Envestra
Investing in energy infrastructure

APA Group

# VICTORIA & ALBURY

# NETWORKS

# CAPACITY MANAGEMENT PLAN

Version 0.6

February 2012

## PREFACE

The objective of this Capacity Management Plan (CMP) is to document:

- The current capacity performance of Envestra's Victorian and Albury Gas Company Distribution Networks (the 'Network');
- The basis for maintaining capacity within the Network;
- Projected load growth and other drivers for network augmentation; and
- The scope, timing and budget estimates of augmentation projects required to effectively sustain network growth and maintain a safe and reliable supply of gas to consumers.

The body of the CMP is structured into 3 sections:

Section 1 - General

- This section provides an overview of the Network and associated assets covered by this plan, and the processes and criteria used to manage network capacity.

Section 2 - Network Demand and Performance

- This section covers forecast demand, network capacity issues and an overview of required network augmentation projects. Supporting business cases detailing drivers, options and costs for network augmentation have been prepared as separate documents.

Section 3 - Appendices

- This section covers detailed information referenced in the preceding sections. It contains a summary schedule of all augmentation projects forecast for the period up to the end of 2017..

## Distribution List

| Manager | Title |
|---|---|
| Edward DePrinse | General Manager APA Networks |
| Brian Fitzgerald | Manager Victorian Networks |
| Ada Cinaglia | Manager Planning & Engineering |
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## Amendment Record

| Version | Date | Changes Made |
|---|---|---|
| 0.1 | June 2011 | First revision |
| 0.2 | June 2011 | Second revision (RM) |
| 0.3 | September 2011 | Update business cases and tables (KL) |
| 0.4 | January 2012 | Review and general update by JRK |
| 0.5 | January 2012 | Review and general update by RM |
| 0.6 | February 2012 | Review and general update by JRK |
| | | |

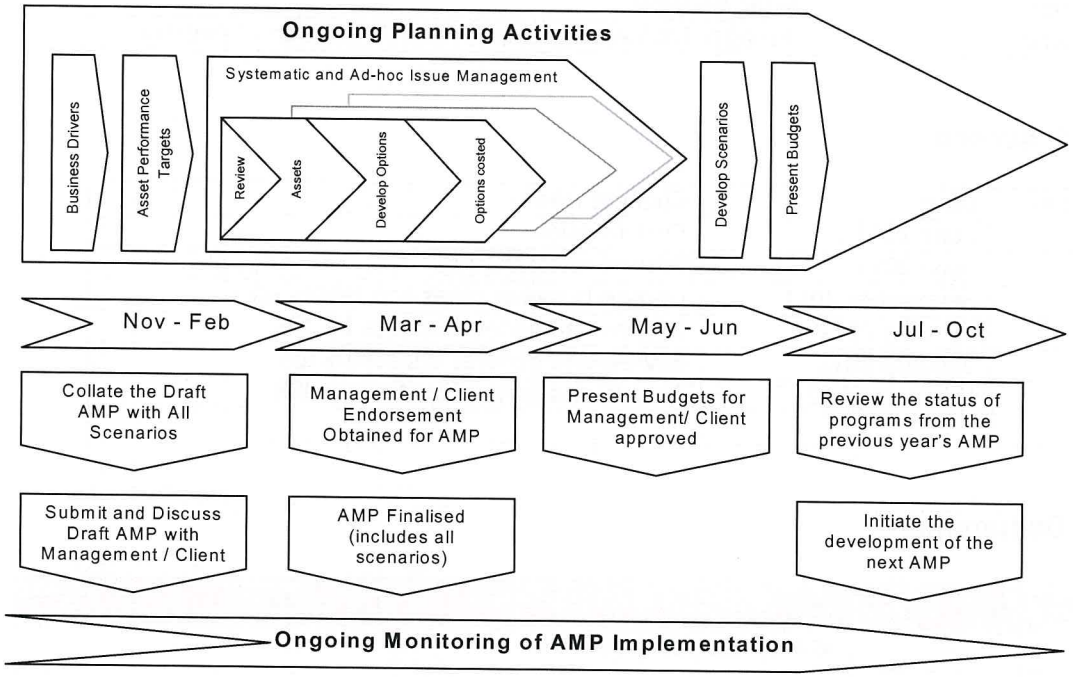
## Reference Documents

| Version | Date | Title | File Reference |
|---|---|---|---|
| | | AS 4645 - Gas Distribution Code | |
| 9.0 | 12 December 2008 | Essential Services Commission (Victoria), Gas Distribution System Code | |
| Issue 2 | March 2009 | VIC -02001 : « Engineering Procedures for Planning a Gas Distribution System : Victorian Networks » | |
| Issue 1 | January 2008 | Procedure No : ES 4127, Victorian Networks Engineering Standards, Distribution Mains and Services | |

## Update and Review Cycle

This plan is reviewed and updated as part of the overall year-round process of Asset Management planning. The process itself can be broadly considered as consisting of two parallel activities:

- The ongoing monitoring of both current asset performance and the implementation of the previous year's projects.
- Project development, taking into account asset performance and risk assessments, followed by assessment of technical solutions, budget preparation and then securing approval to proceed.




## Revision and Update of the Plan

The Manager, Asset Strategy and Planning (Vic) is responsible for revising and updating this plan.

## Definitions

| Abbreviation | Definition |
|---|---|
| AEMO | Australian Energy Market Operator |
| CAPEX | Capital Expenditure |
| CI | Cast Iron |
| CTM | Custody Transfer Meter |
| DTS | Declared Transmission System |
| EDD | Effective Degree Day |
| GasNet | APA Transmission (Victoria) - GasNet |
| GIS | Geographic Information System |
| HP | High Pressure |
| LP | Low Pressure |
| MAOP | Maximum Allowable Operating Pressure |
| MinAOP | Minimum Allowable Operating Pressure |
| MIRN | Meter Installation Registration Number |
| MP | Medium Pressure |
| SCADA | Supervisory Control and Data Acquisition |
| SP | Protected Steel |
| TP | Transmission Pressure |
| UPS | Unprotected Steel |
| Vic | Victoria |

# SECTION 1 GENERAL

## 1.1 Network Overview

This section documents Envestra's principal gas distribution networks within the Network and associated assets. It should be noted that Envestra's Mildura network, while geographically located within Victoria, is operated and managed as part of Envestra's South Australian network, and is therefore not covered by this document.

## 1.2 Sources of Supply (Refer to Maps - Appendices 1&2)

The majority of the Network is supplied with natural gas from the Declared Transmission System (DTS) operated by AEMO and managed by APA Gasnet.

