pipeline MAOP (Maximum Allowable Operating Pressure) of 14,895 kPag. EGP has three gas receipt points and thirteen delivery points, tow compressor stations at the beginning of the pipeline at Longford and at the midline at Mila.

## 1.1 GENERAL OPERATING CONDITIONS

### 1.1.1 SITE DESCRIPTIONS AND PRESSURES

**RECEIPT POINTS**
The Jemena Eastern Gas Pipeline currently has three gas receipt points. Two gas receipts; known and Longford and VicHub are located at Longford Compressor Station and the third is located at Orbost. VicHub is a bidirectional system and could be a receipt or delivery point depending on the Victorian gas market activity.

**Longford**

The Longford Compressor Station (KP0.00) is the starting point of the Eastern Gas Pipeline. It is the receipt point for gas from the BHPP/Esso gas processing facility into the Eastern Gas Pipeline.

Facilities include:

- Inlet Filter Separator
- Gas quality measurement equipment
- Gas metering equipment
- Four sets of Solar Taurus turbine and compressor unit
- Coolers
- Odorant Injection System
- Pig Launcher
- Station/Pipeline Isolation Facilities
- SCADA Control & Monitoring System
- Radio and Telephone Communications
- Compressor control room
- Maintenance facility

**VicHub**

VicHub (KP 0.00) is an interconnect facility situated at the Longford Compressor Station, that enables gas to flow bi-directionally between the EGP and the Victorian gas transmission system.

Facilities include:

- Water Bath Heater
- Dual filters
- Dual regulator run
- Gas quality measurement equipment
- Gas metering equipment
- Station/Pipeline Isolation Facilities
- SCADA Control & Monitoring System

### Orbost Meter Station

The Orbost Meter Station (KP146.4) receives gas supply from Santos Patricia Baleen gas processing facility.

Facilities include:

- Pig Launcher/Receiver
- Gas filtration equipment
- Gas quality measurement equipment
- Gas metering equipment
- Gas regulation equipment
- Station/Pipeline Isolation Facilities
- SCADA Control & Monitoring System

## COMPRESSOR STATION

### Longford Compressor Station

The Longford Compressor Station (KP0.00) is a four-unit compressor station located at Longford, Victoria.

Facilities include:

- Inlet Filter Separator
- Gas quality measurement equipment
- Gas metering equipment
- Four sets of Solar Taurus turbine and compressor unit
- Coolers
- Odorant Injection System
- Pig Launcher
- Station/Pipeline Isolation Facilities
- SCADA Control & Monitoring System
- Radio and Telephone Communications
- Compressor control room
- Maintenance facility

### Mila Compressor Station

The Mila Compressor Station (KP289.69) is a single unit midline compressor station located outside the town of Mila, New South Wales. The primary role of Mila Compressor Station is to re-pressurise gas to facilitate gas transportation to the EGP delivery points.

Facilities include:

- Inlet Filter Separator
- Gas measurement equipment
- One Taurus turbine and compressor unit
- Gas Engine Alternator
- Coolers
- Pig Receiver and Launcher
- Station/Pipeline Isolation Facilities
- SCADA Control & Monitoring System
- Radio and Telephone Communications
- Compressor control room
- Maintenance facility

## DELIVERY POINTS

There are currently thirteen delivery point facilities on the Jemena Eastern Gas Pipeline. The delivery points are VicHub, TGP (Tasmanian Gas pipeline), Bairnsdale Meter Station, Bairnsdale City Gate, Cooma, Bombala, Nowra, Bomaderry, Hoskinstown, Tallawarra, Port Kembla, Horsley Park and Smithfield. The facilities at each delivery point are briefly described below:

### VicHub

Please refer above for details on the VicHub facilities.

### TGP

TGP delivery point is located at Longford Compressor Station (KP0.00). It is a supply point to the Tasmanian Gas Pipeline.

Facilities include:

- Single regulator run
- Gas metering equipment
- Station/Pipeline Isolation Facilities
- SCADA Control & Monitoring System

### Bairnsdale Meter Station

The Bairnsdale Meter Station is located at the end of a 2.3 km lateral connected at KP

62.20 on the Eastern Gas Pipeline. It services the Bairnsdale Power Station.

Facilities include:

- Dual Filters
- Dual Coriolis Meter Run
- Dual Water Bath Heater
- Dual Regulator Run
- SCADA Control and Monitoring System

**Bairnsdale City Gate**

The Bairnsdale City Gate is located at the end of a 2.3 km lateral connected at KP 62.20 on the Eastern Gas Pipeline. It services a small reticulation system.

Facilities include:

- Dual Filters
- Dual Coriolis Meter Run
- SCADA Control and Monitoring System

**Bombala**

The Bombala Delivery Point is connected at KP 308.97 and supplies a local reticulation system..

Facilities include:

- Filter
- Coriolis Meter Run
- SCADA Monitoring System

**Cooma**

The Cooma Delivery Point is connected at KP 393.36 and supplies a reticulation system..

Facilities include:

- Filter
- Coriolis Meter Run
- SCADA Monitoring System

**Nowra**

The Nowra Delivery Point is connected at KP 640.12 and supplies the local reticulation system.

Facilities include:

- Filter
- Coriolis Meter Run
- SCADA Monitoring System

**Bomaderry**

The Bomaderry Delivery Point is connected at KP 650.56 and supplies the local reticulation system which consist a mix of domestic, commercial and industrial consumers.

Facilities include:

- Filter
- Ultrasonic Meter Run
- SCADA Monitoring System

**Hoskintown**

The Hoskintown Delivery Point is connected at KP 504.08 and supply reticulation system in Canberra, which consists of a mix of domestic, commercial and industrial consumers.

Facilities include:

- Filter
- Ultrasonic Meter Run
- Water Bath Heater
- SCADA Monitoring System

**Tallawarra**

The Tallawarra Delivery Point is located at the end of a 2.6km a lateral connected at KP 702.18 It supplies the TRUenergy power station.

Facilities include:

- Dual Ultrasonic Meter Runs
- SCADA monitoring system
- Station/Pipeline Isolation facilities
- Pig Launcher Station
- Pig Receive Station

**Port Kembla**

The Port Kembla Delivery Point is located at the end a 7.0km lateral connected at KP 710.52. It supplies the Blue Scope Steel plant and Illawarra gas network.

Facilities include:

- Dual Filters
- Dual Ultrasonic Meter Runs
- Dual Heat Exchangers
- Dual Hot Water Heaters
- Dual Regulator Run
- Gas Quality Measurement equipment
- SCADA monitoring system
- Station/Pipeline Isolation facilities
- Pig Receiver

**Horsley Park**

The Horsley Park Delivery Point is located at the end of the Eastern Gas Pipeline mainline at K.P. 796.6. It supplies the Sydney Gas Network.

Facilities include:

- Dual Filters
- Three Water Bath Heaters
- Dual Ultrasonic Meter Runs (AGL)
- Dual Regulator Runs (AGL)
- Dual Regulator Runs (Smithfield)
- SCADA monitoring system
- Station/Pipeline Isolation facilities
- Pig Receiver (Mainline)
- Pig Launcher (Lateral)

**Smithfield**

The Smithfield Delivery Point is located at the end of the Smithfield Lateral approximately 9.6km downstream of the Horsley Park delivery point. It supplies the Marubeni Power Station.

Facilities include:

- Dual Filters
- Dual Turbine Meter Run
- SCADA monitoring system
- Station/Pipeline Isolation facilities
- Pig Receiver (Located approximately 900m upstream at Smithfield Scraper Station KP 8.78)
- Gas Quality Measurement Equipment
- A buried sales tap is located at KP 9.18 on the Smithfield Lateral

## SCRAPER STATIONS

Launcher/receiver facilities are located at the Longford receipt point and the Horsley Park delivery point and two dedicated intermediate scraper stations at Mila Compressor Station (KP 289.7) and Oallen/Nerriga (KP 562.0). The primary function of the scrapper stations are for the insertion and withdrawal of pipeline pigging facilities.

Facilities at these sites include:

- Pig Launcher/Receiver equipment
- Pipeline Isolation & Blowdown equipment
- Main Line Valve
- SCADA Control & Monitoring
- Cathodic Protection rectifier
- Connections for future Compressor Station (Mila)

**MAIN LINE VALVES (MLVS)**

In addition to the scraper stations there are fifteen MLV's installed on the pipeline. The MLV's are installed to facilitate isolation of sections of the pipeline for operational activities or during gas emergency. The stations at Orbost and Michelago have additional valve setup to facilitate future compressor stations. The stations at, Cooma, Molonglo, and Albion Park have additional valve setup for future sales tap. The stations at Bairnsdale, Nowra and Bomaderry have scale offtakes.

The MLVs are located at the following locations:

| | |
|---|---|
| Bairnsdale | kP 62.3 |
| Orbost | kP 146.3 |
| Cann River | kP 226.0 |
| Cooma | kP 393.4 |
| Michaelago | kP 458.8 |
| Molonglo | kP 497.5 |
| Nowra | kP 640.1 |
| Bomaderry | kP 650.5 |
| Albion Park | kP 691.1 |
| Kembla Grange | kP 710.5 |
| O'Briens Gap | kP 718.3 |
| Appin | kP 750.0 |
| Menangle Park | kP 762.6 |
| Raby Road | kP 774.2 |
| Austral | kP 786.0 |

### 1.1.2 LINE PACK

Jemena owns and maintains sufficient line pack for the safe and efficient operation of pipeline transportation services.

Pipeline pressure, temperature and gas composition values are continually monitored at various locations on the pipeline via the SCADA system and some are used in the line pack calculation software.

Line pack calculations are performed real time and are presented in the SCADA system. The calculation is used for operational monitoring and daily pipeline inventory purposes.

