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Appendices

1 THE GAS TRANSMISSION SYSTEM

The *Gas Transmission System* (GTS) is depicted in Figure 1.1. The *South West Pipeline* (SWP) from Iona to Lara, the Iona to North Paaratte pipeline, the *Murray Valley* pipeline, and the Interconnect to Culcairn in NSW are included in the GTS and the Victorian Gas Market.

The integration of *Western Transmission System* (WTS) into the market is expected to occur by late 2002 after completion of GasNet Access Arrangements. Since December 2000, supply to the WTS has been through the connection to the GTS at North Paaratte.

The Wimmera pipeline from Carisbrook to Horsham is not part of the GTS. The connection at Carisbrook is treated as a *Tariff D* withdrawal point within the Gas Market.

The *Eastern Gas Pipeline* (EGP) from Longford to Wilton and the Berri to Mildura Pipeline are not included in the Victorian Gas Market and are not connected to the GTS at this stage. Loads on these pipelines are not included in the forecasts.

Other pipeline projects such as the Longford to Bell Bay (Tasmania) pipeline, the South Australian Pipeline from Port Campbell to Adelaide, and the proposed Yolla (Bass Strait) to Melbourne pipeline are not shown.

Figure 1.2 depicts the *System Withdrawal Zones* (SWZ) that are used for the regional forecasts.

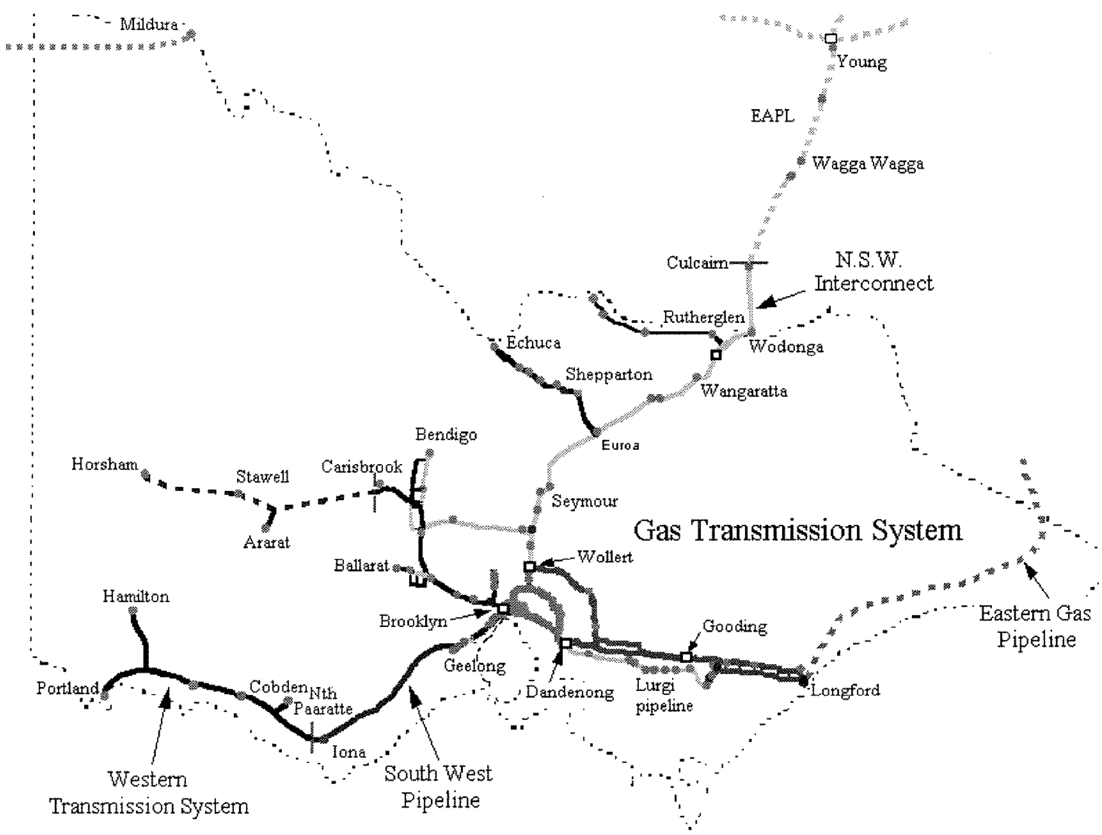

Figure 1.1 The Victorian Gas Transmission Systems

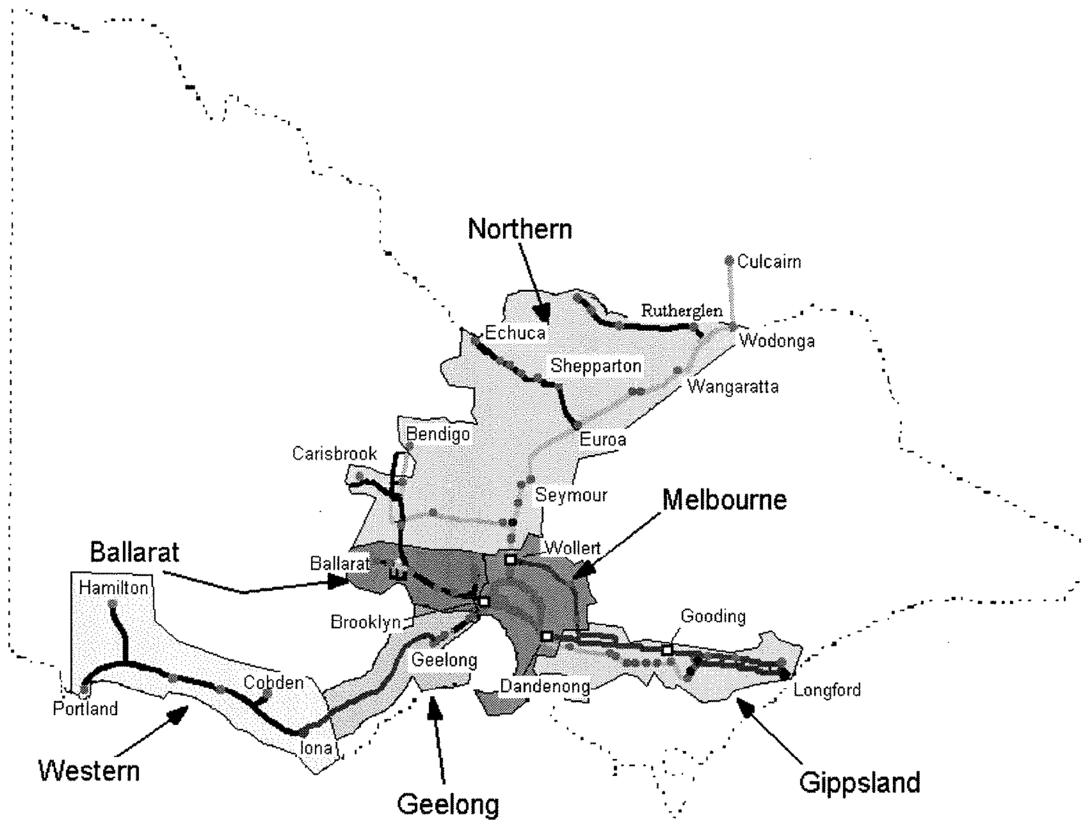

Figure 1.2 Victorian Gas Market System Withdrawal Zones

2 LONG TERM DEMAND FORECASTS 2002 TO 2016

This chapter provides a summary of the forecast approach and discusses the three economic scenarios developed and used by NIEIR to produce the long term gas forecasts for the Victorian Gas Market.

Revisions to the weather standards used in the gas forecasts are also explained.

Demand forecasts and modelling results in this report pertain to general load unless explicitly stated. General load includes residential, commercial and industrial loads including gas cogeneration but excludes demand for gas power generation, exports to interconnecting pipelines and withdrawals into storage. Demand for gas power generation is normally treated separately because of the magnitude and the volatility in this sector. Indicative forecasts for gas cogeneration and gas power generation are provided for each of the scenarios.

Exports and withdrawals into underground storage are also addressed separately.

Annual load forecasts over the longer term to 2016 are presented. Detailed discussion and analysis using the medium term forecasts are presented in Chapter 3.

2.1 The Forecast Approach

VENCorp engaged the National Institute of Economic and Industry Research (NIEIR) to produce independent long term gas load forecasts for the Victorian Gas Market.

The general load forecasts were generated from econometric models using key forecast economic inputs shown in Table 2.1 including:

- Gross State Product (GSP);
- state industry output projections;
- state population, dwelling stock and household disposable income projections; and
- forecast gas prices.