Envestra's Bairnsdale and Paynesville networks are supplied from Jemena's Eastern Gas Pipeline.

The DTS is primarily supplied by gas from the ESSO/BHP plant at Longford. The DTS also receives supplementary gas injections at Iona (from gas supplied either from the Otway Basin or the underground gas storage facility), Culcairn (from gas sourced from the Moomba Basin), Pakenham (from the Yolla fields) and the LNG facility at Dandenong.

Gas is delivered into the Network via gate or custody transfer stations. These transfer stations consist of facilities that control the delivery pressures and or measure and report on the quantity and quality of gas injected into the Network.

The custody transfer metering facilities are owned and operated by the upstream transmission pipeline organisations (Gasnet and Jemena). The pressure reducing facilities are owned and operated by Envestra.

Envestra has access to metering facilities data and equipment calibration witnessing rights through contractual interface agreements.

In total there are 56 custody transfer points supplying gas to the following principal gas distribution regions.

- Melbourne Metro - Central
- Melbourne Metro - North
- Mornington Peninsula
- Gippsland
- Bairnsdale
- Goulbourn Valley
- Murray Valley
- Northern Regional

The table below summarises Envestra's principal sub-networks and their respective Custody Transfer Meters (CTM).

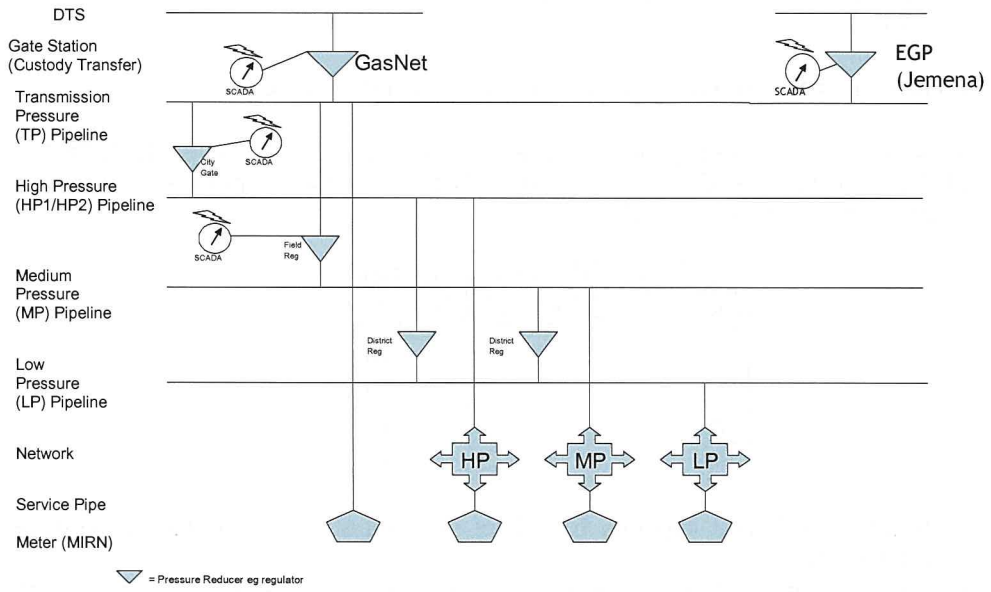
| CTM MIRN | CTM LOCATION | CTM GROUP | Logical Network |
|---|---|---|---|
| Melbourne Metropolitan Region | | | |
| 30000112PC | Epping | Melbourne | Melbourne Central |
| 30000107PC | Keon Park | Melbourne | |
| 30000013PC | Melbourne | Melbourne | |
| 30000017PC | West Melbourne | Melbourne | |
| 30000033PC | Healesville | Melbourne | Healesville |
| 30000145PC | Mernda | Melbourne | Mernda |
| 30000172PC | Whittlesea | Melbourne | Whittlesea |
| 30000194PC | Beveridge | Melbourne | Beveridge |
| Mornington Peninsula Region | | | |
| 30000002PC | Dandenong | Peninsula | Mornington |
| 30000040PC | Hampton Park | Peninsula | Berwick |
| 30000041PC | Narre Warren | Peninsula | |
| 30000042PC | Berwick | Peninsula | |
| 30000193PC | Officer | Peninsula | |
| 30000038PC | Clyde | Peninsula | Clyde |
| 30000036PC | Cranbourne (Huon Park) | Peninsula | Cranbourne |
| 30000037PC | Cranbourne (C'bourne Rd) | Peninsula | |
| 30000035PC | Lyndhurst | Peninsula | Lyndhurst |
| 30000039PC | Pakenham | Peninsula | Pakenham |
| Gippsland Region | | | |
| 30000055PC | Churchill | Gippsland | Churchill |
| 30000092PC | Darnum | Gippsland | Darnum |
| 30000057PC | Drouin | Gippsland | Drouin |
| 30000065PC | Longwarry | Gippsland | Longwarry |
| 30000069PC | Moe | Gippsland | Moe |
| 30000070PC | Morwell (City Gate) | Gippsland | Morwell (City Gate) |
| 30000066PC | Morwell (Firmins Ln) | Gippsland | Morwell (Firmins Ln) |
| 30000072PC | Rosedale | Gippsland | Rosedale |
| 30000073PC | Sale | Gippsland | Sale |
| 30000078PC | Trafalgar | Gippsland | Trafalgar |
| 30000079PC | Traralgon | Gippsland | Traralgon |
| 30000084PC | Warragul | Gippsland | Warragul |
| 30000086PC | Yarragon | Gippsland | Yarragon |
| Bairnsdale Region | | | |
| 30000178PC | Bairnsdale | Bairnsdale | Bairnsdale |
| Goulburn Valley Region | | | |
| 30000058PC | Echuca | Goulburn Valley | Echuca |
| 30000062PC | Kyabram | Goulburn Valley | Kyabram |
| 30000068PC | Merrigum | Goulburn Valley | Merrigum |
| 30000075PC | Shepparton | Goulburn Valley | Shepparton |
| 30000076PC | Tatura | Goulburn Valley | Tatura |
| 30000077PC | Tongala | Goulburn Valley | Tongala |
| Murray Valley Region | | | |
| 30000094PC | Chiltern | Murray Valley | Chiltern |
| 30000105PC | Cobram | Murray Valley | Cobram |
| 30000106PC | Koonoomoo | Murray Valley | Koonoomoo |
| 30000103PC | Rutherglen | Murray Valley | Rutherglen |
| 30000104PC | Yarrawonga | Murray Valley | Yarrawonga |
| Northern Region | | | |
| 30000050PC | Benalla | Northern | Benalla |
| 30000051PC | Benalla North | Northern | Benalla North |
| 30000053PC | Broadford | Northern | Broadford |
| 30000059PC | Euroa | Northern | Euroa |
| 30000061PC | Kilmore | Northern | Kilmore |
| 30000074PC | Seymour | Northern | Seymour |
| 30000071PC | Tallarook | Northern | Tallarook |
| 30000081PC | Wallan | Northern | Wallan |
| 30000082PC | Wangaratta | Northern | Wangaratta |
| 30000083PC | Wangaratta East | Northern | Wangaratta East |
| 30000056LC | Wodonga | Northern | Wodonga |
| 20000015LC | Albury | Northern | |

## 1.3 Network Description

### 1.3.1 Network Overview

The Network is made up of a collection of sub networks with assets operating under different pressure regimes. These sub networks are defined based on operating pressure, gas flow null points, and or geographic location.