The line is divided into various sections and each section is calculated separately.

| | | |
|---|---|---|
| Longford | – | Bairnsdale |
| Bairnsdale Offtake | | Bairnsdale Power Station |
| Bairnsdale | | Orbost |
| Orbost | – | Cann River |
| Cann River | – | Mila |
| Mila | – | Bombala |
| Bombala | – | Cooma |
| Cooma | – | Michelago |
| Michelago | – | Molonglo |
| Molonglo | – | Hoskinstown |
| Hoskinstown | – | Oallen/Nerriga |
| Oallen/Nerriga | – | Nowra |
| Nowra | – | Bomaderry |
| Bomaderry | – | Albion Park |
| Tallawarra Offtake | | Tallawarra Power Station |
| Albion Park | – | Kembla Grange |
| Kembla Grange Offtake | | Port Kembla Meter |
| Kembla Grange | – | O'Briens Gap |
| O'Brien's Gap | – | Appin |
| Appin | – | Menangle Park |
| Menangle Park | – | Raby Road |
| Raby Road | – | Austral |
| Austral | – | Horsley Park |
| Horsley park | | Smithfield |

Real time data is acquired from RTU's at each compressor, meter, scraper or MLV station and stored in the line pack system database along with the physical properties of each section. The changes in pipeline volume due to the effect of temperature and pressure variations are considered with each calculation cycle. The line pack program performs a calculation cycle every five minutes, applying the weighted moving average for section end point pressures, temperatures and weighted gas composition.

Calculations are performed based on the Universal Gas Law to determine the quantity of gas contained within each section, expressed at Standard Conditions. Further corrections are made in accordance with the AGA 8 equations to account for gas compressibility.

### 1.1.3 NORMAL FLOW

Typical gas flow direction in Eastern Gas Pipeline is from Longford to Horsley Park. This is referred to as forward flow.

The producer/s supply gas into the pipeline receipt point/s at a flow rate (GJ/day) specified on a daily basis. Shippers for Longford receipt point are responsible for the gas receipt at the inlet of the Longford station in the range 5400 kPag – 6895 kPag. The gas was then compressed via the Longford Compressor Station to a pressure sufficient to maintain supply at or above the minimum contracted delivery pressures to the customer delivery points.

Pipeline integrity is ensured through continuous flow monitoring (via SCADA) and the capacity to limit and isolate flow. Automated and manual shut in valves are a feature at each Receipt and Delivery Point, and at a further seventeen locations along the pipeline.

### 1.1.4 REVERSE FLOW

The Eastern Gas Pipeline is designed to enable flow reversal if conditions allow.

### 1.1.5 DELIVERY PRESSURES

The following are the delivery pressure range at each of the delivery points.

| Location | Minimum kPag | Maximum kPag |
|---|---|---|
| Bairnsdale | 6500 | 14,895* |
| Bairnsdale City Gate | 6500 | 14,895* |
| Bombala | 3800 | 14,895* |
| Cooma | 3800 | 14,895* |
| Hoskintown | 3800 | 14,895* |
| Nowra | 3800 | 14,895* |
| Bomaderry | 3800 | 14,895* |
| Port Kembla | 3000 | 14,895* |
| Horsley Park | 3800 | 14,895* |
| Smithfield | 3200 | 14,895* |
| Tallawarra (Yallah offtake) | 6500 | 14,895 |

* Note: The Eastern Gas Pipeline and associated facilities currently have a MAOP of 14.895MPa. The pipeline is strength tested to a pressure that achieves a minimum of 100% of SMYS at the high point in each test section. This is intended to permit the pipeline MAOP to be capable of being upgraded to 16.55 MPag at some time in the future, if and when AS2885 is revised to permit a design factor of 0.8. Notwithstanding the initial operating pressure, nothing in the design of the Pipeline inhibits the intended future increase in

operating pressure to 16.55 MPag. Specifically, for all items which cannot be isolated from the pipeline for later removal and upgrade:

- Valves and appurtenances have been specified and certified to be suitable for operation at 16.55 MPag,
- Flanges have not been used (welded connections only).

Jemena will provide Shippers at least three months notice of its implementation of a modified MAOP greater than 14.895 MPag.

## 1.2 ROUTINE MAINTENANCE

### 1.2.1 MEASUREMENT, GAS RECEIPT AND DELIVERY STATIONS

All measurement stations are inspected on a regular basis. The status of critical equipment, in particular the metering and cathodic protection equipment, is noted and compared with SCADA records. Detailed checks, recording of measurement equipment outputs and non-intrusive routine maintenance are carried out at calendar month intervals to coincide with the billing periods Measurement equipment validations are carried out at approximately 8 week intervals or at longer periods as determined by Jemena after consideration of the accuracy, repeatability and reliability of the equipment. Procedures for validation of the equipment and the maintenance frequency are set out in the Jemena EGP Measurement Manual.

On a quarterly basis “third level” preventive maintenance and instrument service is completed. This work is identified from the 3 monthly station inspections.

Bi-annually, further preventive maintenance is performed including:

- Bench tests
- Filter checks

On an annual basis, additional preventive maintenance and testing is carried out including:

- Instrument and alarm “set points” are check calibrated.
- Leak surveys of station equipment such as flanges and fittings.
- Valve servicing.
- Regulator servicing and inspections (check wear parts).
- Load test 24 volt back up batteries at stations.

Individual items of equipment demand preventative maintenance carried out to code or vendor requirements including:

- Relief Valve limit tests
- Internal/External inspections of pressure vessels
- Regulator servicing and inspections (check diagrams)
- Replace instrument back up batteries at stations

## 1.3 CORROSION PROTECTION SYSTEM

The pipeline is protected from external corrosion by a high quality fusion bonded epoxy system as the primary form of protection. The following additional measures have been designed and installed to support the coating system in providing a high level of external corrosion protection for the pipeline;

### 1.3.1 CATHODIC PROTECTION SYSTEM

- The cathodic protection system can be summarised as follows;
- The cathodic protection has been designed and installed in accordance with AS 2885.1:1997 and AS/NZS 2832.1:1998.
- Cathodic protection monitoring procedures have been developed using AS/NZS 2832.1:1998 as a minimum requirement.
- Cathodic protection criteria acceptance limits are in accordance with AS/NZS 2832.1:1998.
- Approximately 400 cathodic protection test points have been installed at 2km nominal intervals for the monitoring of pipeline cathodic protection potential measurements.
- Eleven impressed current cathodic protection units (CPUs) have been installed along the pipeline. All CPUs are fitted with interrupters, which can be synchronised via the SCADA system, so that true cathodic protection potential measurements can be carried out over the length of the pipeline if needed.
- Cathodic protection pipeline potential and output current is continuously monitored by SCADA at each cathodic protection unit so that a rapid response may be provided to unit problems.

### 1.3.2 STRAY CURRENT MONITORING AND CONTROL SYSTEMS

The pipeline is subject to stray current effects from telluric origin and from the electrified railway system in the vicinity of Sydney. These effects can cause significant rates of corrosion if not controlled.

Stray DC effects are mitigated by a number of measures:

- Transformer Rectifier Assisted Drainage (TRAD) units are installed to provide protection from stray current effects associated with two electrified railway line crossings. These units automatically monitor and control the level of stray DC current from the rail system to minimise any corrosive effects,

- The length of stray current pick-up is limited by installing in-line insulating joints along the areas likely to be effected.

- Zinc earthing beds are installed on the pipeline at selected locations. The beds control most large stray current transients.

- In the railway stray current affected area near Sydney, insulating joints and cathodic protection units are located at closer intervals to assist in the mitigation of the higher levels of stray current.

- Corrosion probes are buried adjacent to the pipeline to monitor actual corrosion protection status in areas of high railway stray current. These probes allow direct measurement of pipeline corrosion rate and supplement normal cathodic protection potential measurements

### 1.3.3 INDUCED AC CORROSION EFFECTS

In areas where the pipeline parallels high voltage overhead powerlines, AC may be induced onto the pipeline. Induced AC can present a corrosion risk hazard to the pipeline. The following measures have been employed to monitor and control this effect;

- Corrosion probes are buried adjacent to the pipeline to monitor actual corrosion protection status in areas where there is risk of induced AC effects. These probes allow direct measurement of pipeline corrosion rate and supplement normal cathodic protection potential measurements.

- The impressed current cathodic protection system has various modes of control to allow induced AC effects to be minimised.

### 1.3.4 PIPELINE EARTHING SYSTEMS

In areas where the pipeline runs parallel to high voltage overhead powerlines, AC may be induced into the pipeline. The level of induced AC may present a hazard to personnel and to equipment along the entire length of the pipeline.

Earthing systems have been designed and installed to mitigate this hazard. In summary these systems consist of the following;

- Zinc earthing beds with ten earthing electrodes in each bed have been installed at 32 locations along the pipeline. Each bed is fitted with surge diverters.

- Short lengths of zinc earthing ribbon fitted with surge diverters are installed on test points,

- Galvanised steel earthing grids are installed at MLV, scraper stations, and test points close to high voltage power lines. This provides an additional level of earthing protection at locations, where there will be a high level of personnel contact with the

pipeline and where there is a high level of instrumentation.

### 1.3.5 LIGHTNING PROTECTION SYSTEMS

Lightning may present a risk to personnel and equipment. The risk is mitigated by:

- Scraper stations and mainline valves are provided with earthing grids and surge diverters for personnel protection.
- All electronic components, which are susceptible to lightning damage, are provided with low impedance earthing and surge diverters to mitigate the hazard.
- All insulating devices are provided with surge protection

## 1.4 RIGHT-OF-WAY (ROW) PATROLS

Ground patrols are carried out in the metropolitan areas daily or at such intervals as local conditions may dictate from time to time.

Rural ROW sections are checked by aerial surveillance on a calendar month basis to check for unauthorised third party activity on or near the ROW, and for any wash outs or erosion.

Sections of rural ROW have ground patrols carried out as necessary to investigate activities detected from the air, advised or known to occur in the area. Personnel travelling to or from stations and along the ROW for routine maintenance patrol the ROW on an ongoing basis.

Once per annum a detailed ROW maintenance program is completed and a further ground patrol is performed as part of this maintenance program. Additionally, when the annual Cathodic Protection Survey is carried out, a full ground patrol is combined with the survey.

## 1.5 EMERGENCY RESPONSE

EGP has developed an Emergency Response Management Plan, which provides for a Jemena organisational structure and methods to control an emergency situation on the pipeline.