Other inputs to the forecasts include:

- Survey results of major industrial users on planned expansions or load reductions over the next 5 years including existing or planned gas cogeneration capacity;
- market information obtained from media reports was also used to refine the forecasts; and
- the impact of increased penetration of reverse cycle air conditioners on the residential gas heating market is included in the energy and the peak day forecasts.

Annual forecasts for the *Tariff D* and *Tariff V* market sectors were derived from forecasts for the industrial, commercial and residential sectors[7], and forecasts by industry (ASIC) group[8].

Forecast gas power generation was derived from a separate model which takes into account current gas usage by existing plants, net generation requirements for Victoria, capacities of proposed gas power generation projects in Victoria and their competitiveness against other power generation capabilities and interstate electricity imports.

[7] NIEIR collated historical sales data from individual retailers and reconciled with historical Tariff D and V data provided by VENCorp.
[8] As defined by the ASIC codes (Australian Standard Industry Classifications).

2.2 Economic Forecast Scenarios

This section summarises the economic outlook for Victoria over the period 2001- 2016. Medium (Base case), High and Low economic projections are presented.

NIEIR's economic forecasts were prepared in September before the 11 September terrorist attacks in New York. It was not possible at the time to accurately assess the impact of the incident on the US economy and the flow on effect on the world economic outlook due to a lack of available economic information. The US Federal Reserve has since lowered the interest rate to 2% in an attempt to inject confidence into the US economy and to support consumer spending. At the time of preparing this APR more economic data emerged confirming a negative growth in the US economy in the September quarter. A number of economists predict that the negative growth in the US economy may continue for possibly another two quarters well into 2002.

In Australia the latest economic data seem to suggest that the economy has not been materially affected by the tragic events in September. Housing approvals in September were down by 4.3% from August but were still 58.4% higher compared to the same time last year, when the newly introduced GST caused a slump in the building industry. The retail sales data for the September 2001 quarter fell by just 0.1% as a result of strong consumer spending unaffected by recent corporate collapses and job cutting across a number of large organisations in Australia.

The immediate future remains uncertain. There is a possibility that the Australian GDP growth pattern may diverge from the US growth pattern in the medium term over 2001/02 and 2002/03 although historically the economic growth patterns of these countries are strongly correlated. NIEIR has prepared three scenarios of economic growth and noted that the probability of the low growth scenario over the next 2 years has increased since the terrorist attacks in September.

The economic forecasts are discussed below. Figure 2.1 compares the High, Medium and Low Victorian GSP scenarios over the medium term to 2006/07.

The Victorian economic outlooks for financial year 2000/01 to 2015/16 are presented in Sections 2.2.1 to 2.2.3. It is important to note that the ABS has, over recent years, made substantial revisions to the calculation/measurement of Australian GDP. One important change this year has been the change in calculating gross value added for selected service industries. The new measures, particularly for the health and community services sector, tend to grow more strongly than the old measures. This has the overall effect of raising the GDP growth rate around 0.5 to 0.7 percentage points above what would have been the growth rate measured on the basis of two years ago. For instance, actual growth for 2000/01 of 2 per cent for Victorian GDP would be equivalent to an actual of around 1.0 per cent under the old basis of measurement.

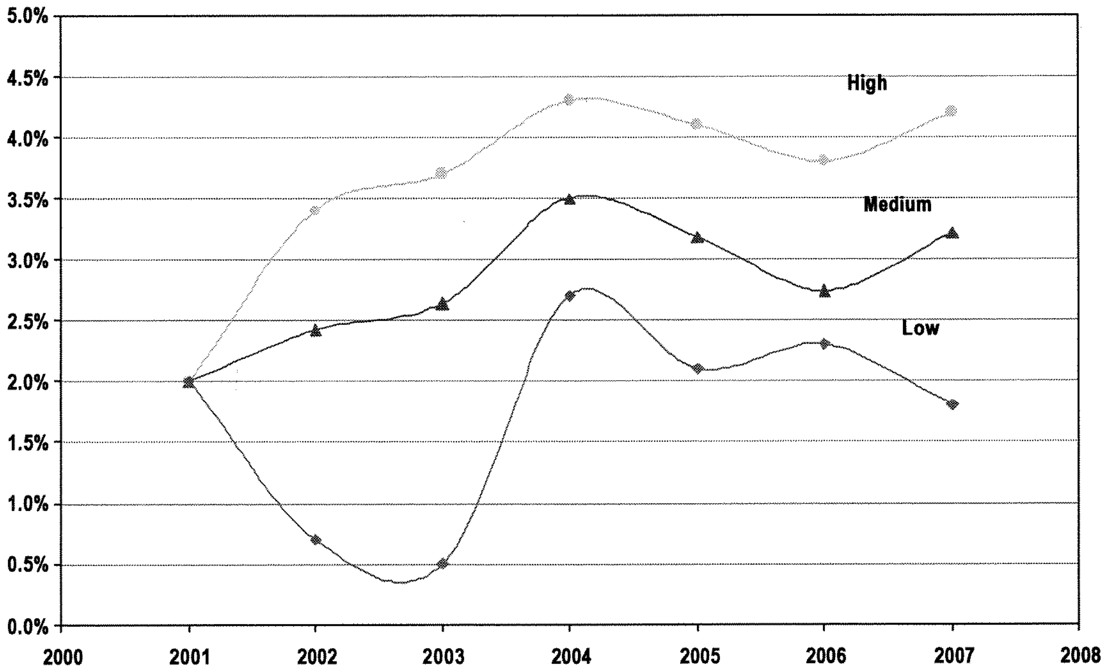

Figure 2.1 Victorian GSP Forecast Scenarios

2.2.1 Medium Economic Scenario

The forecast Economic Indicators and Real Gas Price 2002 to 2016 for the medium economic scenario are shown in Table 2.1.

Table 2.1 Medium Economic Scenario

Forecast Economic Indicators and Real Gas Price 2002 to 2016- CAGR

Year Ending June 30	GSP	Popul'n	No. Dwelling	Real Household Disposable Income	Real Average Gas Price	CPI
2001	2.0%	1.3%	1.7%	2.3%	-0.6%	6.0%
2002	2.4%	1.2%	1.6%	2.1%	-2.0%	3.1%
2003	2.6%	1.0%	1.5%	2.4%	0.0%	2.6%
2004	3.5%	0.9%	1.5%	3.7%	-1.0%	2.2%
2005	3.2%	0.9%	1.7%	3.6%	-1.8%	2.5%
2006	2.7%	0.8%	1.9%	2.5%	0.2%	3.2%
2007	3.2%	0.8%	1.7%	3.2%	0.6%	3.7%
2001-2007	2.9%	0.9%	1.7%	2.9%	-0.7%	2.9%
2007-2016	2.9%	0.8%	1.5%	2.8%	0.0%	2.4%

Victorian GDP growth was 2.0% for 2000/01 following a period of high growth of about 5% per annum between 1997/98 and 1999/00. This outcome is very close to NIEIR's forecast of 2.1% reported in the Annual Planning Review 2000. The forecast contraction last year was due to a slump in the construction industry and other sectors following the introduction of the GST. The housing industry has since recovered partly from the contraction following the introduction and extension of the Federal government First Home Owner Grant. The GSP is projected to grow at 2.4% this year to reflect the moderate recovery in the housing sector and growth in agricultural exports which have benefited from a lower Australian dollar. The Victorian GSP grows stronger at 3.5% and 3.2% over 2003/04 and 2004/05 driven by a stronger housing demand and both private consumption and business investment.

The average forecast growth is 2.9% per year for both the medium and longer term.

Victoria has experienced a recovery in population growth over the recent years as a result of higher net international migration gains and a dramatic turnaround in net interstate migration. Nevertheless, population growth is projected to slow down over the medium term due to a net loss of population to interstate, in particular Queensland. The population is projected to grow at an average of 0.8% to 0.9% per year over the next 15 years.

Real Household Disposable Income (RHDI) is projected to fall to 2.1% this current year as a result of weakening in the labour market following manufacturing closures, corporate collapses and rising unemployment. The contraction in employment has already been implied in the ANZ job Ads leading indicator. A strong rebound in RHDI is projected post 2003/04 due to the recovery in the labour market. The projected average growth in RHDI is about 2.8% and 2.9% per annum over both medium and long term.