The following diagram provides an overview of Network key components.




### 1.3.2 Pressure Regimes

The Network operates under five pressure regimes as defined in the following table.

| Pressure Regime | Definition |
|---|---|
| Transmission Pressure (TP) | Networks with a MAOP between 1050 kPa and 10,000 kPa |
| High Pressure (HP1) | Networks with a MAOP between 140kPa and 515 kPa |
| High Pressure (HP2) | Networks with a MAOP between 515kPa and 1050 kPa |
| Medium Pressure (MP) | Networks with a MAOP between 7 kPa and 140 kPa |
| Low Pressure (LP) | Networks with a MAOP up to 7 kPa |

Each sub-network has its own defined operating range depending on the network configuration and capacity requirements. Operating pressures may vary depending on seasonal load demand.

Nominal operating pressure ranges are summarised in the following table. Actual operating pressures may vary within these ranges.

| Network Operating Pressure Ranges - kPa | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pressure Regime | Melbourne Metro | Mornington Peninsula | Gippsland | Goulbourn Valley | Murray Valley | Northern | Bairnsdale |
| TP | 1050-2760 | 1050-2760 | 1050-4200 | 1050-2760 | - | 1050-2760 | 2760-7400 |
| HP1 | 140-515 | 140-515 | 140-515 | 140-515 | 140-515 | 140-515 | 140-150 |
| HP2 | 515 - 1050 | 515-1050 | - | 515-1050 | 515-1050 | - | |
| MP | 15-140 | 15-140 | - | - | - | - | |
| LP | 1.5-7 | 1.5-7 | 1.5-7 | 1.5-7 | | 1.5-7 | |

Minimum pressures are nominated based on the following considerations:

- Minimum distribution supply point pressures as nominated in Schedule 1, Part A of the Victorian 'Gas Distribution System Code'. The minimum pressures are detailed in the following table.

| Pressure Regime | Minimum Fringe Point kPag | Minimum Outlet of Meter kPag |
|---|---|---|
| LP | 1.4 | 1.1 |
| MP | 15 | 1.1 |
| HP1 | 140 | 1.1 |
| HP2 | 600 | 1.1 |

- Maintain sufficient capacity to deliver demand at agreed metering pressures to I&C consumers.
- Meeting minimum inlet design pressures to ensure effective pressure control by district regulators feeding lower tier networks is maintained; and
- Maintaining sufficient capacity to ensure variation in demand, caused by weather, additional connections to the network and or consumer diversity, does not result in loss of supply.

### 1.3.3 Pipe Material and Length

The following tables summarise the inventory of all transmission and distribution mains within the Network as of 23rd December 2011.

| Installed Mains Summary - km | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | CI | Coated Steel | HDPE | MDPE | PE - LP | PVC | UPS | Total |
| Low | 527 | 43 | 0 | 3 | 7 | 515 | 53 | 1149 |
| Medium | 35 | 28 | 12 | 2 | 0 | 0 | 2 | 79 |
| High | 0 | 3001 | 3071 | 3135 | 0 | 0 | 30 | 9236 |
| Transmission | 0 | 245 | 0 | 0 | 0 | 0 | 0 | 245 |
| Total | 561 | 3317 | 3083 | 3140 | 7 | 515 | 85 | 10709 |
| % | 5% | 31% | 29% | 30% | 0.06% | 5% | 0.8% | 100% |

## 1.4 System Capacity Management

This section details the philosophy, processes and criteria that underpin capacity management for the Network.

### 1.4.1 Capacity Management Philosophy

Network capacity management seeks to avoid the risk of:

- Creating a potentially hazardous condition for domestic consumers should there be a momentary loss of supply
- Interruptions to customers and businesses
- Developing a perception that delivery of gas is unreliable, which would adversely affect future utilisation of the Network.
- Breaching regulatory obligations.

Network capacity management involves:

- Monitoring network performance;
- Assessing foreseeable demands and its impact to system delivery pressures;
- Assessing threats to supply; and
- Addressing the above according to the risk they present, balancing the costs of doing so against the benefits of expending limited resources elsewhere in the Network.

Network capacity is augmented where:

- The minimum pressure in a network falls, or is forecast to fall, below the recommended minimum end of main pressure during design load conditions.
- There is insufficient redundancy within the network adversely affecting the security of supply to a large number of consumers should damage occur.

