VICTORIAN GAS PLANNING APPROACH

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

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CHAPTER 1. OVERALL

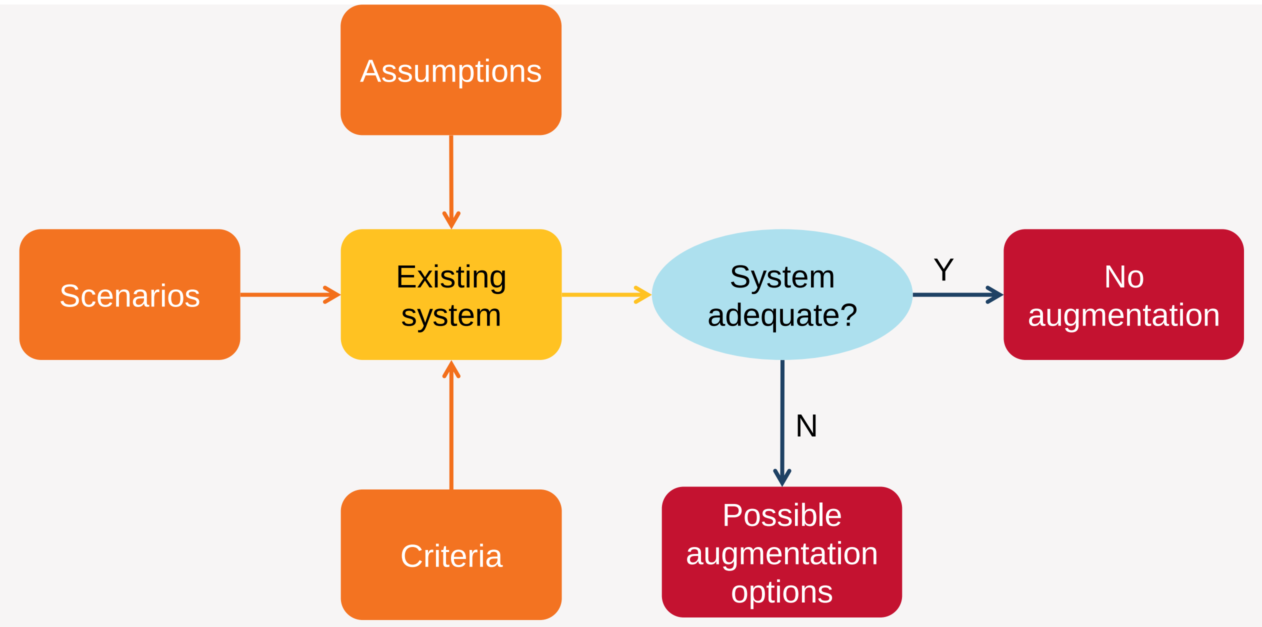
The Victorian Gas Planning Approach describes AEMO's approach to planning Victoria's gas Declared Transmission System (DTS).

AEMO's objective is to facilitate economically efficient expansion of the DTS as demand grows, while maintaining a safe and secure system (taking into account relevant uncertainties), and the timely provision of this information to the market.

A major requirement is for AEMO to forecast and report the adequacy of the gas supply and transmission capacity to meet anticipated demand. AEMO carries out detailed computer simulations of the DTS to analyse system adequacy.

Figure 1 shows a high-level overview of this process.

Figure 1 The Victorian gas planning process



When AEMO identifies a need for a DTS augmentation, we publish the information via the Victorian Gas Planning Review (VGPR) or a detailed planning report specific to that augmentation.

In previous years, AEMO's gas planning cycle was tied to the Victorian Annual Planning Review (VAPR), published annually in June. In 2013, the name of VAPR was changed to Victorian Gas Planning Report (VGPR). The changed Rule now requires the VGPR to be published every two years. For 2015, AEMO has merged the VGPR into the GSOO, published in March 2015.

