Draft report to

Independent Pricing and Regulatory Tribunal of NSW

REPORT TO THE TRIBUNAL

Review of demand forecasts for the 2004 electricity network review

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McLennan Magasanik Associates Pty Ltd
242 Ferrars Street
South Melbourne Vic 3205
Tel: (03) 9699 3977
Fax: (03) 9690 9881
Email: mma@mmassociates.com.au
Website: www.mmassociates.com.au

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Independent review of demand forecasts

The Independent Pricing and Regulatory Tribunal of New South Wales (the Tribunal) is undertaking a review of the regulatory arrangements to apply to the four NSW electricity distribution network service providers (DNSPs), EnergyAustralia, Integral Energy, Country Energy and Australian Inland from 1 July 2004.

The anticipated regulatory structure is sensitive to demand or growth forecasts. As part of the review process the DNSPs were asked to submit medium, high and low demand forecasts to the Tribunal. The Tribunal has asked McLennan Magasanik Associates (MMA) to review the demand forecasts submitted by the DNSPs and prepare independent forecasts of customer numbers, energy consumption and peak demand for each DNSP.

Review methodology

The review has been based on requesting and clarifying historical, methodological and forecast data from DNSPs and a desk-top review of other available material including further historical, demographic, weather and economic information. Because of the brevity of the study the methodology was restricted to data supplied by the DNSPs or publicly available. This meant that analysis was generally possible only in two sectors, residential and non-residential, rather than by more disaggregated customer and size classes.

Key DNSP methodology and assumptions

The key approaches taken, and assumptions made by the DNSPs are provided in Table 1 together with MMA overview commentary.

Table 1: DNSP forecasting methodology and assumptions

Residential	Non-residential	MMA Comment
EnergyAustralia		
• Customer number forecast from NIEIR • Average usage per customer using EA appliance model	• Demonstrated relationship between electricity and Gross State Product (GSP) • Move to use same relationship with Network Region Gross	• Forecast residential customer number growth is low compared to recent history • Appliance model suggests a significant shift in average usage from recent history

Residential	Non-residential	MMA Comment
	Product (NRGP) • NIEIR forecast for GSP	• Strong relationship demonstrated between GSP (but not NRGP) and non-residential usage
Integral Energy		
• Customer number forecast based on history and NIEIR • Average usage per customer using IE appliance model	• Assumed relationship between non-residential electricity and GSP and real price of electricity • Assumed elasticities which reduced significantly over time • NIEIR forecast for GSP and price • Separate forecasts for business and inter distributor transfers (IDT) in the non-residential sector	• Customer number growth seems high compared to recent history • Appliance model suggests a significant shift in average usage from recent history • No relationship demonstrated for the combined relationship between electricity, GSP and real price • According to IE, elasticities are based on judgement and recent experience of changes in the non-residential class. No quantitative evidence has been provided to support either the elasticities used or their rapid reduction over the period.
Country Energy		
• Prepared independently by NIEIR • Methodology not transparent	• Prepared independently by NIEIR • Methodology not transparent	• Historical information limited and very patchy. • NIEIR breakup of sectors is very different to that of Country Energy. • Forecast information is very different to that prepared by NIEIR in terms of sector numbers and growth rates
Australian Inland		
• No change in customer numbers • Trend for volume	• No change in customer numbers • Initial reduction in demand for major non-residential customer then flat • Trend for volume for remaining non-residential customers	• Very limited history • Changes to major customer not justified • Trend for other customers not justified.

Independent MMA forecasting

MMA has used a combination of historical trends and key drivers in producing independent forecasts for each DNSP. The key drivers assessed are reviewed in Table 2.

Table 2: MMA forecasting approach and methodology

Key Driver	MMA approach, methodology and comments
Residential customers	Combination of historical growth and forecasts, taking into account demographic data and forecasts from ABS, NIEIR and the Metropolitan Development Program from Planning NSW. Customer growth is expected to moderate somewhat from recent history but not necessarily shift geographically.
Appliances and average usage per residential customer	Consideration given to history for both general tariff and off-peak loads, appliance models, penetration rates and energy efficiency trends. MMA approach balances historical trend and appliance modelling. Average use per customer is expected to moderate compared to recent history.
Economic Growth	MMA has established a strong relationship between GSP and electricity consumption for the state as a whole, with an elasticity of 0.87. MMA has confirmed the strong relationship between GSP and electricity consumption for the EA network with an elasticity of 0.8. The statewide relationship has been used for all DNSPs apart from EnergyAustralia. MMA has used a common NIEIR GSP forecasts across all DNSPs.
Weather Impact	MMA could not reproduce the impacts estimated by EnergyAustralia and Integral Energy. MMA has therefore used trend analysis.
Price	Both the changes to real price of electricity and the elasticity are very uncertain. MMA has not used any price forecasts or relationship in forecasting.
Cogeneration and major new projects	Own-use by expected additional cogeneration has been used to offset growth in the non-residential sector.
Maximum Demand	Based on MMA's residential appliance model, changes to customer numbers and customer peak usage for the residential sector and load factors for non-residential usage for each DNSP.
Demand Management	Continuation of energy appliance efficiency trends and reduced residential "comfort factor" growth. No other impact of current programs assumed on either energy or Maximum Demand.