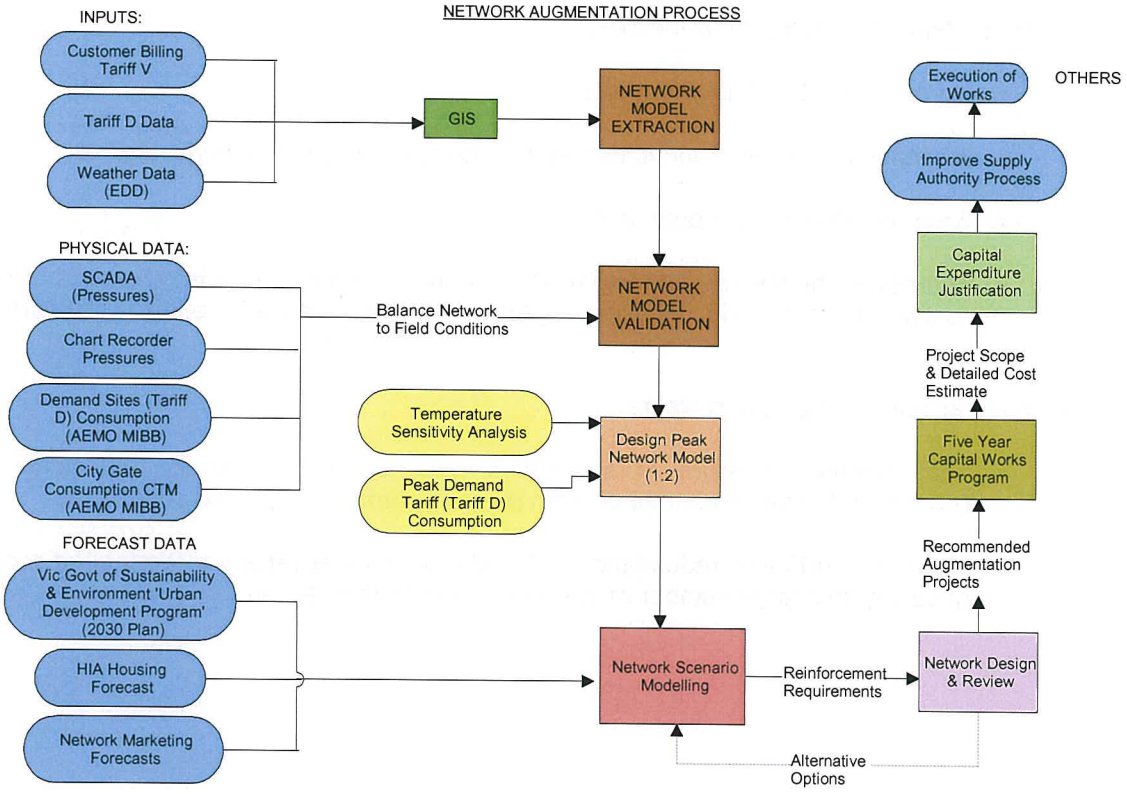
### 1.4.2 CAPACITY MANAGEMENT PROCESS

Network augmentation planning involves the assessment of network capacity and developing options for maintaining adequate capacity in the gas network to ensure supply is maintained to all existing and new consumers given network utilisation and load growth, effects of weather, and risks associated with a single point of failure within the network.

The output from this process is a specification for additional infrastructure or operational changes required to support peak system demand, for both new and existing consumers.

The network augmentation process is summarised in the following flow diagram.

Details of the network augmentation process are provided in the "Engineering Procedures for Planning a Gas Distribution System: Victorian Networks".



Capacity Management key activities are summarised as follows:

#### 1.4.2.1 *Maintaining Baseline Capacity Models.*

Meter to main connectivity configuration is maintained within the GIS. Network details are exported from the GIS into capacity modelling software (SynerGEE) where network models are validated matching actual network pressure and flow measurements.

#### 1.4.2.2 *Design Load Assessment - Transmission*

The process in determining the design load is a combination of CTM demand data and a bottom-up approach of peak day hourly consumption derived from validated network models which are supplied by the transmission system and converting this peak to an equivalent 1 in 20 year peak load (EDD of 16.5) and daily profile.

Tariff D customer design loads are normalised on a "semi" coincident basis that considers coincident use during the peak hour and non-coincident peak hour flows during the peak evening period during winter. Tariff D loads are not considered temperature sensitive.

#### 1.4.2.3 *Design Load Assessment - Distribution*

The design basis conditions for lower tier networks are derived from the minimum recommended network fringe pressures detailed in Schedule 1 Part A of the Victorian Gas Distribution Code (Refer to Section 1.3.2).

The design load is based on a 1 in 2 year peak load (EDD 14.55). The combination of a 1:2 EDD and minimum network fringe pressure criteria provide the capacity margin to cater for variations of load during more severe winters.

#### 1.4.2.4 *Forecasting Load Growth*

For network planning and augmentation purposes, domestic load growth forecasts are compiled based on data from:

- The Urban Development Program published by the Victorian Department of Sustainability and Environment,
- Housing Industry Association data
- Internal marketing and connection trend analysis
- NIEIR forecast assessment
- Historic growth

Forecast additional connections are converted to an expected hourly demand at specific locations within the network. The output of this process is an annual load growth file that is superimposed on the network model to identify future capacity constraints.

#### 1.4.2.5 *Forecasting & Assessing Network Requirements.*

Various load scenarios and network augmentation options are analysed using a computer based network modelling application (SynerGEE). Capacity shortfalls are identified and solution options modelled to confirm pipe size, pressure, location and timing requirements.

The timing of projects is based on the year that capacity shortfall is identified based on load growth assumptions. These are reviewed on an annual basis to account for variations in forecast connection numbers, coincident loads and location of new developments.

#### 1.4.2.6 *Development of Augmentation Concept Plans.*

The various capacity, replacement and security of supply issues are reviewed and options considered. A high level description and summary of options and issues are produced and documented within the individual network files. This data is later collated for inclusion within a 5-year capital works programme.

All works are assessed annually based upon relative system growth and other works which may impact or alter the project requirements, such as mains renewal works, new estate developments and security of supply priorities, to define the following budget year's augmentation requirements.

#### 1.4.2.7 *Developing Augmentation Project Business Cases*

A business case is developed and approved in line with nominated delegations of authority.

Each project's business case addresses:

- An overview of scope, cost and timing
- Drivers for change
- Options Considered
- Justification
- Detailed Cost Breakdown

In addition to normal commercial and business drivers, augmentation projects must conform to the National Gas Rules 79 (1) and (2) where:

- The capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services;

- The capital expenditure is necessary to:

    - maintain and improve the safety of services; or
    - maintain the integrity of services; or
    - comply with a regulatory obligation or requirement; or
    - to maintain the service provider's capacity to meet levels of demand for existing services

### 1.4.3 Mains Replacement Planning

Mains replacement, where applicable to a network, focuses on cast iron and unprotected steel mains, typically found in LP networks. Key network performance data (leak repairs, mains breaks, water in main incidents, network operating pressures, operating and maintenance costs) are used to prioritise replacement areas.

The output of this process is combined with capacity and security of supply issues to optimise the location and size of principal supply mains and regulators within the network.

### 1.4.4 Security of Supply

Gas is increasingly being regarded by the community as an essential service, with an accompanying expectation that it will be uninterruptible under all but the most extreme events.

Historically, risks to supply arising from failure of network components have been considered relatively low probability events, with the network configuration providing intrinsic capacity to cater for such events.

The balance between functional design, economic viability and capacity requirements is an important consideration. Within this process the trade-off for additional infrastructure is based on:

- The physical effort and timing to reinstate supply
- The number of consumers affected, ie impact on the community
- the type of consumers affected, eg hospitals, schools
- risk/safety implications(which also involves the above factors).