An Emergency is considered to be anything unexpected or seriously wrong with the operation of the pipeline and its facilities, which creates:

- an immediate or potential hazard to persons or to property
- a threat to the security of gas supply
- a requirement for third party assistance
- a situation that may give Jemena significant media coverage.

**EGP's first priority during an emergency is to the safety of any persons in the**

**immediate vicinity.**

Emergency Response manuals are issued to all parties related to pipeline activities. The document is subject to document control therefore any reviews or updates will be issued to parties for update as soon as they are approved by Jemena management.

If an emergency situation occurs Jemena will inform Shippers and Suppliers of the following information as soon as it becomes available:

- that an emergency situation exists and that Jemena is running under the Emergency Response organisational structure
- site of the emergency
- any delivery or receipt restrictions
- regular updates on availability of supply
- regular updates on the progress of the emergency situation
- estimated time to remedy the emergency and
- when the emergency situation has ceased.

If, during an emergency, supply to Shippers needs to be curtailed, Jemena will use its best endeavours to keep any such curtailment to a minimum.

# 2 GAS QUALITY

Maintenance of pipeline integrity, effective utilisation of pipeline capacity, and market requirements restrict the quality of gas that will be accepted into the pipeline.

For treatment of off specification gas, see Section 4.13.

Jemena Melbourne Control Centre monitors on a continuous basis, the quality of the gas entering the pipeline. The analysis is performed by the gas chromatographs installed at each receipt point, and values are fed into the SCADA system.

## 2.1 SPECIFICATIONS

The Jemena Standard Terms and Conditions for the EGP state the acceptable gas quality limits in Section 19. Those requirements are restated in Table 2.1.1: **GAS QUALITY SPECIFICATIONS** below.

This specification requires that the natural gas:

(a) be commercially free from sand, dust, gums, gum forming constituents, crude oil, impurities or other objectionable substances; AND

(b) have measured or calculated values for certain parameters within the stated tolerances;

to avoid damage to the pipeline and associated infrastructure, or interference with:

(i) the transmission of the natural gas through the pipeline; OR

(ii) the commercial use of the natural gas.

| ITEM | SPECIFICATION | TEST METHOD |
|---|---|---|
| Minimum Temperature | 2 °C | |
| Maximum Temperature | 50 °C | |
| Wobbe Index | Minimum 46.0 Maximum 52.0 $MJ/sm^3$ | ISO 6976; OR ASTM D 3588 |
| Oxygen | Maximum 0.2% by volume | ISO 6976 AND ISO 6976; OR ASTM D 1945 |
| Total Inerts | Maximum 7% by volume | ISO 6976 AND ISO 6976; OR ASTM D 1945 |
| Hydrocarbon Dewpoint | Maximum 2 ° C Over the range 0 – 14 895 $kPa_g$ | |
| Water Dew Point | 0°C @ 14895 $kPa_g$ | ASTM D 1142 |
| Water Content | Maximum 68 $mg/m^3$ to comply with dew point limit | ASTM D 1142 |
| Hydrogen Sulphide | Maximum 5.7 $mg/m^3$ | ISO 6326 |
| Total Sulphur (excluding odourant) | Maximum 25 $mg/m^3$ | ASTM D 1072 |

**Table 2.1.1: Gas Quality Specifications**

1. All values measured or specified at 15 °C and 101.325 kPa unless otherwise stated.

2. Wobbe Index means the Higher Heating Value divided by the square root of the relative density of the gas, both measured at the same time.

3. For the purposes of this clause, carbon dioxide and nitrogen shall be deemed to be inert gases.

4. For the avoidance of doubt, objectionable substances include:
   - Fluorine and Chlorine;
   - Glycols;
   - Methanol;
   - Radioactive substances; and
   - Trace metals where trace metals include Sodium, Potassium, Calcium, Lead,

Vanadium, Magnesium, Lithium, Mercury, Cadmium, Bismuth, Arsenic, Antimony, Phosphorus, Boron, Gallium, and Indium.

# 3 NOMINATIONS & SCHEDULING

## 3.1 GENERAL

"Nominations" are forecasts from Shippers of the daily quantities of gas, in gigajoules per day, requested to be received at each receipt point and delivered to the Shipper's delivery point. The primary method of submitting nominations to Jemena is through Jemena's gas accounting system (pypIT). Nominations received from Shippers can cover a period of one week, one day or, in the case of an intra day nominations, part of one day. These Nominations are used by Shippers to forecast to Jemena delivery rates and Jemena uses these nominated quantities for calculating available pipeline and meter capacity and transportation agreement compliance. Jemena also uses the Nominations to schedule daily receipt quantities to control pipeline pressure and Shipper imbalances. Nominations also provide Jemena and Suppliers prior knowledge of excessive or low delivery rates which enable maintenance and/or production planning.

"Schedules" are rates, in gigajoules per day, which Jemena requires to be flowed from a Shipper's Receipt Point/s to meet Shipper Nominations plus any system use gas and imbalance corrections as applicable.

Shippers may submit a request for changes (submitted to the website) to weekly nominations at any time. Jemena shall exercise best endeavours to satisfy a late request initiated by a Shipper but will not be obliged to comply with the request. A change takes effect once Jemena sends confirmation via Jemena web site to the Shipper. In deciding whether to implement a requested change, Jemena will take into account operational matters and whether the proposed change will detrimentally affect other users.

Jemena may, from time to time, request additional Nominations from Shippers. These may be for, but not limited to, annual quantities of gas to be transported and peak demands.

The Shippers have designated an Authorised Person in each Haulage Service Contract as responsible for the issuing of notices, including nominations, to Jemena. The Authorised Person may delegate the responsibility for nomination to another person, Jemena Control Centre requests formal notification when there is a change to the Authorised person. If Operational Balancing Agreements are in place, the terms of those agreements may require that the operator of facilities downstream of Delivery Points nominates on behalf of the Shipper, or that Jemena provides advice of scheduled flow rates directly to an operator of facilities upstream of a Receipt Point.

## 3.2 NOMINATIONS

### 3.2.1 WEEKLY NOMINATIONS

Weekly Nominations are to be submitted to the Jemena Pipeline Control Centre by 1200hrs on the Friday prior to the nominated week. A nominated week runs from Saturday to Friday inclusive.

Weekly nominations are to be submitted through Jemena's gas accounting system (pypIT). Weekly nominations are intended to provide a closer indication of anticipated flow quantities and are critical to the efficient running of the pipeline. During the week the Shipper must revise the Weekly Nomination, if required, to ensure the Nomination always represents a good faith forecast by the Shipper as to its expected Daily Nomination on each of the next 3 Days during that Week, or the remaining Days in that Week, as the case requires. Jemena is not required to respond to the Shipper's Weekly Nomination or any revision to the Weekly Nomination.

### 3.2.2 DAILY NOMINATIONS

Daily nominations must be submitted by the Shippers by no later than 1400 hours on the day before the start of the next gas day. .If the Shipper does not request a change in respect of any Day covered by the Weekly Nomination, the Shippers' Daily Nomination for that Day will be deemed to be as described in the Weekly Nomination.

(a) In the event that the Daily Nomination is received between 14:00 hours and 16:00 hours on the Day before the Service Providers are to provide the Service to the Shipper, the Service Providers have no obligation to accept the change, but must use reasonable endeavours to accommodate the request.

(b) The Service Providers must by 16:00 hours or as soon as possible thereafter on the Day before the Day on which the Service Providers are required to provide the Service to the Shipper, provide a notice to the Shipper containing the Shipper's:

(i) Confirmed Receipt Nomination; and

(ii) Confirmed Delivery Nomination

(together a **Confirmed Nomination**).

(c) The Service Providers are not under any obligation to accept any change requested in a Daily Nomination submitted after 16:00 hours on the Day before the Service Providers are required to provide the Service to the Shipper.

(d) In making a decision regarding whether to accept a Daily Nomination, the Service Providers, acting reasonably and in good faith, will consider:

(i) operational matters;

(ii) the provisions of this document, including any relevant Annexures; and

(iii) whether sufficient Capacity is available, taking into account the Priority of Service,

and the Service Providers' decision regarding a Daily Nomination is final.

(e) Unless otherwise set out in the notice, the Confirmed Nomination is final and has immediate effect upon receipt by the Shipper.

### 3.2.3 DAILY SCHEDULING

Schedules are flow rates, expressed in GJ/day, which Jemena requires to flow from each of a Shipper's Receipt Points to meet the Shipper's confirmed delivery nominations plus imbalance corrections. The imbalance correction includes the Shipper's system use gas contributions.

Jemena determines Schedules in advance of each gas day to reflect the Shipper's then current imbalance. That is, for example, Jemena will schedule on a Monday, the required receipt rate from the supplier for the period 0630 hrs AEST Tuesday to 0630 hrs AEST Wednesday (Tuesday's gas). This ensures that the line pressure is maintained at an appropriate level, and the pipeline capacity is most effectively utilised, and that Shipper imbalances are corrected in a timely manner.

This also gives producers sufficient notice to organise production or alternative supply arrangements for the gas day. Jemena retains the right to reschedule or adjust a Shipper's nominations when, in Jemena's reasonable judgement, expected receipts and deliveries:

a) will cause adverse operating conditions in the pipeline;

b) will be at variance with capacity limitations resulting from force majeure events or other events and circumstances which endanger the safety or integrity of the pipeline including the need to perform unscheduled maintenance and/or repairs;

c) will not maintain Jemena EGP's ability to meet service commitments; OR

d) will adversely affect imbalances under users' service contracts.

### 3.2.4 JEMENA TO SHIPPER CONFIRMATION OF DAILY SCHEDULE RATES

Jemena will endeavour to have submitted to Shippers the Confirmation of Daily Scheduled nominations on the Jemena Customer website by 14:00 hrs AEST. The Confirmation of Daily Nomination Rates is also used by Jemena to supply Shippers with daily accounting information.

Should the Shipper not agree with the daily scheduled amounts on the Jemena Customer website, they must immediately notify Jemena so the situation may be clarified/rectified.