Forecast gas price is projected for each market sector (Residential, Commercial and Industrial) separately and the weighted average price is reported in Table 2.1. The projections for the medium term are highly uncertain owing to the pending outcomes of the Distribution of Transmission Tariff Reviews and future wholesale gas prices. On the other hand increased competition may drive retail price down. Real average gas price is projected to fall by 0.7% per annum over the next 5 years with no further reduction in the period beyond 2006/07.

2.2.2 High Economic Scenario

The forecast Economic Indicators and Real Gas Price 2002 to 2016 for the high economic scenario are shown in Table 2.2.

The high economic scenario is based on assumptions of stronger growth in industry outputs, population, housing construction and RHDI. Under this scenario the state GDP is projected to grow at an average rate of 4.0% per annum or 1.1% per year above the medium scenario forecasts over the next 5 years. Similarly the period post 2006/07 grows 0.9% stronger than the medium case forecasts at an average rate of 3.8%. There is little movement in real gas price compared to the medium scenario.

2.2.3 Low Economic Scenario

The forecast Economic Indicators and Real Gas Price 2002 to 2016 for the low economic scenario are shown in Table 2.3.

As discussed earlier the likelihood of a low scenario to prevail in the next two years has increased since the September 11 terrorist attacks. The Low scenario is for a significant slowdown in the economy over both the medium and long term. Negative growth in the economy of Australian major trading partners will impact on Australian exports and drive business confidence lower over the next 2 years. There is a high risk that the world recession will turn into a depression if the equity price falls further. The state GSP is projected to grow at merely 0.7% in 2001/02 and 0.5% the following year before rebounding to above 2% growth rate post 2003. The average GSP growth rate is 1.8% per annum for both the medium and longer term. Growth in Population, housing stocks and RHDI is also lower.

Table 2.2 High Economic Scenario

Year Ending June 30	GSP	Popul'n	No. Dwelling	Real Household Disposable Income	Real Average Gas Price	CPI
2001	2.0%	1.3%	1.7%	2.3%	-0.6%	6.0%
2002	3.4%	1.3%	1.8%	3.4%	-1.2%	1.5%
2003	3.7%	1.2%	1.8%	3.3%	0.2%	1.7%
2004	4.3%	1.0%	2.0%	4.5%	-0.6%	1.9%
2005	4.1%	1.0%	2.0%	4.7%	-1.8%	2.1%
2006	3.8%	0.9%	2.0%	4.1%	-0.2%	2.3%
2007	4.2%	1.0%	1.9%	3.9%	0.2%	2.8%
2001-2007	4.0%	1.0%	1.9%	4.0%	-0.6%	2.1%
2007-2016	3.8%	1.0%	1.7%	3.7%	-0.3%	1.8%

Table 2.3 Low Economic Scenario

Year Ending June 30	GSP	Popul'n	No. Dwelling	Real Household Disposable Income	Real Average Gas Price	CPI
2001	2.0%	1.3%	1.7%	2.3%	-0.6%	6.0%
2002	0.7%	1.0%	1.4%	1.0%	-2.0%	3.9%
2003	0.5%	0.8%	1.3%	0.3%	-1.2%	4.3%
2004	2.7%	0.7%	1.3%	2.5%	-2.0%	4.5%
2005	2.1%	0.7%	1.6%	1.9%	-2.1%	3.7%
2006	2.3%	0.6%	1.7%	2.4%	0.4%	3.6%
2007	1.8%	0.6%	1.5%	2.1%	0.6%	3.2%
2001-2007	1.8%	0.7%	1.5%	1.7%	-1.0%	3.9%
2007-2016	1.8%	0.6%	1.3%	1.6%	0.1%	3.5%

2.3 Melbourne Weather Standard

Weather has a considerable impact on demand due to the very high penetration of gas heating appliances in Victorian households.

Gas heating load correlates very highly with the Effective Degree Day (EDD), a weather measure used to model the influence of weather on gas heating demand.

In the last five years Victoria has experienced a wide range of weather from a severe winter in 1995 of 1677 EDD to the mildest winter on record in 1999 of 1230 EDD. A variation of 100 EDD will result in a change in annual system gas demand of about 1.8% in a given year and, for example, 3.8 PJ in 2002.

The weather standard used in the forecasts in this annual planning review was revised in 2001 following a detailed analysis of the urban heating effect on temperature readings at the Bureau of Meteorology's Melbourne weather station. The results showed that the Annual Heating Degree Days[9] (DD) had been trending down by 6 DD/year since 1950 due to urban warming effects in the Central Business District. This DD trend was fairly localised as is not apparent in data from regional centres and is barely discernible in data from outer suburban stations such as Tullamarine and Laverton.

The annual EDD forecast standard has been revised from 1504 EDD to 1445 EDD for the APR 2001 forecasts using the DD trend line at 2002. This change equates to about a 2.2PJ reduction in forecast gas load for area and space heating compared to forecasts produced in 2000 and is reflected in the forecasts in this report.

It should be noted that the EDD standard of 1537 EDD used in 1999 was the 20 year average EDD to June 1995. This standard was revised to 1504 EDD in 2000 using the 20 years to June 2000. Thus the cumulative correction for changes in weather standard since 1999 amounts to 92 EDD - about 3.4PJ of load reductions in this forecast compared to the forecasts prepared by VENCorp in 1999 or earlier.

The change in standard does not reflect global warming or a real change in average temperatures across regions served by the gas transmission system. It is simply a correction for a systematic change that has occurred at the Melbourne weather station so that the current forecasts reflect weather consistent with the midpoint of the current weather distribution.

2.4 Long Term Annual Demand Forecasts

This section presents the long term system annual demand forecasts. The forecasts include gas cogeneration but exclude gas power generation, exports, and withdrawals into UGS. Gas power generation is covered in Section 2.6. The forecasts corresponding to the three economic scenarios are shown in Table 2.4 and Figure 2.2.

2.4.1 Medium Growth Demand Scenario

As shown in Table 2.4, forecast system demand grows at an average rate of 2.4% per annum from 197.5PJ in 2001 to 222.4PJ in 2006. Total forecast growth is 25 PJ of which 10 PJ of growth is generated from expansion in gas cogeneration. Forecast demand is driven by moderate growth in both GSP and dwelling stocks and to a lesser extent by a reduction in gas price. Forecasting gas price movement in the future remains uncertain as the Market becomes fully contestable. The forecast gas prices in this report represent a possible scenario assuming competition and market forces will drive the retail price lower in the medium term as seen in the Telecommunications industry. Forecast growth between 2006 and 2016 totals about 50 PJ of which about 27 PJ is associated with new gas

[9] See Appendix A for details on DD and EDD measures.

cogeneration. The average growth rate is 2.4% per annum over the next 5 years compared to 2.1% in the following ten years.

Detailed forecasts based on the medium growth forecasts from 2002 to 2006 are presented in Chapter 3.

Table 2.4 Forecast Annual Gas Demand (TJ)

Calendar Year	Low Scenario	Medium Scenario	High Scenario
2001	197,504	197,504	197,504
2002	195,406	199,861	204,149
2003	196,904	204,408	213,186
2004	200,392	211,615	225,714
2005	202,943	218,517	237,605
2006	204,325	222,385	244,583
2010	214,156	242,060	280,940
2016	230,094	272,809	344,699
CAGR 2001-2006	0.7%	2.4%	4.4%
CAGR 2006-2016	1.2%	2.1%	3.5%