### 1.4.5 NETWORK RISK ASSESSMENT

All Network Augmentation projects are assessed to provide a relative risk rating as part of prioritisation of stay in business Capex projects. The following matrix and prioritisation criteria are used.

| | Typical Severity Class | | Minor | Moderate | Severe | Major | Catastrophic |
|---|---|---|---|---|---|---|---|
| CONSEQUENCE | Health &Safety | | Single - no permanent injury Lost time injury | Multiple - no permanent injury | Hospitalisation Single permanent injury | Single fatality Multiple permanent injury | Multiple fatalities |
| | Financial Impact | | Less than $1M Change to Project Budget | $1M - $5M Change to Business Unit Budget | $5 - $20M Financial explanation to Market Regulators | $20 - $50M Change to strategy due to Cash Flow constraints | $50M + Cash Flow crisis Credit Rating downgraded |
| | Customer & Business Interruption | | Short term localised service interruptions to less than 100 customers / day Parameters not met to1 contract customer | Short term localised service interruptions to less than 1000 tariff customers / day or 1 contract customer | Loss of service to less than 10000 tariff customers / day, or few contract customers | Short term loss of service to more than 10000 customers / day Area growth affected | Long term loss of service to mass market (>100000 customers /weeks). Viability of Company in doubt |
| | Environment | | Localised incident immediately contained | Localised damage immediately contained. Reportable - no financial penalty | Serious short term impact to ecosystem Reportable - financial penalty | Serious long term impact to ecosystem Reportable - prosecution | Wide area - long term affected Reportable - potential lost of licence |
| | Compliance & Legal | | Technical non-compliance with statutory, licence, regulations. Voluntary explanation to Regulator | Non- compliance with statutory, licence, regulations. Compulsory explanation to Regulator | Non-compliance with statutory, licence, regulations New conditions to Licence manageable | Non-compliance with statutory, licence, regulations New conditions to Licence affecting ability to operate | Non-compliance with statutory, licence, regulations. Loss of Licence. Significant financial penalty Prosecution |
| | Reputation | | Isolated localised public complaints | Adverse comments in local media Public statement required | Adverse comments in State media Widespread concern from investors, customers and regulators | Adverse coverage in National media. Customers and investors question company reliability | Prolong adverse coverage in national/ international media. Significant impact on shareholder value |
| LIKELIHOOD | Almost Certain | Expected in most circumstances, At least once per year or more | Moderate 11 | High 16 | Extreme 20 | Extreme 23 | Extreme 25 |
| | Likely | Will occur in most circumstances At least once every 3 years | Moderate 07 | High 12 | High 17 | Extreme 21 | Extreme 24 |
| | Possible | Might occur at some time At least once every 10 years | Low 04 | Moderate 08 | High 13 | Extreme 18 | Extreme 22 |
| | Unlikely | Could occur at some time At least once every 25 years | Low 02 | Low 05 | Moderate 09 | High 14 | Extreme 19 |
| | Rare | May occur only in exceptional circumstances Less than once every 25 years | Low 01 | Low 03 | Moderate 06 | Moderate 10 | High 15 |

| Priority | | Priority Description |
|---|---|---|
| Priority 1 | | Any project, where Risk Level of at least one risk area falls into Extreme must be included in Priority 1. These projects should be regarded as non-discretionary, as their justification is to mitigate the risk level that is not acceptable to APA. |
| Priority 2 | | Any project, where Risk Level of at least one risk area falls into High must be included in Priority 2. The non inclusion of these projects may expose APA, or third party asset owner to potential short and long-term business damage. |
| Priority 3 | | Any project, where Risk Level of at least one risk area falls into Moderate must be included in Priority 3. The non inclusion of these projects may affect reliability of assets; as well it may affect operating efficiency and compliance. |
| Priority 4 | | Any project, where Risk Level of at least one risk area falls into Low must be included in Priority 4. The non inclusion of these projects may affect opportunity for overall company risk reduction and operating efficiencies. |

# SECTION 2 NETWORK DEMAND & PERFORMANCE

## 2.1 Consumer Growth

### 2.1.1 HISTORIC & FORECAST CONNECTIONS

Details of Tariff V consumers grouped by distribution region, suburb/town are included in Appendices 3-9.

For the purposes of augmentation planning, forecast customer connections within regions have been based on historic trends and information on planned land releases.

There can be shifts in the number of connections within specific locations that alter the timing of network augmentation, bringing forward or delaying projects. Consequently forecast connections are periodically reviewed for material changes.

Historically approximately two to three additional Tariff D consumers are added each year. Generally it is not possible to forecast the size or location of these connections. The impact on the network is evaluated as and when they materialise. The relatively long lead times for such customers allow additional network infrastructure to be planned accordingly.

### 2.1.2 BASELINE TARIFF V DESIGN LOAD

A fully diversified average peak hourly 1:2 winter load of 1.1$m^3$/hr has been historically applied to new connections and is also applied to forecast new connections.

### 2.1.3 BASELINE TARIFF D DESIGN LOAD

The following table summarises the spread of Tariff D consumer peak hourly consumptions under various scenarios.

| Demand Customer Consumption Profile Summary - m3/hr | | | | | |
|---|---|---|---|---|---|
| Region | Year | Coincident Peak Hour Load Peak Day | Semi Coincident Evening Pk June -Aug 6.00pm-9.00pm | Semi Coincident Morning Pk June -Aug 6.00am-9.00am | Semi Coincident Winter June -Aug anytime |
| Melbourne Metro | 2011 | 31,034 | 42,732 | 55,580 | 58,108 |
| Peninsula | 2011 | 22,049 | 40,631 | 43,810 | 45,380 |

As there can be significant variation between coincident peak hour and semi coincident loads design loads for Tariff D consumers, these loads are based on actual winter load profiles but moderated to cater for the potential of higher loads during the network peak hour.

### 2.1.4 PROJECTED TARIFF LOAD GROWTH

Tariff V connections have been forecast based on:

- Housing Industry Association projections
- Victorian Department of Sustainability and Environment 'Urban Development Program'
- NIEIR forecasts
- Historic connection rates

Individual sub-network capacity has been assessed taking into account connection rates and trends observed within the relevant region (see Appendices 3-9) over the previous 5 years as well as information from external sources such as the Urban Development Program and the Housing Industry Association.

Based on a 1:2 year winter consumption of 1.1 $m^3$/hr/consumer, this domestic growth results in an annual increase in the network peak hour flow of about 16,500 $m^3$/hr/year.

### 2.1.5 PROJECTED TARIFF D LOAD GROWTH

Growth in gas consumption from the Tariff D market sector is expected to track in line with growth in the GDP. Based on typical peak day demand this could potentially add a further 1,500 $m^3$/hr/year growth. However, due to the uncertainty of the location and timing of new Tariff D consumers no allowance can been made for new Tariff D consumers in the modelling. The scope, cost and timing of supply mains and or network reinforcement is evaluated on case by case basis as these projects arise.