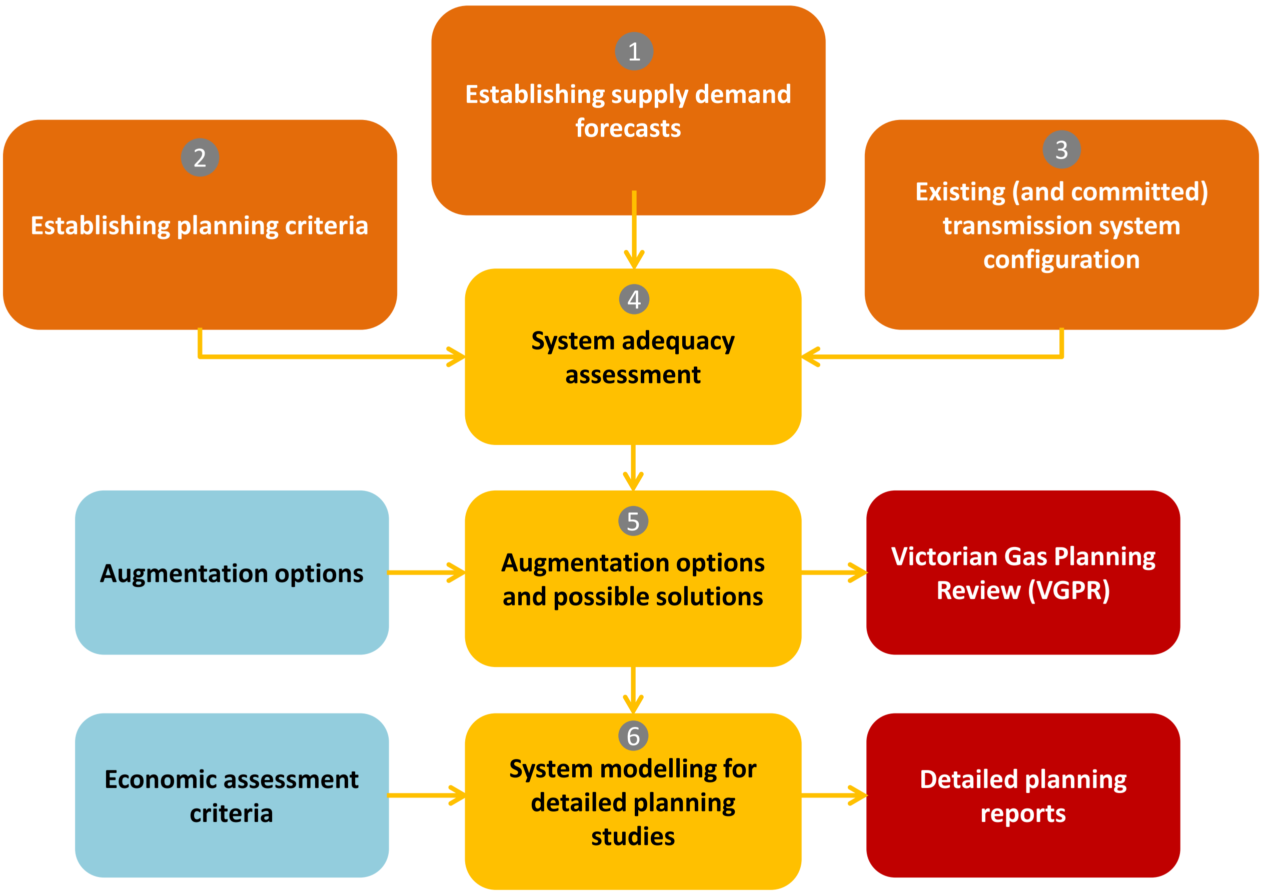
As a part of AEMO's obligation to review gas system adequacy, critical system pressures are also reviewed annually. AEMO prepares offtake pressure forecasts and provides these to gas distributors before winter.

CHAPTER 2. PLANNING METHODOLOGY

AEMO's planning methodology involves a series of tasks that aim to assess planning assumptions involving supply, demand, and capacity. They establish the planning criteria and operating characteristic requirements to enable safe and reliable supply over the outlook period.

Figure 2 shows a detailed description of AEMO's gas planning tasks and a high-level overview of the planning methodology.

Figure 2 Gas planning tasks



Establishing supply demand forecasts (step 1)

Planning assumptions consist of forecasts of gas supply, demand, and other operational assumptions such as load profiles. Before modelling work commences, AEMO validates these assumptions using historical data available in the database. As part of the VGPR process, five-year forecasts of peak day demand are prepared for each market sector, and for all system withdrawal zones (SWZs), based on a range of anticipated injection and withdrawal scenarios.

Establishing planning criteria (step 2)

The planning criteria address the operating characteristics that must be satisfied over the planning period to ensure the system is capable of safe and reliable operation. These include the critical minimum pressures at key locations from the Wholesale Market System Security Procedures (Victoria) (previously called AEMO System Security Guidelines), and a range of other operating criteria that need to be satisfied, such as linepack targets.

Existing (and committed) transmission system (step 3)

In conjunction with APA Group, AEMO creates and maintains the DTS models representing the current system configuration.

AEMO determines system capacity using a calibrated gas transmission system model – specifically, the Gregg Engineering WinFlow (steady state) and WinTran (transient) software modules.

AEMO's gas transmission system model is calibrated annually using actual winter metered gas injections and withdrawals on selected high and moderate demand days. Annual model calibration refines the model to ensure that it accurately simulates the observed pressures and flows throughout the DTS. The methodology and a set of assumptions and pipelines parameters are set out in the Guidelines for the Determination of the Victorian Gas Declared Transmission System Capacity document, jointly owned by AEMO and the APA Group.

AEMO also establishes the expected gas transmission system configuration factors for the planning outlook:

- Committed augmentations and upgrades to the transmission system.
- New connections.
- Planned changes at injection points and storage facilities.
- Known operational constraints.

The APA Group provides notification about planned augmentations, upgrades, and changes. Planned changes to one part of the transmission system can cause constraints in other parts of the system. As a result, it may be necessary to evaluate some projects within inter-related groups, resulting in one project in a group being contingent on other projects also proceeding.

System adequacy assessment (step 4)

AEMO assesses the system performance with the Gregg Engineering software. AEMO uses the VGPR to notify the market about potential system constraints.

The gas flows and pressures in the DTS are modelled under a range of demand and supply scenarios over a five-year outlook.