Demand forecast by distributor

MMA demand forecasts for each of the distributors are provided in Table 3 to Table 6 below, together with the DNSP medium forecasts for comparison. Results are provided for financial years ending June 30th.

Table 3: Comparison of forecasts for EnergyAustralia

MMA forecasts, GWh	2003	2004	2005	2006	2007	2008	2009
Residential	9729	9935	10090	10311	10497	10764	10973
Non-residential	16031**	16377	16789	17254	17561	17946	18358
Total	25760	26312	26880	27565	28057	28711	29331
EnergyAustralia forecasts, GWh	**2003***	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Residential	9609	9813	9873	9972	10035	10153	10196
Non-residential	16031	16396	16789	17152	17495	17897	18398
Total	25639	26209	26662	27124	27530	28050	28594

* Actuals for 2003, forecasts provided to MMA from 2004
** MMA has used the non-residential actuals in 2003 as the basis for forecasting purposes

The MMA and EnergyAustralia forecasts differ in total by 2.6% in 2009. However, the percentage difference is much greater in the residential sector. MMA believes that EnergyAustralia has underestimated the residential customer number growth and over-estimated the reduction in average usage per customer compared to recent history. The MMA and EnergyAustralia forecasts for the non-residential sector are similar.

Note that EnergyAustralia's two major customers and IDTs are not included in these forecasts.

Table 4: Comparison of forecasts for Integral Energy

MMA forecasts, GWh	2003	2004	2005	2006	2007	2008	2009
Residential	5731	5926	5984	6079	6153	6273	6358
Non-residential	10727**	11075	11363	11687	11907	12179	12470
Total	16458	17000	17347	17766	18060	18452	18827

Integral Energy forecasts, GWh	2003*	2004	2005	2006	2007	2008	2009
Residential	5583	5925	6010	6125	6252	6369	6486
Non-residential	10727	11136	11428	11701	11931	12046	12273
Total	16310	17061	17438	17826	18183	18415	18759

* Actuals for 2003, forecasts from 2004

** MMA has used the non-residential actuals in 2003 as the basis for forecasting

The MMA and Integral Energy forecasts differ in total by 0.4% in 2009. There is overall little difference between the forecasts, although the forecasting methodologies and assumptions have been quite different. In the residential sector MMA has forecast less usage than Integral Energy over the period. MMA expects lower customer number growth over the regulatory period than does Integral Energy, but with a greater average usage per customer which largely compensates. In the non-residential sector MMA has forecast a generally higher growth rate but this is to some extent compensated for by increased own-use from additional cogeneration.

Note that the Integral Energy IDT export volumes are included within these forecasts.

Table 5: Comparison of forecasts for Country Energy

MMA forecasts, GWh	2003	2004	2005	2006	2007	2008	2009
Residential	4694	4767	4815	4888	4950	5043	5108
Non-residential	5432	5559	5712	5884	5998	6142	6297
Total	10126	10326	10527	10773	10949	11185	11405
Country Energy forecasts, GWh	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Residential	4700	4780	4861	4944	5028	5113	5200
Non-residential	5434	5526	5620	5716	5813	5912	6012
Total	10134	10306	10482	10660	10841	11025	11213

* Forecasts from 2003 inclusive. Based on Table 9 of data provided by Country Energy to MMA

The MMA and Country Energy forecasts differ in total by 1.7% in 2009. Here the difference is largely in the non-residential sector. MMA believes that Country Energy has under-estimated the growth in the non-residential sector and somewhat over-estimated its residential sector consumption.