## 2.2 Network Augmentation and Reinforcement

### 2.2.1 Overview

The following sections provide an overview summary of network performance, and the drivers for augmentation. A schedule of forecast augmentation projects is detailed in Appendix 11. These business cases detail the scope, drivers for change, options, risks, costs and justification for the various augmentation projects.

Augmentation timing for individual projects has been based on the best available forecast. There will always be a degree of uncertainty associated with consumer connection volumes and location, changes to existing consumer load profiles and the addition/loss of major I&C consumer loads. To this end the timing and scope of all projects are reviewed annually.

### 2.2.2 TP Networks

#### *2.2.2.1 Sale to Maffra (Proj. Ref. V76 - Appendix 11).*

The Sale to Maffra transmission system supplies the east Gippsland towns of Sale and Maffra. The transmission system is supplied at a fixed pressure from the Sale City Gate to the John St limiter south of Sale.

Ongoing organic growth within the HP Sale and Mafra networks supplied by the transmission system is forecast to result in the transmission system reaching its capacity limit with potential to affect the demand consumer Murray Goulbourn in Maffra.

Analysis has confirmed, given severe (1:20) winter conditions and coincidence of consumer demand, there is a risk to supply to approximately 2,000 existing domestic and demand (Murray Goulburn and Ridley Agriproducts) consumers in Maffra unless the planned pipeline augmentation is carried out.

It is proposed to duplicate a section of the existing TP main from the Sale to Maffra.

#### *2.2.2.2 Dandenong to Frankston ( Proj. Ref. V77 - Appendix 11).*

The Dandenong to Frankston transmission system is the main supply to the northern-western portion of the Mornington Peninsula region. This system is fed from the main Dandenong to Crib Point pipeline, with supply sourced from the Dandenong Terminal Station (DTS).

The Dandenong to Frankston transmission system currently supplies in excess of 50,000 consumers. Additional development in Carrum Downs, Skye and Sandhurst and an increase in the average diversified demand due to changes in consumer behaviour and upgrading of appliances is forecast to exceed the capacity of the supplying city gate station.

It is proposed to increase the capacity of the gate station as part of an overall strategy to augment the capacity of the Dandenong to Crib Point transmission network meeting consumer demand as well as enhancing security of supply to the downstream Frankston high pressure network.

#### *2.2.2.3 Dandenong to Crib Point ( Proj. Ref. V78 - Appendix 11).*

The Dandenong to Crib Point Transmission system is the main transmission supply to the Mornington Peninsula region as well as providing an additional supply into the Cranbourne network. The pipeline delivers natural gas to over 120,000 consumers in this region,

representing 20% of Envestra's Victorian consumers and delivers 22% of Envestra's annual demand.

Peak demand during cold weather conditions coinciding with weekend/public/school holidays and the changing "landscape" with holiday homes becoming permanently occupied as the primary place of residence are contributing to the 'load creep' on the gas distribution system.

In addition strong growth in customer connections have been experienced within the Mornington Peninsula over the past 10 years and this is forecast to continue due to the Greenfield development sites within Carrum Downs, Mornington, Langwarrin and Cranbourne West which are supplied from this transmission network.

It is proposed to duplicate a section of the existing transmission main and install an additional TP to TP regulator.

### 2.2.3 HP Networks

#### 2.2.3.1 *Cranbourne ( Proj. Ref. V51 - Appendix 11).*

Land surrounding Cranbourne has been progressively released for development over the past number of years under Melbourne's Urban Development program. Future growth will remain strong within these areas with land supply for over 10 years still available for development.

Forecast new connections due to the above developments will require various mains extensions and interconnections between 2013 and 2016 to augment the capacity of the Cranbourne high pressure network.

#### 2.2.3.2 *Lynbrook (Proj. Ref. V52 - Appendix 11)*

The Lynbrook High Pressure Network supplies the southern Melbourne metropolitan suburbs of Lynbrook and Lyndhurst. This network is situated within one of Melbourne's major Urban Growth Areas in south-eastern metropolitan Melbourne.

Five major housing estate developments (Lynbrook, The Rise at Lyndhurst, Lynfield at Lynbrook, Mellington Estate and Marriott Waters Estate) are supplied from this system. Forecast new connections due to the above development will require a staged extension of a supply main in 2013 and 2017 to augment system capacity.

#### 2.2.3.3 *Frankston HP Network (Proj. Ref. V53 - Appendix 11)*

Land within Sandhurst, Skye and Carrum Downs has been progressively released for development over the past number of years under Melbourne's Urban Development program. Growth will continue within these areas with land supply for up to 10 years still available for development. In the established suburbs of Frankston, Seaford, Frankston North and Mt Eliza, there is incremental demand growth. This is partially due to new connections, which are relatively small, and an increase in the average diversified demand due to changes in consumer behaviour and upgrade of appliances.

Forecast new connections in new developments as well as incremental growth within the established suburbs will require interconnection of various supply mains between 2013 and 2016 to augment system capacity.

#### 2.2.3.4 *Wodonga HP Network (Proj. Ref. V54 - Appendix 11)*

Growth in the northern regional city of Wodonga and surrounding areas of West Wodonga, Leneva, Bandiana and Killara has required a continuing cycle of network planning and system augmentation.

Land within the areas named above has been progressively released for development over a number of years with connection rates steadily increasing during the past 10 years. Future

growth will remain at similar rates observed over the current Access Arrangement Period with land supply for over 20 years still available for development.

Forecast new connections due to the above development will require augmentation of the capacity of the Wodonga high pressure network before winter 2015.

#### 2.2.3.5 *Mornington Peninsula HP Network (Proj. Ref. V55 - Appendix 11)*

The Mornington Peninsula system is a long and relatively narrow system, extending 45 km between Mornington to Portsea. The network supplies gas to over 48,700 consumers. Growth in customer connections has varied between across the Peninsula with 1.5% per annum in Mornington to 3% per annum in Portsea.

Peak occupancy within the areas of Portsea, Sorrento, Blairgowrie and Rye are during holiday periods and long weekends. These areas are geographically the furthest away from the network supply points, with the system fringe being located at Portsea and Sorrento.

Accommodation within the abovementioned areas has changed dramatically over the past 15 years from basic holiday homes with no connected gas, to luxury accommodation with gas connected for spa/swimming pool heating and multiple heating and hot water appliances at many premises. Consequently, the increase in load per connection in the south-western tip of the Mornington Peninsula is more acute during holiday and long weekend periods. This behaviour differs to other networks that predominantly comprise domestic connections which follow a weekday peak, temperature sensitive profile.