A system constraint is identified when the secure system parameters are breached (representing a potential threat to system security).[1]

Augmentation options and possible solutions (step 5)

Where appropriate, AEMO evaluates potential solutions. This involves considering a number of options available to restore the system to a secure state, including:

- Augmentations or upgrades to the gas transmission system.
- Additional or new supply capacity and storage.
- Economic curtailment.

[1] It is assumed that all pipeline facilities are available and operational.

The adequacy assessment studies consider a range of solutions, to the extent this is feasible, given the availability of data and commercial confidentiality. However, given the outlook period and the use of less detailed analysis, the constraints and constraint solutions must be treated as indicative only.

System modelling for detailed planning studies (step 6)

AEMO performs detailed planning studies (using deterministic[2] and probabilistic[3] mass-balance models) under the following circumstances:

- On request from APA Group to help its access arrangements review.
- When AEMO has identified a need for efficient augmentation investment, and the gas industry has not taken sufficient initiative.
- By request from regulators or government agencies to independently review requirements for augmentation(s).

Based on screening study recommendations, AEMO will select the key constraints identified over the next five years, and prepare a more detailed evaluation. The aim is to identify the economically efficient solution, and facilitate the required investment(s).

The aim of these studies is to facilitate actual investments by providing a rigorous and timely analysis that meets Australian Energy Regulator (AER) standards for regulatory approvals.

The planning reports for the detailed planning studies are published as required.

[2] Deterministic mass-balance modelling is used to evaluate the peak day requirement for LNG.
[3] Probabilistic mass-balance modelling is used to evaluate the benefits of carrying out a major augmentation by determining the reduction in LNG use and demand curtailment.

CHAPTER 3. PLANNING ASSUMPTIONS

AEMO applies a series of network assumptions and conditions relating to the supply of gas to the DTS for modelling the capacity to supply.

Table 1 to Table 3 list the standard modelling assumptions used by AEMO.

Table 3 and Table 4 list the capacity modelling assumptions used by AEMO for South West Pipeline and Northern Zone export.

An additional modelling assumption involves injections into the DTS that reflect known injection point capabilities at each injection point.

To better reflect real-world conditions, AEMO has modelled the adequacy of the system to meet peak demand using typical beginning-of-day (BoD) linepack[4] (lower than the linepack target) and surprise cold weather.[5]

Modelled maximum capacities can only be realised with reliable demand forecasting and operating conditions (on the day) that are similar to the model's assumptions. Extreme high demand days that test system capacity are often also surprise cold days, where scheduling is not optimum and maximum capacities cannot be realised. On peak days, the level of linepack and the BoD operating conditions are also critical. Modelled system capacity is based on pressures less than maximum allowable operating pressure (MAOP), which optimise operational capabilities.

[4] The BoD target is 855 TJ, being the total DTS linepack, which includes both passive and active linepack.

[5] If BoD injections are lower than required for the actual demand (due to actual demand exceeding forecast demand), linepack is depleted more quickly than expected, until injections are rescheduled upwards.

Supply assumptions

Table 1 lists the assumptions relating to the supply of gas to the DTS.

Table 1 Gas DTS supply modelling assumptions

Supply assumptions and conditions	Notes
Longford injections at flat hourly profile.	Normal operating condition.
VicHub injections at flat hourly profile.	Normal operating condition.
Iona and SEA Gas injection at flat hourly profile.	Normal operating condition.
Heating Value 38.7 MJ/m.3	Victorian gas standard properties.
New South Wales injection at Culcairn at flat hourly profile.	Normal operating condition.
Liquefied natural gas contracted vaporisation rate at 100 t/h for 11 hours.	For peak shaving purposes to support critical system pressures, LNG is effective only up to 10.00 pm. Eleven hours LNG is assumed, equivalent to 60 TJ.

Demand assumptions

Table 2 lists the assumptions relating to gas demand in the DTS, which have a significant effect due to DTS topology.

Table 2 Gas DTS demand modelling assumptions for 1-in-20 day: Network modelling assumptions and conditions

Demand assumptions	Notes
Load profiles calculated by AEMO.	Calculated from historical flow data for each custody transfer meter.
Load distribution as per AEMO forecasts.	Based on historical custody transfer meter data and expected system configuration changes.
Supply to Horsham pipeline at Carisbrook.	Carisbrook to Horsham pipeline modelled with demand at Ararat, Stawell, and Horsham (connected in 1998). The minimum pressure requirement at Horsham is 1,200 kPa (AusNet Services design requirement).
Supply to Murray Valley (Chiltern Valley–Koonoomoo).	Pipeline commissioned in 1998.
Transmission unaccounted for gas (UAFG) determined at Longford.	Calculated from calibrated model data.
BOC liquefaction operating, let-down gas operating.	Full supply to this customer is normally required.
Existing gas-powered generation (GPG) demand (open-cycle gas turbine (OCGT)).	A 25 TJ/d OCGT demand profile.[a]

a. The OCGT demand profile is from 12.00 pm till 9.00 pm.

Analysis for the five years is based on a 1-in-20 peak day system demand forecast, which is the agreed standard with APA Group. Tariff D and Tariff V[6] load changes are based on demand forecasts. Existing GPG demand is based on GPG capacity for 1,300 TJ/d with historical load profiles. Future GPG demand is based on GPG forecast from AEMO's NDNTP study. These are checked for consistency with the electricity VAPR and APA Group for any committed connections to the DTS.