## 3.3 PRODUCER DAILY SUMMARY

The Producer Daily Summary is a report provided to suppliers of natural gas to the Receipt Points on the pipeline. The report summarises individual Shippers' Schedules and advises a single total receipt quantity required to be received from that producer at that Receipt Point.

Jemena will determine the required receipt quantities the day prior to the gas day. That is, for

example, Jemena will schedule on a Monday, the required receipt quantity from the supplier for the 24 hour period 06:30 hrs AEST Tuesday to 06:30 hrs AEST Wednesday (Tuesday's gas). Jemena will endeavour to submit the summary to Suppliers no later than 15:00 hrs AEST each day.

Jemena retains the right to review or adjust the required receipt quantity from the supplier and issue an amended Producer Daily Summary when, in Jemena's reasonable judgement, expected receipts and deliveries:

a) will cause adverse operating conditions in the pipeline;

b) will be at variance with capacity limitations resulting from force majeure events or other events and circumstances which endanger the safety or integrity of the pipeline including the need to perform unscheduled maintenance and/or repairs;

c) will not maintain Jemena EGP's ability to meet service commitments; OR

d) will adversely affect imbalances under Shippers' service contracts.

The Producer Daily Summary provides the Producer with the following information:

- Supplier's name.
- Previous 24hrs delivered amounts to Shippers.
- Previous 24hrs input (if not available to the Supplier).

## 3.4 RECEIPT POINT FLOW ALLOCATIONS

Ideally, EGP will receive gas at a Receipt Point in conformance with the aggregated scheduled quantities of the Shippers from that point, such that the total quantity delivered into the Pipeline over any Gas Day is equal to the summarised quantity as advised to the Producer via the Producer Daily Summary. In reality, this level of perfection is unachievable, and one of two possible allocation methodologies must be applied:

a) If an Operational Balancing Agreement (OBA) is in effect at the receipt point, the daily receipt schedules will be deemed to be the receipt quantities for the purposes of Shipper accounting. Any deviation from the required receipt quantity is accommodated initially by variations in the line pack (within an agreed tolerance), and must be corrected by the Producer in a timely manner. In this manner, the Shipper is enabled to exert appropriate control over imbalances.

b) If there is not an OBA in place, gas producers supplying more than one Shipper at a Receipt Point on the EGP are responsible for allocation of the receipt gas at the pipeline inlet. In this case, Jemena allocates actual Receipt Point quantities using a method provided by or approved by the producer. In the absence of an appropriate methodology from the Producer regarding Receipt Point quantity allocation, Jemena shall allocate inlet gas on a pro-rata basis, based on Shippers' nominations. This will result in determination of imbalance quantities that differ from those indicated by the Shipper's nominations, and imbalance charges, if any shall be determined with reference to the amended quantities.

The Shipper remains responsible for ensuring that their Producer provides scheduled gas

quantities at the pipeline Receipt Point.

## 3.5 MAXIMUM DAILY QUANTITY

Maximum Daily Quantity (MDQ) is the contracted maximum daily quantity of gas, in gigajoules per day, which Jemena agrees to deliver to a Shipper's delivery point on a daily basis for the term of the Shipper's Haulage Service Contract subject to receipt at the receipt point for that path of a quantity of natural gas equal to the sum of the MDQ and an additional quantity for the correction of imbalances.

If a Shipper requires additional gas over MDQ to be delivered under a Firm Forward Haulage Service Contract to its Delivery Point/s, the Shipper will need to advise Jemena via the nominations process of the amounts of gas, in gigajoules per day, over MDQ which the Shipper requests to be delivered. Jemena will then assess whether there is sufficient capacity on the pipeline to deliver the amounts of gas nominated by the Shipper, and whether the request complies with any contract conditions. If there is insufficient capacity available to satisfy the request for additional haulage quantities, Jemena will notify the Shipper that deliveries are limited to MDQ.

If capacity is available on the pipeline to deliver amounts above MDQ, Jemena will confirm the delivery nomination and schedule the amounts with the Shipper's respective Supplier. (The amount of gas delivered above MDQ is classified as Overrun Quantity and is subject to overrun charges.)

During the term of a Firm Forward Haulage Service Contract a Shipper can increase its MDQ but cannot decrease its contracted MDQ. Increase of an MDQ is done by amending the Annexure A to the Shipper's Firm Forward Haulage Service Contract and is subject to availability of capacity on the pipeline.

## 3.6 IMBALANCES

### 3.6.1 DAILY IMBALANCE

Jemena EGP calculates daily imbalances at a Shipper's receipt point for each path as follows:

**quantity of natural gas allocated as received on Shipper's account in respect of that path and contract type**

***less***

**(quantity of natural gas allocated as delivered on Shipper's account along that path and contract type**

**plus**

**Shipper's system use gas allocation for quantities of gas transported under that contract type along that path.)**

### 3.6.2 CUMULATIVE IMBALANCE

Jemena EGP keeps a running total of a Shipper's daily imbalances for all paths originating from a receipt point for each contract type, called the ***cumulative imbalance*** for the Shipper from that receipt point.

A positive cumulative imbalance occurs if the quantity of natural gas delivered under the contract type at delivery points supplied from a receipt point is less than the quantity of natural gas received at that receipt point (net of system use gas).

A negative cumulative imbalance occurs if the quantity of natural gas delivered under the contract type at delivery points supplied from a receipt point is more than the quantity of natural gas received at that receipt point (net of system use gas).

Shippers must control and, if necessary, adjust receipts and deliveries of natural gas to make sure that their cumulative imbalances under their contracts are minimised. Shippers must correct a cumulative imbalance within 3 days unless Jemena EGP agrees to a longer period.

Jemena EGP may offer an ancillary service to adjust scheduled flows in order to manage imbalances on a Shipper's behalf.

Jemena may correct a Shipper's cumulative imbalance by adjusting its nominations if, in Jemena's reasonable opinion:

a) the Shipper's cumulative imbalance is affecting Jemena EGP's ability to perform its obligations to other users under their service contracts;

b) the Shipper's cumulative imbalance is affecting Jemena EGP's ability to offer services to prospective users; OR

c) the Shipper is not taking reasonable steps to control its cumulative imbalance.

For further information on imbalances and imbalance charging refer to section 16 of Jemena EGP'S Standard Terms And Conditions.

## 3.7 OPERATIONAL BALANCING AGREEMENT

An Operational Balancing Agreement (OBA) is an agreement between the Pipeline Owner and owners/operators of interconnecting facilities such as natural gas producers, other transmission pipelines or Distribution Networks, to co-operate in the management and accounting of Shippers' gas quantities at receipt and delivery interfaces.

An OBA enables Shippers' nominations to be deemed to be the Receipt or Delivery quantity, as the case may be, for the purposes of contracts between an individual Shipper and a particular service provider. Any deviation from the aggregated required quantity for all shippers on any gas day at an interface is accommodated initially by variations in the line pack (within an agreed tolerance) of one of the parties, and must be corrected in an agreed timely manner by the party responsible for the deviation. This provides certainty both operationally and financially for the Shippers and the parties to the OBA. The OBA Parties manage the “Operational imbalance”, which is the difference between the aggregated nominated quantity & the physically metered quantity at each interface.

An example of how the accounts would be managed is shown below:

**Day 1**

- User / Shipper nominates quantity to Pipeline: 10TJ
- Pipeline nominates quantity to Producer: 10TJ
- Producer physically flows: 9TJ

The Report to the User / Shipper for this day is that the contract receipt quantity was 10TJ rather than the physical 9TJ.

Therefore, the producer must replace the 1TJ imbalance in conjunction with the following days nomination.

**Day 2**

- User / Shipper nominates quantity to Pipeline: 10TJ
- Pipeline schedules quantity to Producer: 11TJ (10TJ + 1TJ OBA operational imbalance correction)
- Producer physically flows: 11TJ

In this working example, the User / Shipper is allocated and charged the exact nominated quantity on both days and the OBA parties assume responsibility for managing the “Operational Imbalance”.

## 3.8 OVERRUNS

### 3.8.1 GENERAL

An overrun occurs when the quantity of natural gas transported for a Shipper along a contractual path is greater than the Shipper's contract entitlements for that path. For the purpose of calculating the extent of a user's overrun, Jemena will aggregate within a zone any overrun by a user at each of the user's delivery points in that zone.

### 3.8.2 OVERRUN CHARGES

**Working out the overrun charge**

Overrun charges are applied to delivered quantities along a path in excess of a Shipper's

entitled quantity by an amount greater than the shipper's contracted tolerance.

Entitled quantity means:

- in the case of Firm Forward Haulage service, the specified MDQ for that path; OR
- in the case of As-Available Forward Haulage service and As-Available Backhaul Haulage service, the specified confirmed delivery nomination for that path.

Contract tolerance:

- Means that tolerance, expressed as a percentage, which is specified in Annexure A, and is applied to a user's entitled quantity, in the determination of overrun charges.

**Authorised overruns**

Subject to clause 15.4 of the EGP Standard Terms & Conditions, the overrun charge for an authorised overrun is calculated such that the first portion of overrun quantity up to the specified contract tolerance of entitled quantity is charged at 100% of the contracted tariff for that path and subsequent quantities are charged at a rate of up to 130% of the contracted tariff for that path.

**Unauthorised overruns**

Subject to clause 15.4 of the EGP Standard Terms & Conditions, the overrun charge for an unauthorised overrun is calculated such that the first portion of overrun quantity up to the specified contract tolerance of entitled quantity is charged at 100% of the contracted tariff for that path, the remainder of any authorised overrun quantity is charged at a rate of up to 130% of the contracted tariff for that path, and subsequent quantities are charged at a rate of up to 150% of the contracted tariff for that path.