Table 6: Comparison of forecasts for Australian Inland

MMA forecasts, GWh	2003	2004	2005	2006	2007	2008	2009
Residential	107	108	108	109	110	111	112
Non-residential	296	309	313	318	321	325	329
Total	403	417	422	427	432	437	441
Australian Inland forecasts, GWh	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Residential	107	103	106	108	111	113	116
Non-residential	307	302	305	309	313	317	321
Total	413	405	411	417	423	430	436

* Forecasts from 2003 inclusive. Based on Table 9 of data provided by Australian Inland to MMA

The MMA and Australian Inland forecasts differ in total by 1.2% in 2009. The difference is attributable largely to the major customer in the non-residential sector. MMA believes that Australian Inland has slightly under-estimated the usage by this customer. Australian Inland's residential sector forecasts are slightly lower than MMA's.

It should be noted that MMA has relied on information provided by the DNSPs in response to MMA questions. We have not checked the forecasts provided to MMA against the forecasts provided to the Tribunal. These may need to be checked for consistency by the Tribunal.

Customer numbers

Customer number forecasts for residential and business customers are provided in Sections 5.6 and 6.8 of the report.

Maximum demand

MMA's maximum demand forecasts and growth rates for the DNSPs who have provided maximum demand numbers are provided in Table 7.

Table 7: Maximum demand forecasts for winter and summer*, MW and growth rate

	2003	2004	2005	2006	2007	2008	2009	% p.a.
EA Winter	5030	5160	5301	5462	5592	5751	5913	2.7%
EA Summer	4951	5115	5296	5499	5666	5863	6068	3.4%
IE Winter	3058	3180	3264	3360	3437	3531	3627	2.9%
IE Summer	3114	3246	3350	3466	3560	3671	3786	3.3%
CE Winter	1990	2036	2085	2141	2187	2242	2298	2.4%
CE Summer	1628	1679	1735	1798	1849	1910	1973	3.3%

* Note, financial years for summer and calendar year for winter maximum demand forecasts

MMA's summer peak growth is approximately 0.4% higher than the DNSPs. This is due to one or more of increased energy forecasts and higher assumed usage of air conditioning.

1 INTRODUCTION

The Independent Pricing and Regulatory Tribunal of New South Wales (the Tribunal) is currently undertaking a review of the regulatory arrangements to apply to the NSW electricity distribution network service providers (DNSPs) from 1 July 2004. The DNSPs under review are EnergyAustralia, Integral Energy, Country Energy and Australian Inland. Under the arrangements to apply from 1 July 2004, the Tribunal will regulate:

- distribution tariffs under the weighted average price cap
- transmission tariffs under a pass through arrangement
- set specific prices for miscellaneous charges and monopoly fees under a price cap.

The operation of the weighted average price cap is sensitive to the demand or growth forecasts used. Demand forecasts are also required to assess the capital and operating costs of the DNSPs for the upcoming regulatory period.

The Tribunal initially invited the DNSPs to submit three growth scenarios – low, medium and high. In July 2003 the Tribunal released an issues paper, *Determining Sales Volumes for the 2004 Electricity Network Review*, which discussed the growth scenarios put forward by the DNSPs. The paper provided an overview of the demand forecasts submitted by the DNSPs and gross comparisons against historical, TransGrid and ABARE forecasts. The DNSP forecasts appeared in most cases to be lower than recent historic growth and other forecasts.

Given the difference between historical growth rates and the incentive for the DNSPs to underestimate their demand forecasts over the coming regulatory period, the issues paper asked stakeholders what kind of review of the demand forecasts was considered most appropriate. Responses to this paper generally called for an independent review of the demand forecasts.

The Tribunal has asked McLennan Magasanik Associates (MMA) to carry out an independent critical review of the forecasts put forward by the DNSPs and to recommend for each DNSP growth forecasts (customer numbers, consumption and maximum demand) for the Tribunal to use for the 2004-2009 regulatory period.

The MMA review has been carried out through a combination of desk-top review and interaction with the DNSPs over a short time period. The Tribunal intends to consider the draft report as part of its draft determination. Public consultation on the MMA draft report will occur with the consultation on the draft determination. MMA will then finalise its review in early 2004 for consideration by the Tribunal in its final determination.

The report is laid out in the following Chapters:

Chapter 2 considers the methodology used to review the demand forecasts for the DNSPs

Chapter 3 provides recent historical customer numbers and energy usage by DNSP

Chapter 4 considers in detail key drivers of customer numbers and energy usage

Chapter 5 reviews DNSP demand forecasts for the residential sector and then provides independent forecasts for each DNSP

Chapter 6 reviews DNSP forecasts for the non-residential sector and then provides independent forecasts for the non-residential sector for each DNSP

Chapter 7 reviews DNSP maximum demand forecasts and then provides independent maximum demand forecasts for each DNSP taking into account the independent forecasts in the residential and non-residential sectors.