Export load is treated differently, due to the need for consistency with any proposals that have been considered by APA Group. The modelling accounts for this.

[6] Tariff D customers use more than 10 TJ/yr or 10 GJ/h. Tariff V customers are the small industrial and commercial users and residential customers.

Impact of operational factors modelling assumptions

Table 3 lists the assumptions relating to operation of the DTS, and assists with the management of linepack and constraints specified in various agreements.

Table 3 Impact of operational factor modelling assumptions

Operational assumptions	Notes
Maximum pressure at Longford 6,750 kPa.	To conform to normal operating practice. Assumed to peak momentarily at 6,750 kPa before reducing again. Longford injections begin to reduce when the pressure reaches 6,400 kPa and cannot be sustained at 6,750 kPa.
Iona maximum pressure 9,500 kPa and minimum pressure 4,500 kPa.	As per pipeline licences, operating agreements and practice.
Gas delivery temperature above 2 °C.	Gas Quality Regulations requirement.
Minimum pressure at Culcairn 5,850 kPa.	Used for capacity modelling purposes and may not be achievable under all operating conditions.
Minimum pressure at Brooklyn–Lara Pipeline (BLP) CG inlet 4,500 kPa.	Pipeline design requirement for the BLP.
Minimum pressure at Brooklyn City Gate (BCG) inlet 3,200 kPa.	Normal operating condition.
Minimum pressure at Wollert City Gate (WCG) inlet 3,000 kPa.	Normal operating condition.
Minimum pressure at Dandenong City Gate (DCG) inlet 3,200 kPa.	Used for capacity modelling purposes and may not be achievable under all operating conditions.
Maximum allowable operation pressure (MAOP) and delivery pressures in connection and service envelope agreements not infringed.	Service Envelope Agreement and Connection Deed requirements (for example, a minimum 3,100 kPa at the DCG).
BoD and end-of-day (EoD) linepack are equal.	For capacity modelling, mining of linepack not allowed.
BoD linepack 20 TJ below target.[7]	Used for lateral constraint modelling.
APA Group pipeline, regulator and compressor assets and operating conditions as specified in the Service Envelope Agreement.	Agreement between APA Group and AEMO.
BoD and EoD pressures similar at key network locations.	Required for system security.
Regulators, compressors, and valves are set to reflect operational guidelines.	Required for operational and system security reasons.

Capacity modelling assumptions

Table 4 lists the assumptions relating to South West Pipeline capacity modelling and Table 5 lists the assumptions relating to Northern export capacity modelling. Under different operating conditions on the day, the capacity results will differ.

Table 4 SWP capacity modelling assumptions and conditions

SWP capacity assumptions	Notes
Injections	Maximum injection from Iona and the rest will be supplied from Longford and/or BassGas for all cases.
GPG demand	No GPG demand for all cases.
Export demand	Export demand of 118 TJ/d (based on latest forecast) was used for all types of system demand as that is the minimum export that must be met on any system demand day up to 1-in-20 peak day.
Compressors	Compressors down rated according to information provided by APA Group for different system demand levels.

[7] The normal BoD linepack target is 780 TJ which includes both passive and active linepack. In this case the BoD linepack is 760 TJ.

SWP capacity assumptions		Notes
Linepack		BOD and EOD linepack are equal for system demand and Geelong zone. For capacity modelling, mining of linepack not allowed.
Critical pressure points	Iona	Maximum pressure is 9,500 kPa. Pressure not allowed to increase over the modelling period.
	DCG	Minimum pressure is 3,200 kPa.
	Wollert CG	System demand ≤ 1,150 TJ is set to 2,550 kPa. System demand ≥ 1,150 TJ is set to 2,650 kPa.
	Wandong CG[8]	Minimum pressure is 3,500 kPa

Table 5 Northern export capacity modelling assumptions

Northern export capacity assumptions		Notes
Injections		Maximum injection from Longford does not exceed 940 TJ/d. The rest will be supplied from Iona, BassGas and LNG for all cases.
GPG demand		GPG demand for all cases varied as agreed between AEMO and APA Group.
LNG		LNG was required to maintain system security for the 1-in-20 peak day system demand case.
Compressors		Compressors down rated according to information provided by APA Group for different system demand levels.
Linepack		BoD and EoD linepack are equal for system demand and Northern zone. For capacity modelling, mining of linepack not allowed.
Critical pressure points	Culcairn	Modelled minimum pressure is 5,850 kPa for Northern capacity modelling cases.
	DCG	Minimum pressure is 3,200 kPa.
	Wollert CG	System demand ≤ 1,150 TJ is set to 2,550 kPa. System demand ≥1,150 TJ is set to 2,650 kPa.
	Wandong CG[9]	Minimum pressure is 3,500 kPa

Due to DTS characteristics and the nature of operational practice, AEMO has to consider a number of operational factors that impact system capacity determinations.

Beginning-of-day linepack

Linepack is the pressurised gas stored in transmission pipelines throughout the DTS. Linepack varies considerably throughout the day, as it is drawn down from the start of the gas day to balance a fairly constant hourly injection rate with the morning and evening demand peaks. Linepack reaches a minimum by around 10.00 pm. Overnight injections exceed demand and linepack is replenished until the start of the morning peak at around 6.00 am, when linepack is at its highest level.