**Example 1:** A user with a Firm Forward Haulage service contract for an MDQ of 1000 GJ/d and a contract tolerance of 5%, who is authorised to flow at 1200 GJ on a certain day, and utilises this amount, will pay an overrun charge as follows:

- 50 GJ at 100% of contract tariff; plus
- 150 GJ at up to 130% of contract tariff

**Example 2:** A user with a Firm Forward Haulage service contract for an MDQ of 1000 GJ/d and a contract tolerance of 5%, who is authorised to flow at 1200 GJ on a certain day, and utilises 1300 GJ, will pay an overrun charge as follows:

- 50 GJ at 100% of contract tariff; plus
- 150 GJ at up to 130% of contract tariff; plus
- 100 GJ at up to 150% of contract tariff.

## 3.9 SYSTEM USE GAS

System Use Gas means the quantity of natural gas used in the provision of services on the pipeline, including:

a) fuel gas used for compressors and other equipment;

b) natural gas lost or not accounted for in connection with the operation of the pipeline; and

c) natural gas recorded as lost or gained due to metering error;

but does not include

d) line pack; and

e) natural gas lost through Jemena EGP's negligence or wilful misconduct.

Shippers are responsible for the provision of quantities of natural gas at their cost to meet their proportion of the pipeline system use gas requirements each day at their receipt point.

The allocation of System Use Gas between shippers is performed on the basis of the ratio of gas delivered by forward haulage services to the account of the Shipper to the total quantities of gas delivered by forward haulage services for all users over equivalent paths.

## 3.10 PRIORITY OF SERVICE

Priority of service on EGP is as follows:

Firm Forward Haulage services shall have the highest priority of service for Shippers at Shipper's Receipt and Delivery Points up to the MDQ identified in the Haulage Service Contract. All Firm Forward Haulage Service Contracts have the same priority of service.

As-Available Backhaul Haulage services shall have a lower priority of service than Firm Forward Haulage service contracts. As-Available Backhaul Haulage Service priority shall be determined by the applicable priority date of service established in Annexure A of the Haulage Service Contract.

As-Available Forward Haulage services shall have a lower priority of service than As-Available Backhaul Haulage services. Service priority shall be determined by the applicable priority date of service established in Annexure A of the Haulage Service Contract.

Overruns for all services shall have the lowest priority and should there be any curtailment overruns quantities will be curtailed first.

## 3.11 AVAILABILITY OF SERVICE

Spare capacity is the portion of the existing pipeline capacity that has not been reserved by Shippers under Firm Forward Haulage Service Contracts. The MDQ nominated in the Annexure A of an As-Available Forward Haulage Service Contract represents a limit on access to spare capacity and is not a commitment by a Shipper, and hence is still considered

to be spare capacity available for reservation for Firm Forward Haulage services.

Pipeline capacity available for As-Available Forward Haulage and As-Available Backhaul Haulage services varies each day and is dependent upon the physical flow requirements of Shippers under Firm Forward Haulage Service Contracts. Jemena will determine and then allocate the capacity available for these As-Available services via the weekly nominations process.

## 3.12 OPERATIONAL FLOW ORDERS

### 3.12.1 WHEN CAN JEMENA EGP ISSUE AN OPERATIONAL FLOW ORDER

From time to time it may be necessary for Jemena EGP to issue an order to Shipper/s to alter natural gas receipts and deliveries ("***Operational Flow Order***") when, in Jemena EGP's reasonable judgement, expected receipts and deliveries:

a) will cause adverse operating conditions in the pipeline;

b) will be at variance with capacity limitations resulting from force majeure events or other events and circumstances which endanger the safety or integrity of the pipeline including the need to perform unscheduled maintenance and/or repairs;

c) will not maintain Jemena EGP's ability to meet service commitments; OR

d) will adversely affect imbalances under users' service contracts.

### 3.12.2 PRIORITY OF OPERATIONAL FLOW ORDERS

Jemena EGP shall use reasonable endeavours to first apply operational flow orders to those users, if any, whose actions or omissions have resulted in the need for operational flow orders.

### 3.12.3 TIMING FOR AN OPERATIONAL FLOW ORDER

Jemena EGP shall fax a copy of the order to Shipper/s no later than 1 hour before the change is to take effect, whereupon Shipper/s shall use reasonable endeavours to take the actions requested by Jemena EGP.

### 3.12.3 CONTENTS OF AN OPERATIONAL FLOW ORDER

Each operational flow order shall contain the following information:

a) time and date of issue;

b) time that the operational flow order is to become effective;

c) duration of operational flow order (if none is specified, the operational flow order will remain in effect until further notice);

d) a description of the section of the pipeline for which the operational flow order is in effect;

e) the specific actions required of Shipper/s at the receipt points and delivery points in order to comply with the operational flow order;

f) the reasons for issuing the operational flow order; AND

g) any other information relevant to the operational flow order.

## 3.13 CAPACITY CONSTRAINTS & CURTAILMENTS

Capacity constraints relate to restrictions of pipeline throughput at individual Receipt Point/s, Delivery Point/s or on segments of the pipeline. Constraints to throughput can be caused by situations such as, but not limited to:

- Force majeure*;
- Limited supply;
- Pipeline safety requirements;
- Maintenance requirements;
- Pipeline modifications and repairs or;
- Operating requirements.

* See Jemena EGP Standard Terms and Conditions for definition and commercial considerations.

Capacity constraints may require Jemena to interrupt or suspend a portion or all of the service at a point or segment on the pipeline in accordance with the curtailment provisions of the Jemena Standard Terms and Conditions.

If Jemena determines the capacity of the pipeline, or any portion thereof, is constrained or otherwise insufficient to meet transportation needs, curtailment of non Firm Haulage services, to zero if necessary, will be carried out beginning with the last quantities scheduled, and then sequentially in reverse order to the priority of service. Overrun quantities under any contract type have the lowest priorities, and will be curtailed prior to interruption of As-Available services.

Curtailment of Firm Forward Haulage service is effected on a pro rata basis with reference to Shippers' MDQs (Refer to Clause 26 of the EGP Standard Terms & Conditions). For the duration of the curtailment, the Firm Forward Haulage Shippers shall be charged only for the quantity of gas actually transported multiplied by the applicable rate.

Jemena will endeavour to implement curtailment procedures only at the point/s or segment/s of the pipeline affected by the constraint, and to minimise the duration or effect of

the curtailment by use of line pack, but only to the extent that the use of line pack does not cause further constraint or cause detriment to the operation of the pipeline.

Jemena will notify Shippers as soon as it becomes aware of any occurrences, which may result in curtailment and will issue an Operational Flow Order to affected Shippers as appropriate. Notification will be by means of the Web site for general information of a non-immediate nature, and by both Web site and facsimile for immediate notices.

Jemena EGP must give as much notice as is reasonably possible of planned alterations, maintenance or repairs to the pipeline. By 31 January each year Jemena EGP will publish on its website a program for the ensuing 12 months outlining:

a) planned alterations, maintenance and repairs that will affect pipeline capacity; AND

b) its estimate of capacity available at each affected receipt point, delivery point or Pipeline segment for the period of such maintenance.

Jemena EGP shall use reasonable endeavours to perform such work:

a) to avoid or minimise so far as is reasonably practicable any curtailment of services to Users;

b) during a period which Jemena EGP reasonably determines to have low aggregate demand for capacity; AND

c) with as little disruption to the provision of services as is reasonably practicable;

and may, if necessary, curtail or interrupt receipts, deliveries, or transport of gas to the extent necessary to carry out that work.

# 4 MEASUREMENT & RECONCILIATION

## 4.1 OVERVIEW OF MEASUREMENT

Jemena is the Measurement Authority for the EGP, with responsibility for measurement and reconciliation of all gas received and delivered on the EGP. Jemena owns, operates and maintains gas quality measuring equipment at the Receipt Point(s) and at selected Delivery Points on the pipeline. Flow measurement facilities are maintained by Jemena at each Delivery Point and Receipt Point, except for the interim measurement equipment at the Bombala Offtake that is owned and operated by Envestra Pty Limited.

Measured flow is corrected for temperature and pressure to produce instantaneous volumetric and energy based flow rates at standard conditions, from the application of gas quality data imported via the EGP SCADA system. An on-site RTU based flow computer performs the calculations, integrates the results, and accumulates volume and energy totals in non-volatile registers within the flow computer memory. All calculations done by the flow

computer are in accordance with recognised industry standards. In conjunction with line pack calculations, the accumulated quantities are used for the daily reconciliation and balancing of the pipeline.

Monitoring of flow is achieved using the SCADA system that has land communications links to on site measurement equipment at the receipt and key delivery points.

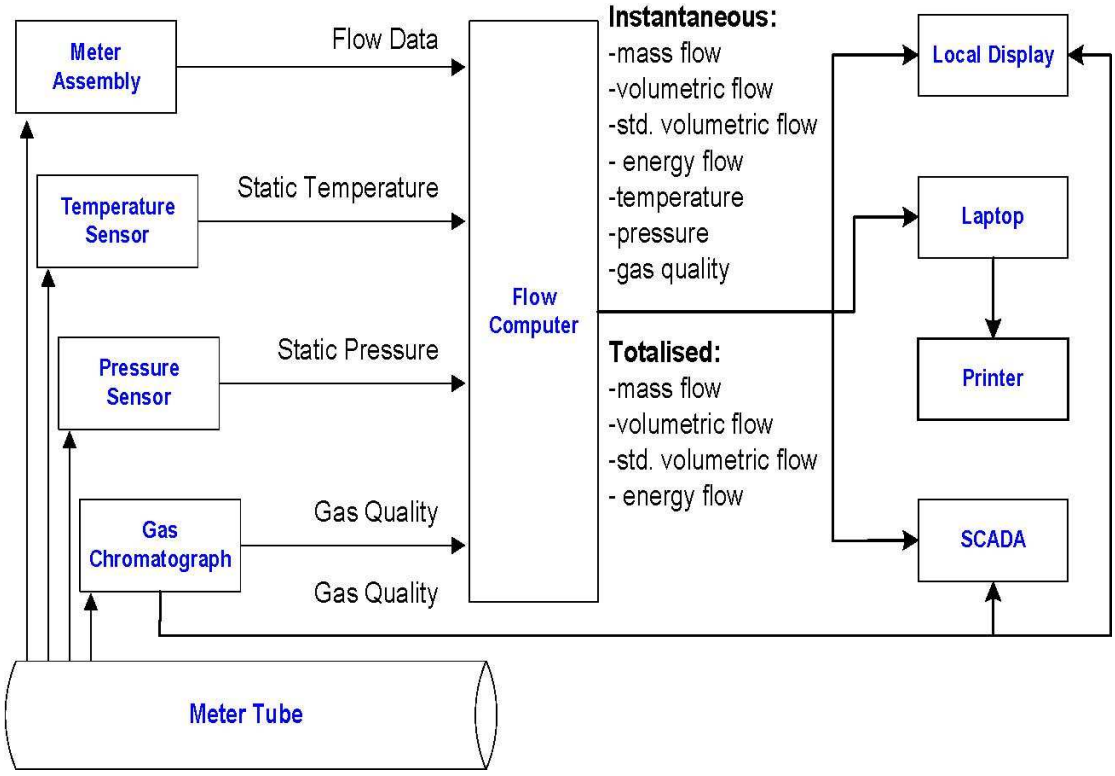


**Figure 4.2.1: Measurement Facility Schematic**

## 4.2 MEASUREMENT EQUIPMENT

The equipment specification varies between measurement facilities, however the schematic Figure 4.2.1 identifies and links the key repeated components.