Note that information regarded as confidential by the DNSPs has been blocked out in the report which is to be made available to the public for comment.

2 METHODOLOGY

2.1 REQUEST FOR INFORMATION

The DNSPs were asked to provide specified data within the following categories in support of their demand forecasts:

- Historical customer numbers by customer class
- Historical sales or consumption by customer class
- Historical network maximum demand for summer and winter
- Weather normalisation methodology
- Weather normalised historical sales by customer class
- Details about the largest customers
- The DNSP's forecasting methodology for customer numbers, consumption and maximum demand
- Key drivers of demand
- Historical and forecast demographic, economic and usage parameters
- Forecasts of customer numbers by customer class
- Forecasts of consumption by customer class
- Forecasts of maximum demand for the network in summer and winter

As many of the questions had been previously asked, responses were requested within two weeks.

2.2 INITIAL REVIEW

The DNSPs all supplied responses to the questions within about two weeks. However, some of the responses were incomplete or inconsistent with information supplied previously.

The responses were initially reviewed and follow-up meetings held with EnergyAustralia and Integral Energy. Clarification was also sought from Country Energy and Australian Inland.

2.3 REVIEW METHODOLOGY

Given the short time available to review the DNSPs' demand forecasts and produce independent forecasts, the review had to be based on information that could be obtained within a short time period. It was not practical to try to use methodologies that could not be supported by available data. Nor was it practical to insist on the DNSPs providing information they said they did not have or could not readily produce.

The review was based on answering the four following questions:

- Is the approach taken the best that could be reasonably expected?
- Are the assumptions made the best that could reasonably be expected?
- Is there a balance between use of "historical trends" and "key drivers" in forecasting?
- Is the methodology properly applied?

The independent MMA forecasts were an attempt to utilise the best approach, assumptions, balance and methodology, given the data limitations and considerations of materiality.

2.4 CONFIDENTIALITY

The DNSPs were provided with a copy of the draft report and asked to identify information they considered to be confidential. The material considered confidential by the DNSPs related mainly to information about specific customers.

The material identified by the DNSPs as confidential is included in the report to the Tribunal but has been removed from this public version of the report. The points where excisions have been made are identified.

2.5 PERIOD AND CURRENCY OF DATA

The DNSP forecasts were intended to be for the period 2003/2004 to 2008/09 inclusive. This is still the period for which forecasting is required.

At the time the DNSPs were preparing their forecasts actual sale and consumption information was available only for the 2001/02 year and many of the economic parameters used were derived late in 2002 or in early 2003.

Thus, for forecasting purposes the DNSPs all used the year 2001/02 as the base year and forecast over the period 2002/03 to 2008/09.

Since that time more recent consumption and economic and demographic parameters have become available. For two DNSPs customer and consumption numbers for 2002/03 are now available, as are more recent forecasts of economic parameters. It is considered reasonable for this review to use the most recent data available. Thus the year 2002/03 (after weather normalisation of actuals in the residential sector) is used as the base year wherever possible.

Year 2002/03 data should also become available for the other two DNSPs within the period available for comment on the draft report and may be used in the final report.

Note that, unless stated otherwise, the years referred to in the report are financial years ending June 30th. The convention adopted in this report is to refer to financial years either through a combined year designation (eg 2001/02) or as the year which ends on June 30th (eg 2002).

2.6 SECTORS FORECAST

2.6.1 Need for load disaggregation and categorisation

The forecasts derived by the networks and approved by the Tribunal are to be used to derive network tariffs and as input into capital expenditure reviews. As such they have significant financial ramifications. They need to be fit for the purpose intended.

Proper forecasting requires that loads be disaggregated into customer classes with similar characteristics, allowing the assessment of historical trends and identification of key drivers over the next period.

2.6.2 Information requested

The four DNSPs were asked to provide historical and forecast information divided into:

- Residential (general and controlled loads)
- Commercial for small (< 40 MWh pa), medium (40 – 160 MWh pa) and large (> 160 MWh pa) customers
- Industrial for small (< 40 MWh pa), medium (40 – 160 MWh pa) and large (> 160 MWh pa) customers
- Other (separated into bulk transfers, public lighting etc)
- Losses.

The DNSPs uniformly responded that they have no ability to separate out commercial and industrial loads. Instead they combined the commercial and industrial categories into a "non-residential" category.

The DNSPs also responded that they could not provide historical data for the non-residential sector disaggregated by size.

This has meant that the forecasts have generally needed to be reviewed and independently forecast on the basis of residential and non-residential sectors alone[1].