Demand forecast error

Daily demand forecast errors occur due to changes in the weather, large loads varying from the initial forecast (such as GPG), and weather forecast errors.

When actual demand is higher than forecast, this can result in a greater depletion of system linepack through the day, reducing system ability to meet demand.

[8] Wandong CG pressure is varied on different system demand days in order to maximise capacity, taking into consideration the minimum pressure at Bendigo CG.
[9] Wandong CG pressure is varied on different system demand days in order to maximise capacity, taking into consideration the minimum pressure at Bendigo CG.

When actual demand is lower than forecast, this can result in excessively high linepack and system pressures, potentially leading to a back-off of injections at the injection points, generally only after the 10.00 pm scheduling horizon, to avoid breaching upper operating limits.

Delivery pressure

Supply pressure drives gas through a pipeline. The higher the supply pressure, then the higher the average level of linepack and effective system capacity.

Injection profiles

For operational reasons, gas production plants generally operate at a fairly constant injection rate. However, varying the injection rate to reflect demand throughout the day can increase the ability to supply demand. In particular, an injection profile with a higher injection rate during the first half of the day can increase gas transport capability.

Gas sources that can be injected for short periods at times of high demand, such as liquefied natural gas (LNG), can assist overall system capacity.

Demand profiles (temporal distribution)

During winter, peaking demand in the morning and evening (due to temperature-sensitive load) draws down system linepack. More severe demand profiles, including the presence of spike loads such as GPG, will deplete linepack at a faster rate.

Spatial distribution of demand

System capacity is modelled using the forecast load distributions across the DTS. If a specific load is located close to an injection point, the gas transport capability is higher than if the load is located further away.

Mass-balance modelling assumptions

Mass-balance modelling is used to test LNG usage and to evaluate major system augmentations. The Gregg Engineering software has been used to determine the linepack limits that are the basis of the mass-balance model and ensures the validity of this method of modelling. Table 6 lists the planning assumptions for deterministic mass-balance modelling.

Table 6 Deterministic mass-balance modelling base case assumptions

Deterministic modelling conditions	Notes
System demand	1-in-20 peak day.
System demand profile	78.8% demand 6.00 am to 10.00 pm.
GPG demand profile	90% demand 6.00 am to 10.00 pm.
Forecasting error	6% under actual demand at 6.00 am schedule.
GPG forecasting error	15% under actual demand at 6.00 am schedule.
BoD system linepack	10 TJ below target.[10]
Supply reschedules	Effective 10.00 am, 2.00 pm, 6.00 pm, 10.00 pm.

[10] The normal BoD linepack target is 780 TJ which includes both passive and active linepack.

CHAPTER 4. PLANNING CRITERIA

The planning criteria used in the DTS modelling are based on specified critical location and pressure obligations contained in Distribution Business (DB) Connection Deeds, Service Envelope Agreements (SEAs), and other connection agreements, and as specified by APA Group.

Critical location and pressure obligations

The minimum and maximum pressure obligations at critical system locations are defined in the Wholesale Market System Security Procedures (Victoria).[11] These limits are derived from agreements that AEMO has with the DBs and APA Group. Additional constraints are also applied for operational security purposes. If gas pressures fall below minimum pressure obligations at critical off-takes, there is a risk to the reliability of gas supply for users on the distribution networks (and directly connected customers).

AEMO operates the system to maintain connection pressure obligations across the DTS, where flows are within the limits specified in the relevant connection deed and agreement schedules. However, as gas demand increases, there is a risk that critical minimum pressures may be breached, potentially requiring customer curtailment to return the system to a secure state.

The system is in a secure state with the following conditions:

- The system is operating within the requirements of the gas quality procedures, and breaches of the gas quality procedures do not require intervention by AEMO.
- There is no threat to public safety.
- There is no threat to the supply of gas to customers, and system pressures and flows are within and are forecast to remain within the agreed operating limits.

Table 7 lists key critical locations and associated pressure obligations – maximum allowable operating pressure (MAOP) and minimum operating pressure (MinOP).

Table 7 Critical DTS locations

Location	Pressure obligation [kPa]			Comment
	MAOP	MinOP	Modelled	
Longford (with VicHub)	6,890	4,500		Pipeline licence pressure (6,750k Pa max for modelling)
Sale	6,895	5,000		DB Connection Deed – 4,800 kPa
Morwell City Gate (outlet)	2,760	2,700		SEA minimum outlet pressure
Warragul	2,760	1,400		AEMO-DB Connection Deed.
Pakenham South	2,760	1,400		AEMO-DB Connection Deed.
Dandenong Terminal Station (Morwell backup)	2,760	2,650		Maintaining the DCG Inlet Guideline Pressure ensures maintenance of the DTS Pressure Obligation
Dandenong Pressure Limiter Outlet (Morwell Backup)	2,760	1,400		SEA minimum pressure
Dandenong North	2,760	2,500		Maintaining the DCG Inlet Guideline Pressure ensures maintenance of the Dandenong North Pressure Obligation

[11] AEMO. Wholesale Market System Security Procedures (Victoria). Available at: http://www.aemo.com.au/Gas/Policies-and-Procedures/Declared-Wholesale-Gas-Market-Rules-and-Procedures. Viewed 28 November 2013.