### 4.2.1 DESCRIPTION

#### Meter Assembly

The meter assembly measures dynamic flow properties for use in the calculation of volumetric flow. Three styles of meter assembly are in service on the EGP. EGP receipt stations use ultrasonic meters. At the Delivery Points, a mixture of ultrasonic, coriolis and turbine meters are employed. Coriolis meters measure the compressor fuel gas.

## Gas Chromatograph

Chromatographs are located at the Longford Receipt Point, Port Kembla and Marubeni delivery points, providing gas quality data for local volumetric and energy flow calculation and for transmission to other delivery points.

### Static Pressure Sensor

The static pressure sensors are mounted on each meter assembly, in accordance with the requirements of the meter type. Generally, the static pressure and temperature are required to formulate the correction factor applied in the conversion of the observed flow rate at metering conditions to a volume at standard conditions.

The pressure transmitter mounted on the coriolis metering skids also serves to compensate for variations in the coriolis meter tube at high pressures to enable enhanced accuracy in the measurement of mass flow.

### Resistance Temperature Detectors

The operating principle of the resistance thermal detector is relatively simple. A platinum wire is fixed within a probe positioned mid stream in the pipe. The resistivity of a conductor is proportional to its temperature. Hence, variation in gas temperature can be inferred from the variation in the measured resistance across the platinum wire.

The resistivity across the platinum wire is monitored and converted to a 420mA signal by a transmitter either directly or remotely mounted. Two styles of temperature transmitter are used on the pipeline. The Honeywell STT350 mounts directly onto the probe at the pipe location, while the TE-16 style of transmitter is located remote from the sensor, within the site control room.

### Flow Computer

Each meter assembly is connected to a local Bristol Babcock RTU programmed as the Flow Computer to apply the appropriate AGA and Pipeline industry standard calculation techniques to local and external data, in order to determine corrected volumetric and energy flow rates.

Fixed inputs are manually programmed using a local interface on the flow computer. These are updated as required.

Based on the data received the flow computer calculates and outputs:

- instantaneous volumetric flow rates at metering conditions;
- instantaneous volumetric flow rate at standard conditions;
- instantaneous mass flow rate;
- instantaneous energy rate;
- higher heating value;
- totalised volume at standard conditions; AND
- totalised energy.

Output is provided on-site via a visual interface and/or laptop computer. The flow

computers are also scanned by the SCADA system.

### 4.2.2 SPECIFICATION

A summary of the flow measurement equipment is provided in the table below.

| Location | Meter Assembly | No. Meter Runs | Flow Computer | Temp. Probe | Press. Transducer | SCADA |
|---|---|---|---|---|---|---|
| Longford | Ultrasonic | Dual | **BB 3310 RTU** | 3-wire RTD | **Honeywell STG 170-EIG** | On line |
| Longford | Coriolis | Single | **BB 3310RTU** | None | **Honeywell STG 170-EIG** | On line |
| Bairnsdale PS | Coriolis | Dual | **BB 3310 RTU** | None | **Honeywell STG 170-EIG** | On line |
| Cooma | Coriolis | Single | **BB 3310 RTU** | None | **Honeywell STG 170-EIG** | On Line |
| Hoskintown | Ultrasonic | Single | **BB 3310 RTU** | | **Honeywell STG 170-EIG** | On line |
| Nowra | Ultrasonic | Single | **BB 3310 RTU** | None | **Honeywell STG 170-EIG** | On line |
| Bomaderry | Coriolis | Single | **BB 3310 RTU** | None | **Honeywell STG 170-EIG** | On line |
| Port Kembla | Ultrasonic | Dual | **BB 3310 RTU** | 4-wire RTD | **Honeywell STG 170-EIG** | On line |
| Horsley Park | Ultrasonic | Dual | **BB 3310 RTU** | 4-wire RTD | **Honeywell STG 170-EIG** | On line |
| Smithfield | Turbine | Dual | **BB 3310 RTU** | 4-wire RTD | **Honeywell STG 170-EIG** | On line |
| Tallawarra | Ultrasonic | Dual | **BB Control Wave Micro** | 4-wire RTD | **Emerson 233.50.100** | On line |

**Table 4.2.1: Equipment Summary**

## 4.3 VERIFICATION

Validation of gas quality, volume and energy accounting equipment is performed at each of the pipeline metering stations to ensure the continued accuracy of metering. The period between validations is initially every 6 weeks. This interval may be varied subject to prior notice by Jemena, as accuracy of a measurement facility is proven. General quality assurance principles shall be applied by Jemena in the determination of an appropriate interval, with gradual increases being permitted subject to sustained satisfactory performance by the site equipment, while detection of component failures may result in the interval reverting to the initial 6 week period. Any variances to intervals shall only be enacted upon issue of written notification by Jemena of its implementation of a proposed variation, or reinstatement of a shortened period. Representatives of each of the parties having an interest in the quality and quantity of gas passing through the measurement facility - Jemena, Network Operators, Producers, Retailers and Traders who are party to contracts with EGP - are to be given at least 48 hours notice of the proposed date and time of scheduled tests so that they may witness the tests. The Field Operators must notify the Jemena Control Centre in Melbourne immediately prior to commencing any measurement facility validation. The Jemena Control Centre, if required, will notify the affected producers or shippers that the validation is to commence. This will alert the producer/shipper should they have to make provision for the loss of flow signals from the Jemena equipment. The Jemena Control Centre must be kept informed as to the status of the measurement facility validation processes and advised immediately of any abnormal test results.

Representatives of each of the parties having an interest in the quality and quantity of gas passing through the measurement facility - Jemena, Network Operators, Producers, Retailers and Traders who are party to contracts with EGP - are to be given at least 48 hours notice of the proposed date and time of scheduled tests so that they may witness the tests. The Field Operators must notify the Jemena Control Centre in Melbourne immediately prior to commencing any measurement facility validation. The Jemena Control Centre, if required, will notify the affected producers or shippers that the validation is to commence. This will alert the producer/shipper should they have to make provision for the loss of flow signals from the Jemena equipment. The Jemena Control Centre must be kept informed as to the status of the measurement facility validation processes and advised immediately of any abnormal test results.

The validation tests will be conducted as scheduled. In the event that any or all of the invited witnesses do not attend, the test results will be deemed to be an accurate statement of current performance and shall be accepted by all parties. Notice will be forwarded to each of the relevant parties within 14 days of the test being completed. Witnesses are given the opportunity to sign report forms at the site to signify their attendance at the validation process.

In the event of rapid onset of equipment failure, damage or accuracy drift, Jemena may conduct interim validations without witnesses and effect appropriate remedial action but shall, where possible, give prior notice to the relevant parties that an interim validation is to be undertaken. Where possible, any maintenance such as changing ultrasonic sensors, replacing consumables or spare parts items, etc. will be performed during a scheduled validation to be witnessed by all parties.

In any case, all affected parties will receive comprehensive written details of the validation results, one copy of each of the completed test reports and advice of any adjustments made to equipment and processes subsequent to the tests.

The following is a general description of the procedures conducted at verification.

Shippers can request unscheduled verifications of equipment, but if the equipment is found to be correct, costs of such verifications will be charged to the shipper. For a detailed description of verification procedures, the Jemena EGP Measurement Manual should be consulted.

### 4.3.1 METER ASSEMBLIES

#### Ultrasonic Meter Assembly

Ultrasonic meters are installed and operated and maintained as per the current requirements of the American Gas Association (AGA) Report No. 9.

Procedures for the validation of the ultrasonic metering systems are provided in the EGP Measurement Manual.

Each meter reading is corrected for temperature and pressure via sensors attached to the meter.

#### Turbine Meter Assembly

Turbine meters are installed and operated and maintained as per the current requirements of the AGA Report No. 7, second edition 1996.

Procedures for the validation of the turbine metering system are provided in the EGP Measurement Manual.

Future full verification involves changing the flow on the meter run skid so the test meter is in series with the in service meter and recording the output from each. Results are then compared with those taken at time of installation to establish any deterioration of the in-service meter performance. The preamplifier unit on the meter is tested using a NATA Certified frequency generator.

#### Coriolis Meter Assembly

Coriolis meters are installed, operated and maintained as per the manufacturer's instructions and Industry Standards.

Procedures for the validation of the coriolis metering system are provided in the EGP Measurement Manual.

### 4.3.2 GAS CHROMATOGRAPH

In addition to the regular self-calibrations, the chromatographs are included in the

verification to ensure their continued accuracy in analysis and computation. See Section 4.4.1.

### 4.3.3 STATIC PRESSURE/TEMPERATURE SENSOR

#### Static Pressure Transmitter

The static pressure sensing lines are leak tested. The transmitter is then calibrated across its range using a Dead Weight tester. A known equivalent pressure is applied to the transmitter. The transmitter output (mA), and the pressure reading (kPa) from the flow computer display are compared to expected values.