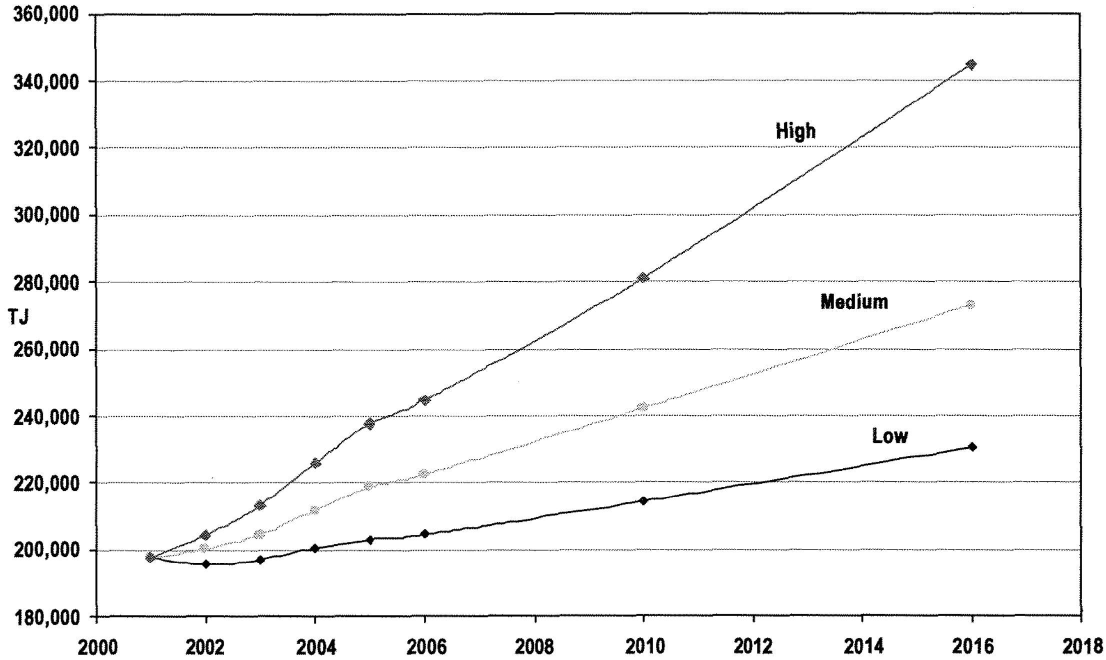

Figure 2.2 Long Term Annual Demand Forecasts Excluding Gas Power Generation

2.4.2 High Growth Demand Scenario

Demand is primarily driven by higher growth in GSP over the medium and longer term despite smaller reductions in the real price of gas related to the higher demand. The high scenario assumes a new fertiliser plant or similar proposal will take up to 7 PJ of gas by 2016. Total system demand is projected to increase to 244.6 PJ in 2006 and to 344.7 PJ over the subsequent 10 years to 2016. Average annual growth rate is 4.4% for the period 2001-2006 and 3.5% for the subsequent 10 years.

2.4.3 Low Growth Demand Scenario

Depressed growth in GSP despite greater reductions in the real price of gas limits growth in annual demand to 204.3 PJ in 2006 and to 230.1 PJ in 2016. A contraction across all industry sectors as well as deferment in gas cogeneration and other major projects underlies the much weaker growth. Gas demand is projected to grow at just 0.7% per annum over the medium term to 2006 given contractions in the next couple of years and by 1.2% over the long term planning horizon. Forecast load grows by 7 PJ and 33 PJ over the next 5 years and the following 10 years period to 2016.

2.5 Forecast Gas Cogeneration

Gas cogeneration provides an economically and environmentally effective and efficient solution to the Victorian electricity supply situation. Cogeneration plants are 20% to 30% more efficient than separate electricity and heat units producing the same amount of output. The potential for increased cogeneration is dependent on government funding, greenhouse policies (the Greenhouse Gas Abatement Program CGAP).

Three scenarios of unscheduled (< 30 MW) and scheduled[10] (>= 30 MW) gas cogeneration have been prepared. In Victoria most of the cogeneration capacity is in paper and chemical industries and the

[10] All generators with capacity greater than 30 MW must be scheduled.

large hospitals. There is currently no installed scheduled cogeneration capacity but significant growth in scheduled cogeneration is expected in the medium term.

The forecast scenarios have been generated using information obtained from the Australian Cogeneration Association (ACA) as well as survey responses from large gas customers with installed and proposed gas cogeneration plants.

Gas cogeneration units generate useful heat used in the manufacturing process. The efficiency gain results in heat displacement that has been allowed for in the forecasts.

The projected gas cogeneration loads served by the gas market are set out for each of the high, medium and low economic growth scenarios in Table 2.5.

Table 2.5 Forecast Gas Cogeneration (TJ)

Calendar Year	Low Scenario	Medium Scenario	High Scenario
2001	6,199	6,199	6,199
2002	6,624	6,856	7,319
2003	7,029	7,414	8,186
2004	7,527	11,127	14,512
2005	8,266	14,998	20,981
2006	9,253	16,233	22,717
2010	15,661	25,932	37,310
2016	21,310	33,438	46,212
CAGR 2001-2006	8.3%	21.2%	29.7%
CAGR 2006-2016	8.7%	7.5%	7.4%

2.5.1 Medium Scenario Gas Cogeneration

The current unscheduled installed gas cogeneration capacity supplied through the Victorian gas market is about 206 MW of which about 170 MW is operational. The capacity is forecast to increase to 303 MW in 2006 and to 441 MW by 2016 and the corresponding unscheduled cogeneration load is expected to increase from 6 PJ to 10 PJ then to 19 PJ respectively over the same periods.

In addition, the medium scenario assumes that scheduled gas cogeneration commences in 2004 with an annual load of about 6 PJ that increases to 15 PJ by 2016.

Total gas cogeneration load grows from about 6 PJ currently to 16 PJ in 2006 then 33 PJ by 2016.

2.5.2 High Scenario Gas Cogeneration

The high scenario assumes that high economic growth will drive the electricity demand to grow faster and hence the need for more cogeneration and summer peaking power generation plants. Total gas cogeneration is projected to grow to about 23 PJ in 2006 and 46 PJ by 2016.

2.5.3 Low Scenario Gas Cogeneration

The low scenario assumes that scheduled cogeneration will not occur until 2007 due to a weaker demand in electricity associated with a slow down in the Australian and State economy. The scheduled cogeneration load is 50% of that under the medium scenario. Total cogeneration demand is projected to grow to about 9 PJ in 2006 and 21 PJ by 2016.

2.6 Long Term Gas Power Generation Forecasts

NEMMCO's 2001 statement of opportunities reported that Victorian summer minimum reserves are expected to be breached in 2001/02 if the gas power generation projects already under construction are not completed in time to meet forecast summer demand. The supply-demand situation will get progressively worse in the medium to long term if additional generation capacity is not installed in time to meet the increasing demand in summer.

Gas power generation plants have been operating at low capacity factors and in general on hot summer days for peak shaving purposes. However, in recent years, gas power generation has been quite substantial during the winter period due to planned and unplanned outages of baseload generators and also due to contractual arrangements between electricity market participants. The current annual electricity load in Victoria is about 46TWh[11] of which just 1.2 TWh or less than 3% comes from gas power generation. Two new gas peaker plants will be operational by early 2002 and more gas peaker generation plants will be constructed in the future to meet the increasing summer demand driven in part by the increased penetration of air-conditioners in households.

Forecast demand for gas power generation is normally treated separately from other demand because of the volatility and potentially very large volume of this load. Given the large number of gas power generation projects proceeding and in the planning stage, it is appropriate to provide indicative forecast gas loads. Accordingly, VENCorp has had NIEIR produce gas power generation load projections for high, low and medium scenarios for the first time. VENCorp's assessment of the adequacy of the gas transmission system to meet such new loads is presented in section 5.6.2.

The forecasts of gas power generation to 2016 were developed by NIEIR using:

- information from NIEIR's half hourly electricity forecasting model; and
- the net new generation requirement for Victoria derived concurrently from NIEIR's annual electricity forecast model for Victoria;
- gas usage by existing plants in Victoria (AES Yarra Newport and AES Jeeralang) and base load plant as specified in Appendix Q Table Q.2;
- potential new gas use from new scheduled[12] gas peaking and intermediate load plant as specified in Appendix Q Table Q.3; and
- NIEIR's forecasts of gas use of new scheduled cogeneration in Victoria.

Gas power generation from the EGP at Bairnsdale is excluded. Gas use for firing or starting existing coal plants in Victoria is already included in the industry based Tariff D forecasts.

Overall, the outlook for gas electricity generation in Victoria is uncertain. Aside from existing commitments to build gas electricity generation plant, future gas power generation capacity will depend upon:

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[11] 1 TWh (Tera.Watt.hour) = 3.6PJ

[12] Scheduled plant generally have a capacity > 30 MW

- inter-connector capacity and new and excess generation capacity in other NEM states;
- other potential electricity plant including base load plant;
- the composition and pattern of half hourly electricity demand growth;
- levels of demand side management and associated wholesale prices for electricity;
- growth in electricity demand in Victoria and South Australia;
- future electricity pool prices;
- competing projects including the SNOVIC interconnector augmentations and new interconnectors such as SNI (See Appendix Q);
- plant economics and subsequent capacity factors;
- gas prices;
- growth in unscheduled cogeneration;
- greenhouse policy; and
- energy policy and mandated renewable energy targets.

Assuming the SNOVIC (NSW-Victoria Interconnect) upgrade and Basslink proceed, the net generation requirement for the peak summer demand will be 2,800 to 3,000 MW by 2016. The net generation requirement in terms of energy is around 12 TWh over the current level of 46 TWh.