Location	Pressure obligation [kPa]			Comment
Brooklyn (Melbourne-side)	2,760	1,800		Brooklyn compressor suction minimum pressure requirement DB Connection Deed – 1,700 kPa
Dandenong City Gate Inlet	6,890	3,000	3,200	SEA Minimum Inlet Pressure
Dandenong City Gate Outlet	2,760	2,700		SEA Minimum Outlet Pressure
Wollert Comp Station Inlet	6,890	3,000		SEA Minimum Inlet Pressure
Wollert Comp Station Outlet	8,800	3,000 @ Beveridge		Wollert–Wodonga pipeline licence pressure
Euroa Comp Station North	7,400	3,200	3,500	SEA Minimum Inlet Pressure
Euroa Comp Station South	8,800	3,200	3,500	SEA Minimum Inlet Pressure
Springhurst Comp Station Inlet	7,400	2,300	2,500	SEA Minimum Inlet Pressure
Springhurst Comp Station Outlet	7,400	2,300	2,500	SEA Minimum Inlet Pressure
Culcairn	10,200	2,700[a]	5,850	When gas is withdrawn at Culcairn (or 3,000 kPa for injections into the DTS from Culcairn)
Wollert CG	2,760	2,650 2,550	2,650 2,550	AEMO, APA and DBs have agreed to lower the pressure at Wollert CG to 2,650 kPa for demand days >1,150TJ and 2,550 kPa for demand days <1,150TJ.
Keon Park West	2,760	2,200		AEMO-DB Connection Deed.
Corio	7,390	2,300 w 1,900 s		7,390 kPa pipeline licence pressure. 2,300 kPa in winter, 1,900 kPa in summer, DB Connection Deed.
BLP	10,200	3,800		10,200 kPa pipeline licence pressure.
BLP City Gate Inlet	10,200	4,500		SEA Minimum Inlet Pressure
Iona (SWP)	10,200 7,400	 3,800	9,500	10,200 kPa pipeline licence pressure in SEA. 7,400 kPa pipeline licence pressure. 3,800 kPa Operating Agreement.
Iona (WTS)	7,400/ 9,890	3,800		WTS has two pipeline licence pressures: 7,400 kPa (Iona-Paaratte) and 9,890 kPa
Winchelsea Compressor Station Inlet	10,200	4,500		
Iluka	9,890	2,500		
Portland	9,890	2,800		
Bendigo	7,390	3,000		
Maryborough	7,390	3,000		
Carisbrook	7,390	3,000		Pipeline agreement
Shepparton	7,400	2,400		
Wodonga	7,400	2,400		
Plumpton PRS	10,200 /7,390	4,500		
Sunbury	7,390	2,000		
Ballarat	7,390	2,100		
Echuca	7,390	1,200		

a. The MinOP for Culcairn will be reviewed as part of the Northern SWZ expansion project

Seasonal variations in the DTS capacity

AEMO's planning methodology, assumptions, and system boundaries are for modelling under peak day conditions during winter, as these are the most common DTS operating conditions analysed by AEMO and APA.

The need to determine export capacity for varied seasonal conditions has become necessary with the increase of export to New South Wales increasing during summer and shoulder periods.

AEMO and APA Group have discussed and agreed on seasonal conditions such as load distribution and load profiles for these periods.

The DTS characteristics change in summer and shoulder periods due to the following factors:

- Residential demand is reduced due to lower space heating needs.
- GPG load increases due to increasing electricity demand for air conditioning and relatively low gas price.
- Compressor stations have lower maximum compressor power available, due to the downgraded performance of the gas turbines (and engines) in summer and shoulder ambient temperature conditions.

Compressor stations have lower maximum compressor power available, due to the downgraded performance of the gas turbines (and engines) in summer ambient temperature conditions.

When modelling summer or shoulder, some key system parameters need to be set differently from the winter assumptions.

These parameters have been discussed and agreed with APA, as it has become necessary to determine the DTS capacity for various seasonal conditions.

MEASURES AND ABBREVIATIONS

Measures

Abbreviation	Unit of Measure
EDD	Effective degree days
GJ	Gigajoules
HDD	Heating degree days
km	Kilometres
kPa	Kilopascals
kW	Kilowatts
MJ/m3	Megajoules per cubic meter
MW	Megawatts
PJ	Petajoule
PJ/m	Petajoules per month
PJ/y	Petajoules per year
t	Tonne
t/d	Tonnes per day: a unit of LNG production
t/h	Tonnes per hour
TJ	Terajoule
TJ/d	Terajoules per day
TJ/h	Terajoules per hour
$	Australian dollars

Abbreviations

Abbreviation	Unit of Measure
AEMO	Australian Energy Market Operator Ltd
AEST	Australian Eastern Standard Time
AER	Australian Energy Regulator
AMDQ	Allocated Daily Maximum Quantity
BBP	Brooklyn Ballan Pipeline
BCP	Brooklyn Corio Pipeline
BLP	Brooklyn–Lara Pipeline
CCGT	Combined Cycle Gas Turbine (a type of GPG)
DCG	Dandenong City Gate
DTS	Victorian gas Declared Transmission System
EGP	Eastern Gas Pipeline
GPG	Gas-powered generation
GSOO	Gas Statement of Opportunities
LMP	Longford to Melbourne Pipeline
LNG	Liquefied natural gas
NFTC	Net Flow Transportation Constraint
MAOP	Maximum allowable operating pressure
MRM	Melbourne Ring Main
MTO	Medium Term Outlook