#### Static Temperature Transmitter

The temperature probes are calibrated using a Kaye K140-4 ice point generator or ice bath and multi meter. The measured resistivity at 0°C is compared to the expected 100 Ohms.

The temperature loops are calibrated using Beamex, RTS-24 resistance box. A known resistance is placed in the loop and the expected resistance/temperature is compared to that indicated on the flow computer. This verifies the temperature-input card.

### 4.3.4 FLOW COMPUTERS

Flow calculations are carried out as per the AGA; or ANSI standard appropriate to the metering apparatus. Calculation of the compressibility factor for the purpose of flow and volume correction to standard conditions is per current requirements of the AGA Report No. 8, second edition 1992.

All programmed constants are checked and confirmed for accuracy and/or appropriateness for operating conditions.

All functions of the flow computer are checked using electronic test instrumentation. Performing a flow calculation using measured properties substituted into custom software, and comparing the result with that from the flow computer assesses calculation accuracy.

### 4.3.5 ANCILLARIES

#### Moisture analyser

Using a calibration gas with a known moisture content as a reference, the moisture analyser is cycled and the measured and expected readings compared.

#### Sulphur Gas Chromatograph

Using a calibration gas with known sulphur component compositions, the sulphur GC can be verified and calibrated.

#### Pressure Transmitters - Scraper Stations

Pressure transmitters located at scraper stations and MLVs are used in the calculation of line pack and are calibrated at least every twelve months.

**Temperature Transmitters - Scraper Stations**

Temperature transmitters located at scraper stations and MLVs are used in the calculation of line pack and are verified at least once every twelve months. The transmitter is tested as per Section 3.3.3 but as the probe is buried and attached to the pipeline it can only be checked against a second (reference) probe which is connected to the pipe along side of the in service probe.

**Alarms and Trips**

A review of all alarms and trips is conducted annually to ensure that the settings remain valid for current pipeline operating conditions.

## 4.4 CALIBRATION

Detailed procedures for the testing and calibration of the gas quality and flow measurement equipment are not included in this operations manual. More appropriately, they are specified in the EGP Measurement Manual. As part of Jemena's obligation under the Standard Terms and Conditions, the EGP Measurement Procedures Manual is available to any shipper upon request.

Measurement equipment is tested for conformity to manufacturer specified tolerances and is detailed in the EGP Measurement Manual.

### 4.4.1 TOLERANCES

Over and above the individual tolerances of the measurement equipment, the limit for equivalent total error in measured volumetric flow is 1%. Equivalent total error in volumetric flow is established by substituting expected and "as found" measured quantities into the flow calculator and equating the % difference.

### 4.4.2 STANDARD CONDITIONS

Standard conditions referenced in the specification of gas quality or used in the calculation of volumetric and energy flow rates are determined as:

- Standard Condition Pressure 101.325 kPa
- Standard Condition Temperature: $15^0$C
- Standard Gravitational Force: 9.80665 m/s$^2$ at sea level and $40^0$ latitude

### 4.4.3 LOCAL GRAVITY AND ATMOSPHERIC PRESSURE CALCULATIONS

#### 4.4.3.1 Local Gravitational Acceleration

Local gravitational acceleration at each site is calculated in accordance with equation 3-A-10 of AGA3-1992. The local gravity is dependent on the latitude and elevation of the site.

#### 4.4.3.2 Local Atmospheric Pressure

Local atmospheric pressure is also calculated for each site. It is calculated using the following equation and is dependent on the elevation only.

$$P_{local} = 101.325 - \frac{(h \times \rho_{air} \times g_{st'd})}{1000} kPa$$

where

| | |
|---|---|
| h | = site elevation (m) |
| $\rho_{air}$ | = 1.2255 kg/m$^3$ |
| $g_{st'd}$ | = 9.80665 m/s$^2$ |

## 4.5 COMPUTATION OF FLOW

Equations applied in the calculation of volumetric flow are specific to the metering system being employed. In general, however, the meter assembly is measuring a time based characteristic of the flow.

Ultrasonic meters measures the velocity of the flow through the meter run by a series of transducers mounted at an angle to the pipe, sending signals through the gas stream. They derive a gas volumetric flowrate from time-of flight measurements of ultrasonic energy pulses transmitted through the flow stream. The transducers both transmit and receive pulses and the transit time is measured. When gas is flowing in the pipe, the pulse travelling against the flow takes longer to reach the opposite transducer than the pulse travelling with the flow. This time difference is used to calculate the velocity of the flowing medium. The difference in transit time between upstream and downstream pulses increases with increasing velocity of the gas stream. Generally, ultrasonic meters are installed by Jemena where flow rates require a metering run of 150mm or greater diameter.

Turbine meters measure the velocity of the flow through displacement of rotary vanes in the gas stream. The observed flow rate (m$^3$/hr) at measurement conditions is corrected to standard conditions (sm$^3$/hr) using a correction factor based on the gas composition and the static temperature and pressure.

Curved tube coriolis meters are used to directly measure the mass flow of fluid and are generally applied by Jemena for metering runs up to 100mm in diameter. The mass flow is determined by passing the fluid through a pair of parallel tubes, which are bent, into a U shape. Vibration is induced into the tubes by a coil and magnet, and fluid moving through the meter's tubes produces Coriolis forces that then cause the flow tubes to twist in opposition to each other. During a no flow condition, there is no Coriolis effect and the sine waves generated by pickup coils and magnets installed at the inlet and outlet of the tubes are in phase with each other. As a result of any flow-induced twist in the flow tubes, the sine waves generated by the pickups are now out of phase, with the inlet side lagging behind the outlet side. The phase shift is directly proportional to the mass flow rate - the greater the phase shift, the greater the mass flow rate.

The energy based flow rate (GJ/day) used in the daily operation of the pipeline is established by multiplying the calculated standard flow rate ($sm^3/hr$) by the calculated Gross Heating Value ($MJ/sm^3$) of the gas, and adjusting the time scale.

## 4.6 RECONCILIATION

Reconciliation is the process by which Jemena checks the relative difference between receipt and delivery meters whilst taking into account change in line pack. This is done by using the equation:

$$\frac{\text{Delivered Quantity + EGP Gas Used + Change In Linepack}}{\text{Receipt Quantity}}$$

The reconciliation process is structured to:

- ensure metering on the pipeline is within acceptable limits;
- identify any metering discrepancy; AND
- calculate the quantity of unaccounted for gas.

The pipeline is reconciled over each gas day and also over the cumulative monthly figures, with summary results being issued to Shippers on a monthly basis as part of the billing documentation.

## 4.7 METERING EQUIPMENT FAILURE

If measuring equipment is found to be in error in excess of stated tolerances such that the total measurement error for the receipt or delivery point exceeds 1% of the total quantity of gas measured, special action is required. Unless an alternate agreement between Jemena and the shipper is reached, or Jemena can identify the time and date of the failure, Jemena will adjust the total quality of gas measured at the receipt or delivery point for a period equal to half the time period since the last verification. A correction to the shipper’s invoice, reflecting the adjustment, will then be issued.

## 4.8 ON SITE ANALYSIS

At each Receipt Point:

- an on-line gas chromatographs (C6 and C9 units) analyse the gas for its major components;
- a moisture analyser continuously samples the stream to establish its water dew point;
- the hydrocarbon dewpoint, higher heating value and relative density are calculated using data from the two gas chromatographs;
- a sulphur GC analyses the sulphur components in the gas;
- an RTD probe measures the gas temperature; AND
- a pressure transmitter measures the static pressure of the gas stream.

At Port Kembla:

- an on-line gas chromatograph (C6 unit only) analyses the gas for its major components;
- the higher heating value and relative density are calculated using data from the gas chromatographs;
- a sulphur GC analyses the sulphur components in the gas;
- an RTD probe measures the gas temperature; AND
- a pressure transmitter measures the static pressure of the gas stream.

At Marubeni:

- an on-line gas chromatograph (C6 unit only) analyses the gas for its major components;
- the higher heating value and relative density are calculated using data from the gas chromatographs;
- an RTD probe measures the gas temperature; AND
- a pressure transmitter measures the pressure of the gas stream.

| **MEASURED ON-LINE** | **CALCULATED ONLINE** | **INFERRED** |
|---|---|---|
| Hydrocarbon breakdown to C6+<br>Hydrocarbon breakdown C6 to C9+ (Longford only)<br>Carbon Dioxide<br>Nitrogen<br>Moisture Dew Point (Longford only)<br>Gas Temperature<br>Gas Pressure<br>Sulphur (Longford and Port Kembla only) | Higher Heating Value Relative Density<br>Wobbe Index Hydrocarbon Dew Point(Longford only)<br>Compressibility Factor | Total Inerts |

**Table 4.8.1: Output from On-Site Analysis**

Output from the on-site measurement equipment is linked to the Melbourne Control Centre via a landline communication network. The SCADA system then uses prioritised alarms to trigger a visual and audible interface to assist controllers in tracking the measured or calculated gas properties should they approach the limits specified in Table 2.1.1: **GAS**

**QUALITY SPECIFICATIONS**.

## 4.9 LABORATORY ANALYSIS

The on-site analysis is limited to monitoring the constituents or properties that have a critical short-term impact on the pipeline operation, or that are necessary for the energy accounting process. The on-site analysis is therefore supplemented with periodic laboratory testing to ensure all conditions of the gas specification are being met.