NIEIR's forecast for gas power generation takes into account:

- the total new generating requirement each year net of estimated supply from interstate and existing generation plant;
- the total new gas power generation requirement is calculated by further deducting existing gas power generation, buyback from scheduled cogenerators and generation by small scheduled generators in the distribution network; and
- excludes buyback from unscheduled cogenerators and renewables.

The gas power generation forecasts for each economic growth scenario are shown in Table 2.6. Total system demand including the gas power generation is also shown in Table 2.6 and charted in Figure 2.3.

The medium scenario assumes the gas power generation and interconnect projects listed in Tables Q.2 and Q.3 in Appendix Q are completed and operational by the dates indicated. Other as yet unspecified gas power generation projects are assumed to meet much of the new load in the longer term.

Under this scenario, gas used for power generation which is projected to be about 13 PJ in 2001, increases to 16 PJ in 2006 and 72 PJ in 2016. There is a small decline in 2002 as summer weather is assumed to revert to the average and unplanned base load generator outages reduce slightly to expected levels. It should be noted that if the scheduled cogeneration under the medium scenario does not proceed, the gas load of about 6 PJ p.a. by 2004/5 is likely to be taken on in part by dedicated gas power generation.

Under the high scenario, electricity peak demand and annual load grows at a higher rate increasing capacity factors of existing and committed gas power generators and bringing forward new projects in the longer term. An average growth rate of 11% per annum is assumed for the period 2002-2006 driven by the stronger economic growth. The forecast growth is even stronger at 18% per annum over the longer term which is due to stronger greenhouse measures under this scenario.

Under the low scenario a slow down in the economy and competing projects will result in a much lower growth in demand for gas power generation over the next 5 years. Loads associated with contracts for generation through the winter period are also reduced and the gas load falls significantly in 2002 as some generation contracts currently in place are not continued. The load is projected to fall to 9.6 PJ in 2006. Demand then starts to recover but at a much lower rate and reaches 34 PJ in 2016.

Table 2.6 Forecast Gas Power Generation (TJ)

	Forecast power generation			System demand including power generation		
Calendar Year	Low Scenario	Medium Scenario	High Scenario	Low Scenario	Medium Scenario	High Scenario
2001	12,972	12,972	12,972	210,477	210,477	210,477
2002	7,140	11,501	12,773	202,546	211,362	216,922
2003	6,945	12,206	13,915	203,849	216,614	227,101
2004	7,189	14,276	17,349	207,581	225,891	243,063
2005	7,938	15,015	19,576	210,881	233,532	257,181
2006	9,561	15,895	21,843	213,886	238,280	266,426
2010	13,321	26,019	42,589	227,476	268,080	323,529
2016	34,078	71,639	114,933	264,172	344,448	459,632
CAGR 2001-2006	-5.9%	4.1%	11.0%	0.3%	2.5%	4.8%
CAGR 2006-2016	13.6%	16.2%	18.1%	2.1%	3.8%	5.6%

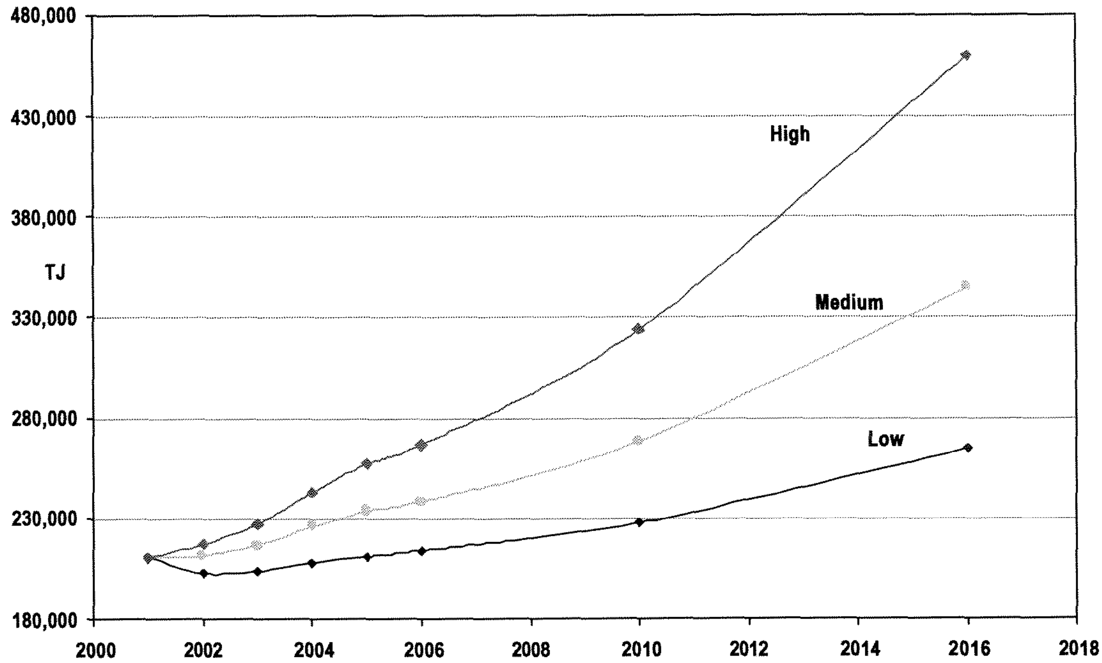

Figure 2.3 Long Term Gas Forecasts including Gas Power Generation

2.7 New technologies

Fuel cells developments are continually assessed but at this stage NIEIR do not foresee commercial applications in non-transport uses before 2008-12; to the extent that fuel cells do become competitive they will displace other technologies in the scenario technology mix such as gas cogeneration.

3 GAS DEMAND FORECASTS 2002 TO 2006

This chapter begins with a review of demand in 2001 followed by annual and peak demand forecasts for the system and each System Withdrawal Zone.

The forecast methodologies and models used in these forecasts are presented in Appendix C.

3.1 Review of Annual Demand 2001

Total system demand[13] for 2001 excluding gas fired power generation is projected to be 191.0 PJ based on actual consumption to 31 September this year. This is 13.2 PJ under the 2000 APR forecast for 2001 of 204.2 PJ[14].

As shown in Table 3.1, 8.7 PJ of the variance is explained by reduced demand for gas heating due to milder than average weather during winter 2001. The weather corrected projection for system load in 2001 is 199.7 PJ.

The balance of 4.5 PJ (or 2.2%) is forecast error associated with greater than expected contractions in the industrial sector. Figure 3.1 shows the 12 months moving totals of the Tariff D load, the total system load, and the total weather normalised (WN) system load including projections to the end of 2001. A contraction across all major industry sectors except Food began in October last 2000. The most affected industries were the Chemical and Non-Metallic Minerals sectors. The contraction continued through to January this year followed by a part recovery except for the Non-Metallic Industry sector which had a sharp decline in consumption due to the closure of the Adelaide Brighton cement plant at Geelong in June.

In the 12 months to 31 October, gas power generation accounted for an additional 12 PJ of load and is projected to be 13 PJ in 2001.

Table 31 Weather Normalisation System Load 2001 (PJ)

12 months actual demand projection[15]		191.0
Load temperature sensitivity PJ/EDD	0.037	
12 months weather (EDD)	1,272	
Melbourne Standard Weather EDD[16]	1,504	
Weather normalisation adjustment	0.037 x 232	8.7
Weather Normalised Demand 2001		**199.7**

[13] Gas used for power generation, interstate exports and withdrawals into storage are not included.
[14] This is based on the superseded annual weather standard of 1504 EDD.
[15] This projection is based on system demand for the 12 months to 31 Oct 00.
[16] Melbourne Standard Weather was revised in 2001 and now reflects milder weather in recent years. See Appendix A.