Abbreviation	Unit of Measure
NGR	National Gas Rules
NIEIR	National Institute of Economic and Industry Research
OCGT	Open Cycle Gas Turbine (a type of GPG)
POE	Probability of exceedance
SEA	Service Envelope Agreement
SWP	South West Pipeline
SWZ	System withdrawal zone
TGP	Tasmanian Gas Pipeline
UGS	Underground gas storage
VAPR	Victorian Annual Planning Report
VGPR	Victorian Gas Planning Report
VGSA	Victorian Gas System Adequacy
WTS	Western Transmission System

GLOSSARY

Definition	Description
1-in-2 peak day	Most probable peak day gas demand forecast, with a 50% probability of exceedance. This is expected, on average, to be exceeded once in two years (also known as the 50% peak day).
1-in-20 peak day	Peak day gas demand forecast for severe weather conditions, with a 5% probability of exceedance. This is expected, on average, to be exceeded once in 20 years (also known as the 95% peak day).
Augmentation	The process of upgrading the capacity or service potential of a transmission (or a distribution) pipeline.
APA Group	Australia's largest natural gas infrastructure business, operating over 2000 km of gas transmission pipeline in Victoria.
Available	The aggregate contracted maximum daily quantities available to the market through commercial arrangements between market participants and gas producers or storage providers.
BassGas	See BassGas injection point.
BassGas injection point	Sources gas from the offshore Yolla gas field (Bass Basin) for supply to the DTS, with treatment at the Lang Lang gas plant and injection into the DTS at Pakenham. Unless specified otherwise, "BassGas" refers to the BassGas injection point.
City gate	A distribution hub where gas is reduced in pressure before it enters the lower pressure, smaller diameter, distribution pipeline network.
Culcairn	The location of the gas transmission network interconnection point between Victoria and New South Wales (Victoria – NSW Interconnect).
Curtailment	The interruption of a customer's supply of gas at the customer delivery point, which occurs when a system operator intervenes, or an emergency direction is issued.
Customer	Any party who purchases gas and consumes gas at particular premises. Customers can deal through retailers or may choose to become market participants in their own right, and take on the retailing functions themselves.
Declared Transmission System	Owned by APA GasNet and operated by AEMO, the DTS refers to those aspects of the Victorian gas system that are a part of the declared network. According to National Energy Law, the DTS of an adoptive jurisdiction has the meaning given by the application Act of that jurisdiction and includes any augmentation of the defined declared transmission system.
Degree Day	A commonly used temperature model for predicting gas demand for area/space heating.
Distribution losses	Losses in the distribution networks typically a result of gas leaks and metering uncertainties. These losses are also known as unaccounted for gas (UAFG)
Eastern Gas Pipeline	The east coast pipeline from Longford to Sydney.
Effective Degree Day	A measure of coldness that includes temperature, sunshine hours, chill, and seasonality. The higher the number, the colder it appears to be and the more energy will be used for area heating purposes. Effective Degree Day is used to model the daily gas demand-weather relationship.
Export demand	Export demand includes withdrawal at VicHub, BassGas, SEA Gas, Iona and Culcairn.
Gas market (market)	A market administered by AEMO for the injection of gas into, and the withdrawal of gas from, the gas transmission system and the balancing of gas flows in or through the gas transmission system.
Gas-powered generation	Where electricity is generated from gas turbines (combined cycle gas turbine, open cycle gas turbine).
Injection	The physical injection of gas into the transmission system.
Iona	See Iona injection point. The Iona gas plant processes conventional gas from the Casino, Henry, and Netherby gas fields. This gas, along with any gas withdrawn from underground gas storage, can flow from the Iona injection point into the Victorian DTS via the South West Pipeline.
Iona injection point	The Iona injection point injects gas into the Victorian DTS via the South West Pipeline. Unless other specified, Iona refers to the Iona injection point.
Linepack	The pressurised volume of gas stored in the pipeline system. Linepack is essential for gas transportation through the pipeline network throughout each day, and is required as a buffer for within-day balancing.
Liquefied Natural Gas	Natural gas that has been converted to liquid for ease of storage or transport. The Melbourne LNG storage facility is located at Dandenong.