Outages were experienced in Portsea and Sorrento (eastern extremity of the network) during the Queen's Birthday long weekend of 2006 where severe weather conditions coincided with a holiday period. As a result a long term strategy of augmenting both the HP and TP networks was developed to ensure system capacity was sufficient to meet consumer demand.

Forecast new connections, and change in usage patterns are driving augmentation with duplication and extension of supply mains, supply main pressure upgrade, and installation of a HP regulator required between 2013 and 2016 to maintain system minimum pressures.

#### 2.2.3.6 *Thomastown HP Network (Proj. Ref. V56 - Appendix 11)*

The Thomastown high pressure network is situated within one of Melbourne's major Urban Grown Areas. Land within Lalor and north of O'Herns Rd in Epping has been released for development over the past number of years under Melbourne's Urban Development Program. It is forecast that growth within this network will increase, especially within the postcode areas of Epping, Epping North and Wollert.

Forecast new connections in these areas will require a number of discrete extensions of supply mains and various interconnections between 2013 and 2017 to maintain adequate system capacity.

#### 2.2.3.7 *Plenty Valley HP Network (Proj. Ref. V57 - Appendix 11)*

The Plenty Valley high pressure network is situated within one of Melbourne's major Urban Grown Areas. Strong growth has been observed in postcode areas of Bundoora, Mill Park, South Morang, Mernda and Whittlesea. Strong growth is forecast throughout this network, especially within Mernda.

Forecast new connections in these areas will require an extension of a supply main and a small network interconnection between 2014 and 2017 to maintain system capacity.

#### 2.2.3.8 *Trafalgar HP Network (Proj. Ref. V58 - Appendix 11)*

Land to the east of Trafalgar has been progressively developed over recent years. Future expansion will continue to the east until the current land bank is fully developed with growth then expected to shift to the west of the system.

Forecast new connections due to the above development will require interconnection of supply mains between 2014 and 2016 to maintain system capacity.

#### 2.2.3.9 *PAKENHAM HP NETWORK (PROJ. REF. V59 - APPENDIX 11)*

The Pakenham high pressure network supplies the south eastern Melbourne suburbs of Pakenham and Officer which are two of Melbourne's major Urban Growth Areas. New domestic connections have been higher than forecast over the last few years. The recent expansion of the of the Urban Development Boundary along the Princess Highway corridor between Officer and Pakenham is expected to maintain strong demand for housing development in this area.

Forecast new connections will require the installation of a new gate station and various interconnections of supply mains between 2013 and 2016 to maintain system capacity.

#### 2.2.3.10 *MORWELL HP NETWORK (PROJ. REF. V60 - APPENDIX 11)*

The Morwell high pressure network supplies the south eastern Victorian township of Morwell. Organic growth throughout the township is forecast to continue at historic rates with total system loads expected to exceed the capacity of the supply regulator. A new TP - HP field regulator is proposed prior to the 2017 winter.

#### 2.2.3.11 *VARIOUS HP NETWORK AUGMENTATIONS (PROJ. REF. V61, V62, V68, V69, V71 & V73 - APPENDIX 11)*

A number of small interconnections within the high pressure networks in the suburbs of Sale, Somerville, Churchill, Wallan, Crib Point and Eltham have been identified to maintain pressures above the recommended minimum.

#### 2.2.3.12 *ALBURY HP NETWORK (PROJ. REF. V64 - APPENDIX 11)*

The Albury high pressure network supplies the southern New South Wales regional city of Albury and townships of Jindera and Thurgoona. The largest area of development in recent years has been in the eastern part of Thurgoona where there it is forecast that 2500 lots will be developed over the next 10 years.

Forecast new connections due to the above development will require interconnection of the network within Thurgoona.

Evaluation of the Albury network has highlighted a risk to supply to over 250 consumers from a single small diameter feed into the network. A secondary feed has been recommended to mitigate this risk.

#### 2.2.3.13 *DROUIN HP NETWORK (PROJ. REF. V65 - APPENDIX 11)*

This high pressure network supplies the south eastern Victorian regional township of Drouin. Development in regional areas outside the Victorian urban growth boundary has been promoted as an alternative to higher cost metropolitan estates. Drouin is well supported with rail and connections to major road infrastructure with growth increasing notably in recent years.

Forecast new connections in the east and west of the township will require interconnection within the Drouin network prior to the 2013 winter.

#### 2.2.3.14 *BERWICK HP NETWORK (PROJ. REF. V66 - APPENDIX 11)*

The Berwick High Pressure Network supplies the south-eastern Melbourne metropolitan suburbs of Hallam, Hampton Park, Narre Warren, Narre Warren North, Narre Warren South, Berwick, Beaconsfield and parts of Officer. These areas are within one of Melbourne's major Urban Growth Areas.

New domestic connections have been quite strong over the last few years and forecast to continue within isolated pockets of development within Narre Warren North, South Berwick, Hampton Park and infill development within Narre Warren South.

Forecast new connections will require augmentation of the capacity of the Berwick high pressure network prior to winter between 2014 and 2017. The augmentation works are

proposed to be staged to align with forecast development. Various extensions and interconnection of existing supply mains have been proposed.

#### 2.2.3.15 *MOE HP NETWORK (PROJ. REF. V67 - APPENDIX 11)*

The Moe High Pressure network supplies the south-eastern Victorian regional townships of Moe and Newborough.

Forecast new connections will required augmentation of the capacity to this system prior to winter 2016.

#### 2.2.3.16 *KILMORE HP NETWORK (PROJ. REF. V70 - APPENDIX 11)*

The Kilmore high pressure network is situated 16 km north of the current Melbourne Metropolitan Urban Growth boundary which terminates at Beveridge. Development in regional areas outside of the urban growth boundary are being promoted as an alternative to the higher cost metropolitan estates, targeting people that are willing to commute. Kilmore is well supported with access to rail transport and recent upgrading to the Hume Hwy and its connections to major road infrastructure into northern metropolitan Melbourne has improved private commuter access into Melbourne.

Historic growth in connections within this network has been relatively consistent. Future growth is forecast to continue at a similar rate with land supply for over 20 years still available for development.

Forecast new connections due to the above development will require augmentation of the capacity of the Kilmore high pressure network before winter 2013.

#### 2.2.3.17 *ECHUCA HP NETWORK (PROJ. REF. V72 - APPENDIX 11)*

The Echuca High Pressure Network supplies the northern Victorian regional townships of Echuca and Moama. The network is supplied from a City Gate in Echuca - Kyabram Rd, south of the township.

Forecast new connections will require augmentation of the capacity of the Echuca high pressure network prior to winter 2014 and winter 2017.