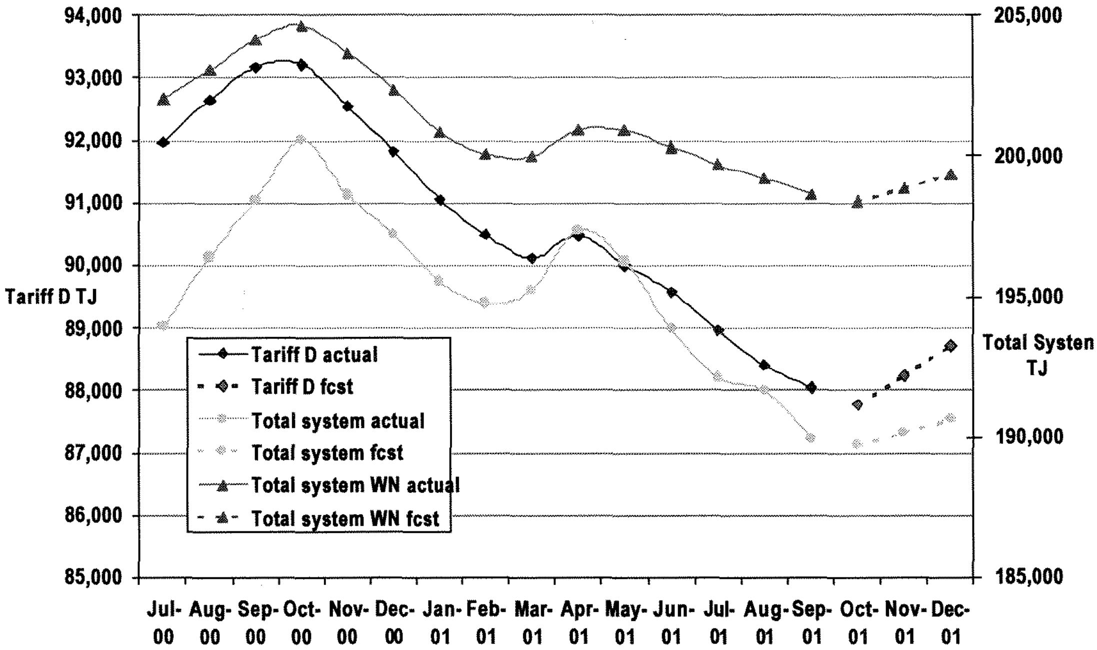

Figure 3.1 Tariff D and System Load trends in 2001

3.2 Annual Gas Forecasts 2002 to 2006

3.2.1 System Forecasts

The forecasts presented here cover the combined industrial, commercial, and residential loads supplied through the gas transmission system and include gas cogeneration. Demand from gas power generation, exports and withdrawals into UGS is treated separately. The underlying industrial and commercial Tariff D forecasts were produced on an industry (ASIC) sector level before aggregation with separately produced Tariff V commercial and residential forecasts.

The medium economic scenario is used for the 5 year planning analysis. Regional demand forecasts were generated for each system withdrawal zones using set proportions of the total system demand based on recent years and forecast growth for each industry and market sector. The forecasts are shown in Table 3.2 and displayed in Figure 3.2. Forecast growth in gas cogeneration (both unscheduled and scheduled) was prorated to regions based on forecast industrial sector demand.

The initial econometric forecasts generated have been refined to produce the final forecasts taking account of the survey responses of industrial customers, forecast information from *Participants*, and the gas cogeneration assumptions.

A number of large manufacturing plants will close their operation over the course of 2002. Announcements of these closures include Arnott's Biscuits, Nestle Confectionery, Bradmill Textiles, Denso Manufacturing, Austrim Nylex and South Pacific Tyres. The closure of the Adelaide Brighton Geelong Cement plant has already had major impact on the contracting Non-Metallic Minerals sector. It is estimated that total load loss over the next 5 years due to additional plant closures is about 2.5 PJ or 1% of total system load. However, growth in the food industry fuelled by increased exports, new gas cogeneration projects and general growth across the tariff V sectors will more than offset the losses. The Chemicals industry sector is also projected to recover after the large slump observed in 2000/2001.

Table 3.2 Annual Demand Forecasts (TJ)

SWZ	2001	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006	CAGR
Ballarat	6,965	7,052	7,217	7,482	7,679	7,824	1.2%	2.3%	3.7%	2.6%	1.9%	2.4%
Geelong	18,705	17,536	17,759	18,207	18,622	18,899	-6.2%	1.3%	2.5%	2.3%	1.5%	0.2%
Gippsland	13,764	14,045	14,466	15,821	17,161	17,514	2.0%	3.0%	9.4%	8.5%	2.1%	4.9%
Melbourne	136,026	137,853	140,498	144,501	148,547	151,060	1.3%	1.9%	2.8%	2.8%	1.7%	2.1%
Northern	18,453	19,613	20,522	21,476	22,209	22,608	6.3%	4.6%	4.7%	3.4%	1.8%	4.1%
Western	3,592	3,761	3,946	4,127	4,301	4,479	4.7%	4.9%	4.6%	4.2%	4.2%	4.5%
System	**197,504**	**199,861**	**204,408**	**211,615**	**218,517**	**222,385**	**1.2%**	**2.3%**	**3.5%**	**3.3%**	**1.8%**	**2.4%**

Growth in Tariff V load being predominantly residential is closely linked to the residential construction cycle. The change in lifestyle with preference for city living has seen a surge in new apartments in the CBD and inner city where gas heating appliances appear to compete less effectively with reverse cycle air conditioners for market share. The projected loss in gas heating share is estimated to be 0.3 PJ in 2002 accumulating to 1.1 PJ in 2006.

Gas demand is projected to grow moderately by 1.2% (or 2.4 PJ) in 2002 and to average 2.4% to 2006. The stronger growth in 2004 and 2005 is attributable to gas cogeneration.

3.2.2 System Withdrawal Zone Forecasts

Forecasts are presented for defined regions known as System Withdrawal Zones (SWZ). These regional forecasts are shown in Table 3.2 and Figure 3.2.

The forecast loads grow at rates depending on the load composition and the economic environment pertaining to each region.

The Geelong region is dominated by large industrial loads and has experienced negative growth of 6.2% over 2002 mainly due to the closure of Adelaide Brighton Cement. The overall load picks up after 2003 but at a moderate growth rate of 0.2% per annum.

Gippsland is projected to grow at 9.4% followed by 8.5% in 2004 and 2005 respectively, the growth is driven by a significant share of gas cogeneration growth. A strong growth rate averaging 4.9% is forecast over the next 5 years.

Growth in the Ballarat region's small load is forecast to average 2.4%.

Melbourne is by far the largest region having about 70% of system load. Forecast growth in the Melbourne region is just 1.2% in 2002 and is affected by the plant closures discussed earlier. A moderate growth of 2.1% per annum is projected for the next 5 years due to the high proportion of commercial and residential load.

Strong growth in the Northern Victoria demand is projected to continue to next year as a result of expansion of major dairy producers. The projected growth in 6.3% for 2002 followed by moderate growth between 3.5% and 4.5% over the following 3 years before the growth settles at 1.8% in 2006.

Forecast demand for Western zone is less certain due to the limited historical data and lack of information on gas usage by large industrial users in this region. Forecast demand growth of 2.4% p.a. over the next 5 years was based on an extrapolation of recent historical trend trends. Appendix D presents the forecast method for SWZ annual forecasts.

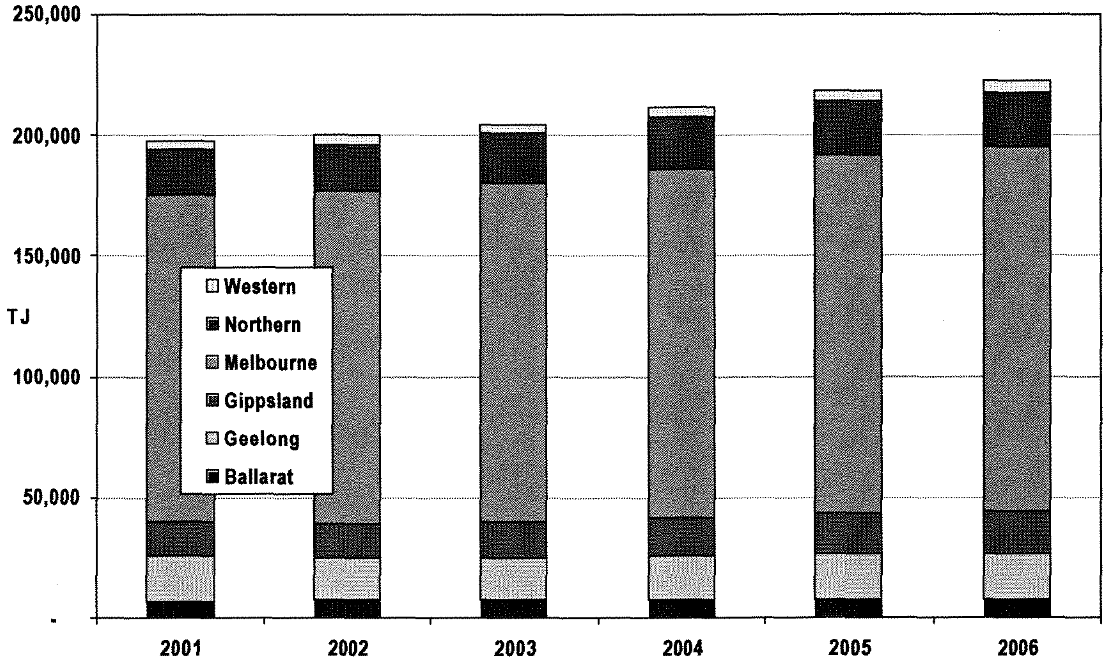

Figure 3.2 Annual Demand Forecasts

3.3 Peak Day Demand Forecasts

3.3.1 Review of Winter Peak Day Demand 2001

The system peak day demand of 1002 TJ included the WTS load and gas fired power generation of 49 TJ occurred on 28 August.