Definition	Description
Longford Melbourne Pipeline	The pipeline from Longford to Dandenong and Pakenham to Wollert.
Longford gas plant	The Longford gas plant, located near Sale in South Gippsland, processes gas from the Gippsland Basin and injects it into the DTS. It also supplies to New South Wales, the Australian Capital Territory, and Tasmania via the Eastern Gas Pipeline and the Tasmanian Gas Pipeline.
Longford ESSO injection point	Injects gas from the Longford Plant into the DTS via the Longford metering station and the Longford to Melbourne Pipeline.
Market participant	A person who is registered by AEMO and participates in declared wholesale gas market of an adoptive jurisdiction. The wholesale gas market involves the market operator, producers, storage providers, retailers, traders, market customers, declared transmission service provider, interconnected transmission pipeline service providers and distributors.
Maximum allowable operating pressure	The maximum pressure at which a pipeline is licensed to operate.
Minimum allowable operating pressure	The minimum pressure at which a pipeline is licensed to operate.
National Institute of Economic and Industry Research	A private economic research, consulting, and training group.
Otway	See Otway injection point. Otway is the interconnection point for the South West Pipeline, Western Transmission System and SEA Gas pipelines; the underground gas storage; and the on-shore and offshore Otway Basin supplies.
Otway injection point	Injects gas from the Otway plant into the gas DTS through the Otway, SEA Gas or Iona injection points. Unless specified otherwise, Otway refers to the Otway injection point.
Participant	A person registered with AEMO in accordance with the National Gas Rules (Victorian gas industry).
Peak day profile	The hourly profile of injection or demand occurring on a peak day.
Peak shaving	Meeting a demand peak using injections of vaporised liquefied natural gas.
Port Campbell	Port Campbell refers to the injection point hub into the South West Pipeline which includes gas supply from Iona, SEA Gas, Otway, and Mortlake injection points. Port Campbell supply is subject to the net transportation capacity of the SWP.
Prospective	Prospective supply is subject to participants offering gas on the gas day, and may depend on interconnecting pipeline operating conditions and contracts.
SEA Gas	See SEA Gas injection point. SEA Gas is the interconnection point between the SEA Gas pipeline and the gas DTS at Iona.
SEA Gas injection point	The SEA Gas injection point, located near the township of Port Campbell in south-west Victoria, is the system injection point for gas from the offshore Minerva gas field and the Otway Basin, Geographe–Thylacine gas field supply developments, and the Mortlake pipeline. From this injection point, gas can be injected into the Declared Transmission System, the SEA Gas pipeline (for export to Adelaide), or the underground gas storage. Unless specified otherwise, SEA Gas refers to the SEA Gas injection point.
Shoulder season/period	The period between low (summer) and high (winter) gas demand. Includes calendar months April, May, October, and November.
South West Pipeline	The pipeline from Iona to Lara (Geelong) to Brooklyn.
Storage facility	A facility for storing gas, including the Liquefied Natural Gas storage facility and the Iona underground gas storage.
System capacity	The maximum demand that can be met on a sustained basis over several days given a defined set of operating conditions. System capacity is a function of many factors and accordingly a set of conditions and assumptions must be understood in any system capacity assessment. These factors include: • Load distribution across the system. • Hourly load profiles throughout the day at each delivery point. • Heating values and the specific gravity of injected gas at each injection point. • Initial linepack and final linepack and its distribution throughout the system. • Ground and ambient air temperatures. • Minimum and maximum operating pressure limits at critical points throughout the system. • Power and efficiencies of compressor stations.

Definition	Description
System demand	Demand from Tariff V (residential, small commercial, and industrial customers nominally consuming less than 10 TJ of gas per annum) and Tariff D (large commercial and industrial customers nominally consuming more than 10 TJ of gas per annum). It excludes GPG demand, exports, and gas withdrawn at Iona.
System injection point	A gas transmission system network connection point designed to permit gas to flow through a single pipe into the transmission system. It may also, in the case of a transfer point, be a system withdrawal point.
System withdrawal point	A gas DTS connection point designed to permit gas to flow through a single pipe out of the transmission system. It may also, in the case of a transfer point, be a system injection point.
System withdrawal zone	Defined regions within the Victorian gas DTS for which AEMO is required to publish demand forecasts. Each zone contains one or more system withdrawal point/s.
Tariff D	The gas transportation Tariff applying to daily metered sites with annual demand > 10,000 GJ or MHQ > 10 GJ and that are assigned as Tariff D in the AEMO meter installation register. Each site has a unique Metering Identity Registration Number.
Tariff V	The gas transportation Tariff applying to non-Tariff D load sites. This includes residential and small to medium-sized commercial and industrial gas users.
Total demand	The sum of System demand, GPG demand and Culcairn Export.
Transmission	Long haul transportation of gas via high pressure pipelines.
Transmission constraint	Any limitation causing some defined gas property (such as minimum pressure) to fall outside its acceptable range.
Transmission system use gas	Transmission system use gas are mainly compressor and heater fuel in support of normal pipeline operation.
Underground Gas Storage	The underground gas storage facility at Iona.
VicHub	See VicHub injection point. VicHub is the location of the interconnection between the Eastern Gas Pipeline and the gas DTS at Longford, facilitating gas trading at the Longford hub.
VicHub injection point	VicHub, located near the Longford plant, has a gas DTS injection point for gas from the Eastern Gas Pipeline. Unless specified otherwise, 'VicHub' refers to the VicHub injection point.
Victoria - NSW Interconnect	Refers to the pipeline from Barnawartha to Wagga Wagga connecting the Victoria and New South Wales transmission systems at Culcairn. The location of the flow measurement between the systems is Culcairn in New South Wales. This does not include the VicHub (Longford) and SEA Gas (Iona) interconnections.
Western Transmission System (WTS)	Western Transmission System. The transmission pipelines serving the area from Port Campbell to Portland, and the Western District from Iona. Now integrated into the gas market and the gas DTS.