#### 2.2.3.18 *HEALESVILLE HP NETWORK (PROJ. REF. V74 - APPENDIX 11)*

The Healesville High Pressure Network supplies the north-eastern Victorian regional township areas of Healesville, Chum Creek and Badger Creek. The network is supplied from a City Gate in Maddens Lane Coldstream, west of the township.

Forecast new connections will require augmentation of the capacity of the Healesville high pressure network before winter 2013. The recommended works will provide supplementary supply to the east of the network providing security of supply and capacity to maintain minimum pressures.

#### 2.2.3.19 *Unspecified/Reactive HP Network Augmentation (Proj. Ref. V75 - Appendix 11)*

A provision for nominal sum of capital expenditure for future augmentation and security of supply works which cannot be specifically identified at this time.

When a system reaches a point of exceeding its design capacity due to system growth, the solution is generally to duplicate or upgrade the existing supply mains in a staged manner to a point where system capacity is restored. In networks within known growth corridors these works have already been identified. In fringe areas, townships and suburbs of low or moderate growth, an increase in utilisation per household (increased diversified hourly load) or an unforeseen growth in connections not included in forecasts may require system augmentation. This business case makes allowance for these circumstances. It has been observed with the introduction of continuous flow hot water services that the average domestic diversified hourly load has increased from 0.7$m^3$/hr up to 1.0 - 1.2 $m^3$/hr which also contributes to load growth in areas where new connections are minimal.

#### 2.2.3.20 *Traralgon HP Network Augmentation (Proj. Ref. V79 - Appendix 11)*

Forecast new connections will require augmentation of the capacity of the Traralgon high pressure network to maintain pressures above the recommended minimum.

This proposal is to augment system capacity in the Traralgon High Pressure network. The works are designed to enable Envestra to continue to meet its Gas Distribution Licence obligation of maintaining sufficient supply pressures in the township of Traralgon in accordance with the Gas Distribution System Code.

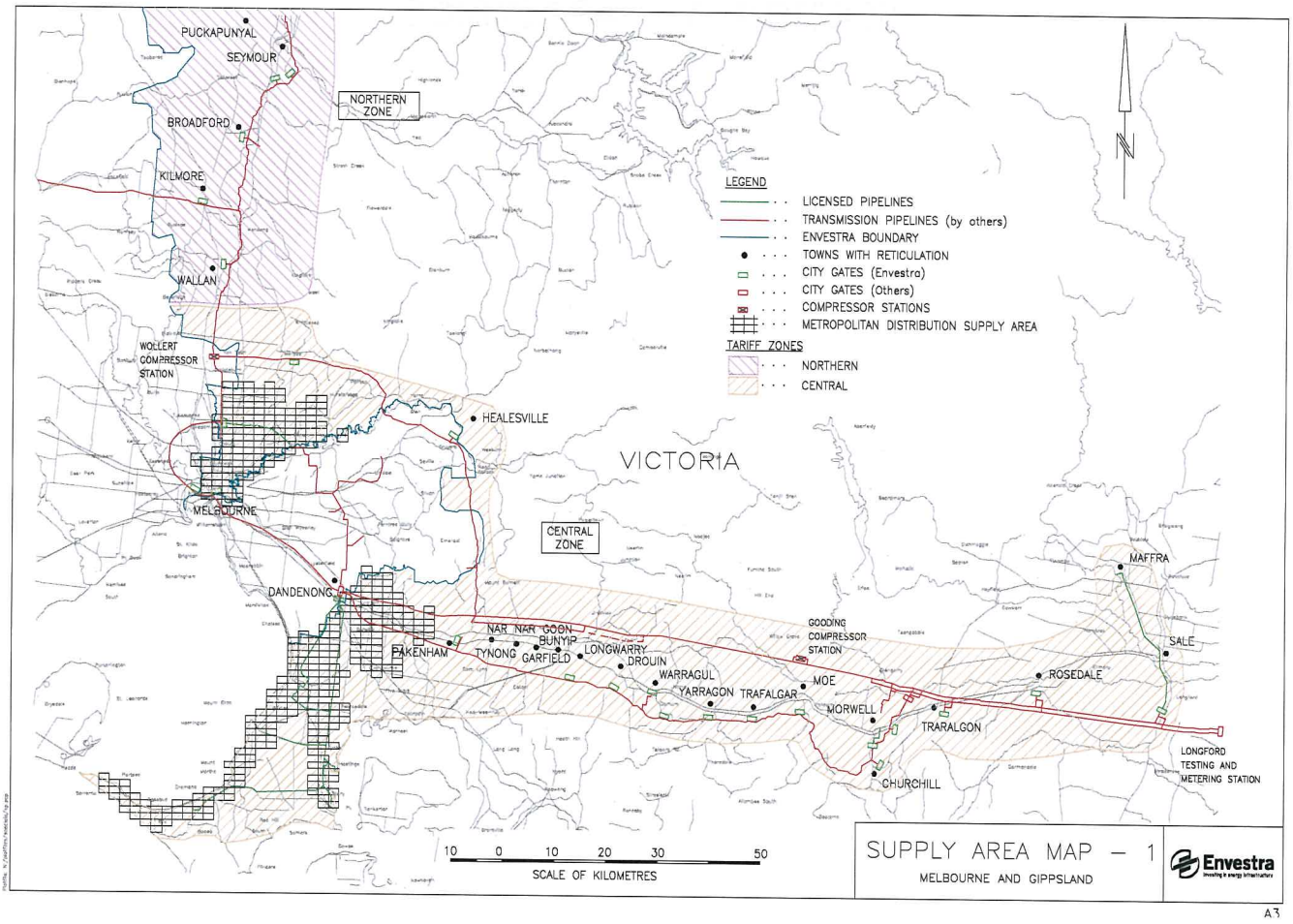
### 2.2.4 MP & LP Networks

Melbourne's LP networks, consisting primarily of cast iron and unprotected steel mains, are now reaching the end of their useful life, with various performance indicators all trending unfavourably, indicative of a network now reaching the end of its useful life. These networks are predominately fed from MP and HP networks

A strategy for the complete replacement and upgrade in pressure of the LP network on the grounds of risk, performance (capacity) and condition has been defined in the Vic Networks Mains Replacement Plan. It is expected that supply problems within the MP & LP networks will be addressed through the proposed replacement programme. It is however expected that there will still be a number of reactive augmentation projects necessary to address local capacity constraints pending completion of broad block replacement and pressure upgrade works.

# SECTION 3 APPENDICES

# Appendix 1 - VIC Metro and Gippsland Network



## Appendix 2 - Vic Northern and NSW Southern