The estimated system 1in 2 peak day[17] demand for 2001 was determined by normalising system demand on the 5 highest general demand days in winter 2001 to the peak day standard of 15.15 EDD. The result of 1038 TJ is 2.2% under the forecast of 1061 TJ. The variance is explained in part by large unexpected contractions and closures in the industrial sector by June 2001.

3.3.2 Winter Peak Day Forecasts

The system peak day is the forecast maximum daily demand of the gas transmission system in a given winter excluding power generation and interstate exports. The SWZ peak day forecasts presented are coincident peak day forecasts i.e. the expected regional daily demands that would occur on the forecast system peak day.

The peak day forecast methodology is presented in Appendix E. The peak day planning standards are explained in Appendix B.

The forecast coincident 1in 2 winter peak days shown in Table 3.3 and Figure 3.3 are based on standard peak day weather conditions of 15.15 EDD and have a 50% chance of exceedence in a given year. The forecast 1 in 2 coincident system peak day grows to 1161 TJ in 2006 at an average rate of 2.3% per annum.

Growth in peak day demand depends on the relative growth of the industry and market sectors and may differ from the growth of the annual load forecasts. As discussed earlier industry growth in the next 5

[17] The 1 in 2 peak day estimates excludes gas power generation.

years is derived mainly from expansion cogeneration and dairy industries which have high load factors, consequently the forecast peak days grow at a slower pace than the annual forecasts, in particular in 2004 and 2005.

The system load factor (average daily demand / peak daily demand) has been revised to 52.4% from 53.0% following revision of the annual forecast weather standard. This is very low compared with most gas networks and is associated with the very high residential heating load driving peak demand in winter.

Table 3.3 Forecast 1 in 2 Peak Day Demand (TJ)

SWZ	2001	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006	CAGR
Ballarat	41	41	42	43	44	45	1.3%	2.4%	3.1%	2.5%	2.1%	2.3%
Geelong	82	79	80	82	84	86	-3.9%	1.7%	2.4%	2.3%	1.7%	0.8%
Gippsland	50	51	52	56	61	62	1.9%	2.7%	7.9%	7.2%	1.9%	4.3%
Melbourne	766	776	793	813	835	851	1.2%	2.2%	2.6%	2.6%	2.0%	2.1%
Northern	86	91	93	97	100	102	5.2%	3.0%	4.0%	3.1%	1.9%	3.4%
Western	13	13	14	14	15	16	4.7%	4.9%	4.6%	4.2%	4.2%	4.5%
Total System	1,038	1,051	1,075	1,107	1,139	1,161	1.2%	2.3%	3.0%	2.9%	2.0%	2.3%

The aggregate 1 in 2 peak day forecasts[18] reported by the *Distributors* is shown in Figure 3.3 and is very close to VENCorp's forecasts for 2002 to 2004 with a variance of about 1%. The forecasts diverge from 2005 with forecast discrepancy rising to 2.5% over the last 2 years. The closeness of the forecasts was achieved this year because the Distributors and VENCorp derived the forecasts from the same set of historical data[19] prepared by VENCorp and use of a standard forecast approach.

The forecast 1 in 20 peak days displayed in Table 3.4 and Figure 3.4 below are based on 1 in 20 weather conditions of 17.25 EDD and have a 5% of probability of exceedence in a given year. The forecast 1 in 20 peak day demand grows by 2.3% per annum over the next 5 years from 1,131 TJ in 2002 to 1,249 TJ in 2006.

[18] Forecast 1 in 2 peak day demand from transmission direct customers and scheduled gas cogeneration were added to the aggregate DB forecasts for comparison purposes.

[19] VENCorp provided to each DB actual and weather normalised historical demand data for the past 2 years.

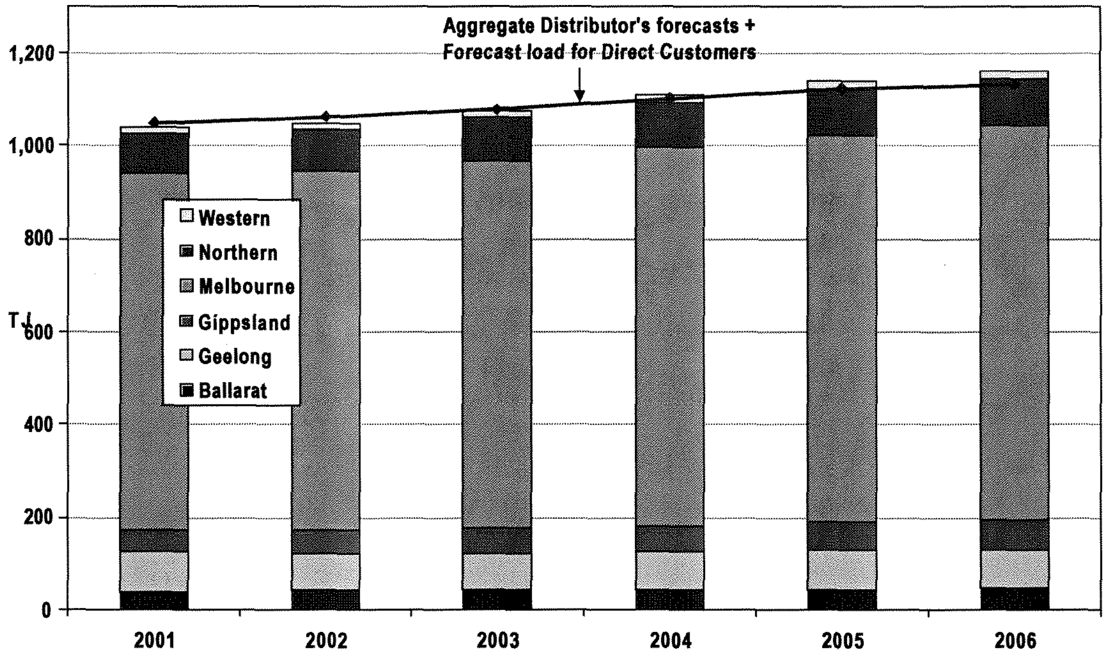

Figure 3.3 Forecast 1 in 2 Peak Day Demand (TJ)

System 1 in 20 peak days are about 7.5% higher than the corresponding 1 in 2 peak day demand due to greater heating load because of the much colder weather conditions. Regions with a large residential load such as the Melbourne show a greater % increase due to a higher proportion of heating load compared to Gippsland, Western and Geelong regions which are dominated by industrial loads.

Table 3.4 Forecast 1 in 20 Peak Day Demand (TJ)

SWZ	2001	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006	CAGR
Ballarat	44	44	45	47	48	49	1.3%	2.4%	3.0%	2.5%	2.1%	2.3%
Geelong	87	84	86	88	90	91	-3.6%	1.7%	2.4%	2.3%	1.8%	0.9%
Gippsland	53	53	55	59	63	64	1.9%	2.6%	7.7%	7.0%	1.9%	4.2%
Melbourne	829	839	857	880	902	920	1.2%	2.2%	2.6%	2.6%	2.0%	2.1%
Northern	92	96	99	103	106	108	5.0%	2.9%	3.9%	3.0%	2.0%	3.4%
Western	13	14	14	15	16	16	4.7%	4.9%	4.6%	4.2%	4.2%	4.5%
Total System	1,117	1,131	1,157	1,191	1,225	1,249	1.2%	2.3%	3.0%	2.8%	2.0%	2.3%