Should a third party analysis of the gas be required, or tests conducted for gas properties outside the capabilities of the installed equipment on the pipeline, then the following table lists the required measured and calculated outputs of the laboratory analyses.

| LABORATORY MEASURED | LABORATORY CALCULATED |
|---|---|
| Methane ($CH_4$) | Higher Heating Value |
| Ethane ($C_2H_6$) | Lower Heating Value |
| Propane ($C_3H_8$) | Absolute Density |
| I-Butane ($iC_4H_{10}$) | Relative Density |
| N-Butane ($nC_4H_{10}$) | Wobbe Index |
| Neo-Pentane ($neoC_5H_{12}$) | Hydrocarbon Dew Point |
| I-Pentane ($iC_5H_{12}$) | Water Content |
| N-Pentane ($nC_5H_{12}$) | Water Dew Point |
| N-Hexane ($nC_6H_{14}$) | Compressibility Factor |
| N-Heptane ($nC_7H_{16}$) | |
| N-Octane ($nC_8H_{18}$) | |
| N-Nonane+ ($nC_9+$) | |
| Nitrogen ($N_2$) | |
| Carbon Dioxide ($CO_2$) | |
| Oxygen ($O_2$) | |
| Tetrahydrothiophene $CH_2(CH_2)_3S$ | |
| Tertiary Butyl Mercaptans $(CH_3)_3C–SH$ | |
| Hydrogen Sulphide ($H_2S$) | |
| Total Sulphur | |

**Table 4.9.1: Laboratory Analysis Output**

## 4.10 SAMPLING AND ANALYSIS EQUIPMENT

### 4.10.1 DANIEL'S DANALYZER GAS CHROMATOGRAPH SYSTEM

A small gas sample is retrieved from the pipeline at nominal intervals of 3 – 6 minutes and is analysed by the C6 gas chromatograph for the following components:

- Methane ($CH_4$)
- Ethane ($C_2H_6$)
- Propane ($C_3H_8$)
- I-Butane ($iC_4H_{10}$)
- N-Butane ($nC_4H_{10}$)
- Neo-Pentane ($neoC_5H_{12}$)
- I-Pentane ($iC_5H_{12}$)
- N-Pentane ($nC_5H_{12}$)
- N-Hexane$^+$ (nC6+)
- Nitrogen ($N_2$)
- Carbon Dioxide ($CO_2$)

A small gas sample is retrieved from the pipeline at nominal intervals of 3 – 6 minutes and is analysed by the C9 gas chromatograph for the following components:

- Methane ($CH_4$)
- Ethane ($C_2H_6$)
- Propane ($C_3H_8$)
- I-Butane ($iC_4H_{10}$)
- N-Butane ($nC_4H_{10}$)
- Neo-Pentane ($neoC_5H_{12}$)
- I-Pentane ($iC_5H_{12}$)
- N-Pentane ($nC_5H_{12}$)
- N-Hexane ($nC_6H_{14}$)
- N-Heptane ($nC_7H_{16}$)
- N-Octane ($nC_8H_{18}$)
- N-Nonane+ ($nC_9$+)
- Nitrogen ($N_2$)
- Carbon Dioxide ($CO_2$)

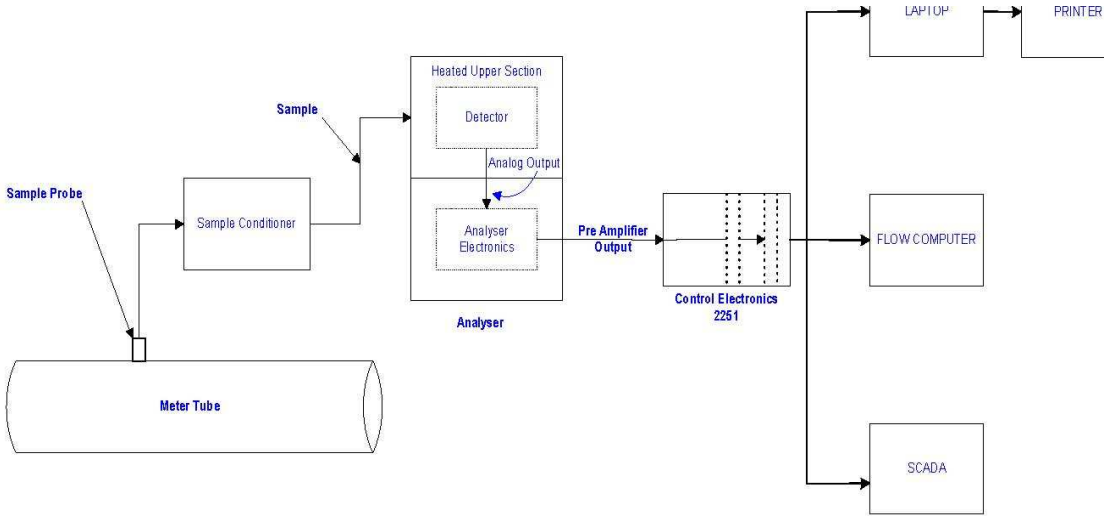


**Figure 4.10.1: Daniel Industries DANALYSZER Chromatograph System**

Component analysis, in general terms, is achieved by passing the sample gas through a separation system. A detector located at the outlet of the separator senses the elusion of each component from the column and outputs an electrical signal, proportional to the volume.

An internal microprocessor calculates from the above data the relative densities, compressibility factor, Higher Heating Values, and the Wobbe index. The basis of these calculations is ISO-6976. These figures are telemetered to the control room via a SCADA system and are also fed into the flow computer for correcting gas volume and calculating gas quantity.

The chromatograph automatically calibrates itself every 24 hours using a reference gas custom-blended to be very similar to the gas being transported. This reference gas is supplied with a certification of analysis, which is entered into the chromatograph for self-adjustment on calibration.

The chromatograph is checked during the routine verifications of gas analysis and energy accounting equipment.

### 4.10.2 MOISTURE ANALYSERS

The Alpha Moisture Analyser draws a continuous stream sample from the gas flow and provides an analogue indication of dewpoint temperature and/or parts per million, together with an analogue output signal and alarm function. The response time from dry to wet is a maximum of 30 sec. The response time from wet to dry depends upon the operating conditions; gas temperature, pressure and flow rate. The gas is typically dry, so the wet to dry response time is of lower priority.

In general terms, the analyser uses the dielectric property of water to establish its dew point. A sensor, essentially a porous capacitor, is immersed in the gas sample stream. Water vapour is absorbed into and condensed within the hygroscopic dielectric layer of the sensor

until equilibrium with the gas stream is reached. The change in the dielectric value of the sensor is measured by the analyser and equated to moisture content.

The analogue output of the analyser is connected to the SCADA system and alarmed and monitored according to the specification of Table 2.1.1**: GAS QUALITY SPECIFICATIONS**.

The moisture analysers are checked as part of routine verifications of gas analysis and energy accounting equipment.

## 4.11 TEST AND CALCULATION PROCEDURES

Standard test and calculation procedures for property analysis are listed in the table below.

| PROPERTY | CODE |
|---|---|
| Hydrocarbons | ISO 6974 AND ISO 6975;<br>ASTM1945; OR<br>GPA 2261 |
| Carbon Dioxide | ISO 6974 AND ISO 6975;<br>ASTM D1945; OR<br>GPA 2261 |
| Nitrogen | ISO 6974 AND ISO 6975;<br>ASTM D1945; OR<br>GPA 2261 |
| Oxygen | ISO 6974 AND ISO 6975;<br>ASTM D1945; OR<br>GPA 2261 |
| Water | ISO 6327;<br>ISO 10101;<br>ISO 11541; OR<br>ASTM D1142 |
| Higher Heating Value | ISO 6976;<br>GPA 2172; OR<br>ASTM D3588 |
| Lower Heating Value | ISO 6976;<br>GPA 2172; OR<br>ASTM D3588 |
| Relative Density | ISO 6976;<br>GPA 2172; OR<br>ASTM D3588 |
| Wobbe Index | ISO 6976;<br>GPA 2172; OR<br>ASTM D3588 |
| Compressibility Factor | ISO 12213;<br>GPA 2172; OR<br>ASTM D3588 |
| Mercaptan Sulphur | ISO 6326;<br>ASTM D6228 (0.02 to 20 mg/m3); OR |

| | |
|---|---|
| | ASTM D5504 (0.01 - 1,000 mg/m3) |
| Tetrahydrothiophene | ISO 6326;<br>ASTM D6228 (0.02 to 20 mg/m3) ); OR<br>ASTM D5504 (0.01 - 1,000 mg/m3) |
| Tertiary Butyl Mercaptan | ISO 6326;<br>ASTM D6228 (0.02 to 20 mg/m3) ); OR<br>ASTM D5504 (0.01 - 1,000 mg/m3) |
| Hydrogen Sulphide | ISO 6326;<br>GPA 2265 |
| Total Sulphur | ISO 6326;<br>ASTM D4468 (0.001 - 20 ppm/v);<br>ASTM D6228 (0.02 to 20 mg/m3);<br>ASTM D5504 (0.01 - 1,000 mg/m3); OR<br>ASTM D1072 (25 - 700 mg/m3) |
| Trace Elements | ASTM D3919 |
| Solids | ASTM D3926 |

**Figure 4.11.1: Standard Test and Calculation Procedures**

## 4.12 OFF SPECIFICATION GAS

Jemena is contractually obligated to flow on behalf of its Shippers only gas that meets specification as outlined above and in more detail in the Jemena EGP Standard Terms and Conditions Clause 19. It is the Shipper's responsibility to ensure that gas to be transported meets this specification at its Receipt Point.

Jemena will immediately notify the Shipper and Supplier when gas is not meeting specifications as identified by Jemena gas quality measuring devices at the Receipt Point. Knowledge of the presence of off-specification gas by Jemena personnel, does not relieve the Shipper from its contractual obligation for providing gas meeting the specifications, or liability for any direct or indirect damages incurred by Shippers due to the receipt of off-specification gas on behalf of a Shipper.

Off specification gas is gas, which does not meet the required standards as set out in section 19 of the EGP Standard Terms and Conditions.

If Shippers receipt gas does not meet specifications Jemena may exercise its right to terminate receipt of gas from the Shipper.

Jemena may consider (for short term emergencies) co-mingling or blending of the off specification gas with gas which is in the pipeline, however, if in the opinion of EGP, the co-mingling or blending of the off specification gas may have an adverse or deleterious effect on any other Shipper on the pipeline, Jemena will terminate the receipt of such gas and immediately notify the Shipper and the Shipper's Supplier of such action.

The supplier can recommence supply when the supplier can prove to Jemena's satisfaction

that gas intended for receipt on to the pipeline has been returned to within specification limits. In resuming receipt of gas after an off specification termination, Jemena will not accept any off specification gas which has accumulated in the connecting pipeline to the Jemena pipeline.