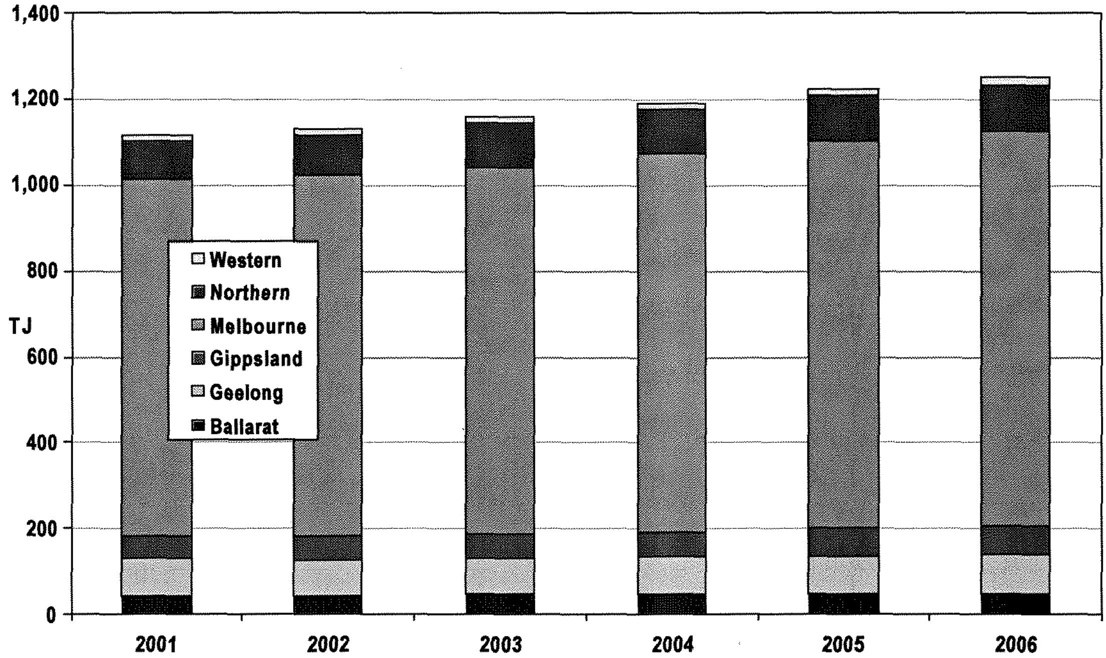

Figure 3.4 Forecast 1 in 20 Peak Day Demand (TJ)

3.4 Gas Cogeneration

The current unscheduled[20] installed gas cogeneration capacity supplied through the Victorian gas market is about 206 MW of which about 170 MW is operational. The capacity is forecast to increase to 303 MW in 2006. The gas cogeneration load is expected to increase from 6.2 PJ to 10 PJ over the same period.

The medium scenario assumes that scheduled gas cogeneration commences in 2004/5 with an annual load of 6 PJ and capacity of about 100 MW. This is included within the industrial load forecasts.

Total gas cogeneration load grows from 6.2 PJ currently to 16.2 PJ in 2006 and is included in the system forecasts.

These forecasts are not based on any particular gas cogeneration proposals, however, very large gas cogeneration projects such as Duke/Paperlinx at Maryvale and Visy at Coolaroo proposed within the planning period to 2006, have been reported in the media.

3.5 Peak Hour Demand Forecasts

The forecast peak hour demand for each region is shown in Table 3.5. This is the forecast maximum hourly non-coincident demand for each region on the system 1 in 2 peak day.

The forecast peak hour demand was generated from analysis of historical hourly demand profiles on peak days and is calculated as a simple proportion of the forecast 1 in 2 peak day.

Peak hour demand for each zone can occur in the evening or morning depending on the inherent load characteristics of each region but is usually from 6 to 7pm.

Hourly demand profiles for each region and the total system are shown in Appendix M.

[20] All current gas cogeneration is unscheduled (<30 MW) and generally embedded in the electricity distribution systems. Future scheduled cogeneration installations (>30 MW) must be bid into the electricity market for scheduling.

Table 3.5 Forecast Peak Hour Demand (TJ)

	SWZ	2001	2002	2003	2004	2005	2006
1 in 2	Ballarat	2.7	2.8	2.8	2.9	3.0	3.1
	Geelong	4.5	4.4	4.4	4.5	4.6	4.7
	Gippsland	3.1	3.2	3.3	3.5	3.8	3.9
	Melbourne	50.4	51.0	52.1	53.5	54.9	56.0
	Northern	5.2	5.4	5.6	5.8	6.0	6.1
	Western	0.7	0.7	0.8	0.8	0.8	0.9
	Total System	65.7	66.5	68.1	70.1	72.1	73.6
1 in 20	Ballarat	3.0	3.0	3.1	3.2	3.2	3.3
	Geelong	4.8	4.6	4.7	4.8	4.9	5.0
	Gippsland	3.3	3.4	3.5	3.7	4.0	4.1
	Melbourne	54.5	55.2	56.4	57.9	59.3	60.5
	Northern	5.5	5.8	6.0	6.2	6.4	6.5
	Western	0.7	0.8	0.8	0.8	0.9	0.9
	Total System	70.7	71.6	73.3	75.4	77.6	79.1

3.6 Gas Power Generation

Gas demand for power generation for Calendar 2001 is projected to be about 13 PJ comparable with that in 2000. The summer peak demand of 182 TJ in the 12 months to October 2001 was considerably lower than the maximum of 240 TJ for the same period last year. The volatility of the peak gas power generation demand is often associated with unplanned generator outages, the electricity market conditions as well as weather.

Gas power generation demand on the winter system peak day in 2001 was 49 TJ reflecting a trend in demand for gas power generation on very cold days in the last two years.

It is expected that the demand for electricity cooling will continues to rise over the next few years and drive growth in summer electricity demand. A number of gas peaker plants are being installed and will be completed this summer. These include:

- Somerton (AGL) 150MW to be partly or fully operational by early 2002
- Valley Power (Edison Mission at Loy Yang B) 300MW to be partly or fully operational by early 2002

In addition AES has a proposal for a 250 MW to 375 MW gas peaker plant in the Geelong region that may be operational by summer 2002/3.

Forecast gas power generation load is projected to grow to about 16 PJ by 2006. This projection is subject to considerable uncertainty being dependent on future electricity market conditions and numerous causal factors including the outcome of competing projects over the next few years such as

SNOVIC, Basslink, Murraylink and SNI. This is discussed in more detail in section 2.6. Forecasts of electricity demand as well as gas generator and infrastructure developments are provided in Appendix Q.

3.7 Replenishment of UGS

Deliveries of gas to Iona for withdrawals into UGS will increase demand. This normally occurs in the shoulder and summer months between November and April. UGS can withdraw at rates up to 90 TJ/d however this is constrained by the requirement to supply the WTS and system demand conditions on the day. Withdrawals of 20 to 80 TJ/d over summer are expected to replenish up to 10 PJ or more of inventory.

3.8 Export Demand

Available imports imply a net flow into Victoria most of the time during the planning period and particularly in winter as occurred in 2001.

In winter net flows to NSW are currently constrained to about 17 TJ/d under the current operating conditions and obligations. However in summer, subject to suitable operation of the NSW system, larger exports are possible. System modelling indicates that net exports exceeding 30 TJ/d are feasible. Exports up to 30 TJ/d occurred on a considerable number of days over summer 2000/2001.

The *Eastern Gas Pipeline* might have available capacity for exports but this would require connection to the GTS. An EGP connection along with the Longford to Bell Bay (Tasmania) pipeline proposal would lead to the development of a *Longford Market Hub* in the medium to long term and enable exports/imports from/to the Victorian gas market.

A proposal for a pipeline from Port Campbell to South Australia, primarily to transport gas from Port Campbell for power generation and industrial needs in South Australia, is under strong consideration and is supported by the S.A. Government. This will require development of Otway Basin offshore supplies such as Minerva in the medium term and possibly the larger Thylacine and Geographe fields at later stage. Such proposals may lead to the development of a *Port Campbell Market Hub* in the medium to long term and enable exports from the Victorian gas market.

3.9 Forecasting and Data Issues

Demand forecasts were developed based on limited historical meter data. Meter data prior to commencement of the Gas Market included a high level of substitution and this has an impact on the accuracy of the regional forecasts. The breakup in 1997 and reform of the industry led to a discontinuity in meter and billing data and loss of some major load data series. The data situation is improving each year with meter data being more complete and reliable in 2000 and 2001 and the build up of new Tariff V and D data series.

VENCorp requested that *Market Participants* provide additional planning information including:

- demand forecasts for direct transmission customers to enable VENCorp to reconcile system forecasts with the aggregate of *Distributor* forecasts; and
- individual demand forecasts for very large customers to enable VENCorp to more accurately forecast loads at the regional level.

Some *Market Participants* fulfilled the request resulting in greater confidence in regional forecasts. Under the MSOR, such information provided to VENCorp remains confidential. VENCorp will continue to encourage *Participants* to provide additional information in the future with the objective of producing more reliable forecasts.