[1] In one case we have considered Inter Distributor Transfers (IDTs) separately from other non-residential usage.

3 HISTORICAL DATA

Unless there are significant changes to key drivers, it could be expected that recent history would provide a reasonable indicator of future trends. Historical information and trends thus play a significant role in informing forecasting.

3.1 RESIDENTIAL

3.1.1 Customer Numbers

The DNSPs provided the historical information contained in Table 8.

Table 8: Residential customer numbers by class

Year ending June 30	1998	1999	2000	2001	2002	2003
Residential Customer Numbers						
EnergyAustralia	1227384	1240021	1260714	1300446	1329500*	1346056
Integral Energy	649724	657919	679445	691561	705950	726600
Country Energy		616696	572036	617957	628422	
Australian Inland				12330	12315	
Controlled Load Customers						
EnergyAustralia	523717	529355	529000	529709	533691*	547453
Integral Energy	347651	347651	341208	352010	355356	349777
Country Energy				337585	452795	
Australian Inland				10543	8584	

* Items in 2002 for EnergyAustralia are estimated by MMA for timing consistency.

Residential customer numbers for both EnergyAustralia and Integral Energy have been growing at around 2% pa over the period, with the compound growth rate for Integral Energy being 2.3% pa and that for EnergyAustralia being 1.9% pa. Controlled load (off-peak) customers have also increased for these networks over the period, but at a rate much less than the growth in residential customers, approximately 0.9% pa for EnergyAustralia and 0.1% pa for Integral Energy.

The data for Country Energy are very inconclusive suggesting significant shifts in customer categorisation.

The very limited data provided by Australian Inland suggest that residential customer numbers are static.

3.1.2 Residential sales

The DNSPs provided the historical sales information contained in Table 9. These are not weather adjusted because the DNSPs stated they could not provide separate weather adjusted historical data for the residential and non-residential sectors.

Table 9: Residential customer sales by class, GWh, not weather adjusted

Year ending June 30	1998	1999	2000	2001	2002	2003
General Tariff Residential Sales						
EnergyAustralia	6629	6746	6842	7570	7663	7712
Integral Energy	3754	3700	4141	4323	4237	4331
Country Energy*			2912	3154	3092	
Australian Inland*				92	76	
Controlled Load Residential Sales						
EnergyAustralia	1752	1815	1878	1825	1904	1896
Integral Energy	1285	1325	1424	1312	1323	1252
Country Energy			1176	1353	1530	
Australian Inland				30	23	
Total Residential Sales						
EnergyAustralia	8381	8561	8719	9395	9567	9609
Integral Energy	5039	5025	5565	5635	5560	5583
Country Energy			4088	4507	4622	
Australian Inland				122	99	

* Rural customer sales for Country Energy and Australian Inland are included within general tariff

Useful historical data has only been provided by EnergyAustralia and Integral Energy. Over the past few years total sales to residential customers have increased by 2.8% pa for EnergyAustralia and 2.1% pa for Integral Energy. For EnergyAustralia this is higher than the observed rate of customer growth (see Section 3.1.1) while for Integral Energy it is somewhat lower. The growth in residential loads was significantly higher for the General Purpose tariffs than for Controlled Loads (mainly off-peak hot water).

It is useful to derive average usage per residential customer for both general purpose and controlled load as well as the residential sector as a whole. Changes to average usage per residential customer for both overall usage and controlled load (off-peak) use is analysed in Section 4.2.

3.2 BUSINESS SECTOR

3.2.1 Customer Numbers

The information provided by the DNSPs about non-residential or business customers is presented in Table 10. The DNSPs all stated they could not separate commercial from industrial customers.

Table 10: Business customer numbers by DNSP

Year ending June 30	1998	1999	2000	2001	2002	2003
EnergyAustralia	138964	143595	143141	145000	142204*	139408
Integral Energy	82557	81526	63798	69474	70403	72294
Country Energy		92932	144394	110865	87808	
Australian Inland				4023	5968	

* Items in 2002 for EnergyAustralia are estimated by MMA for timing consistency.

The numbers provided are clearly distorted by movements between customer classes and possibly consolidation of customer accounts. They are, therefore, not further analysed.

3.2.2 Non-residential sales

The DNSPs provided the historical sales information for the non-residential sector contained in Table 11. The non-residential sector includes business sales, public lighting and IDT exports[2]. These are not weather or "daytype" normalised as two businesses did

[2] Except for EnergyAustralia which we understand did not include IDT exports in its forecasts, see Section 6.2.1.

not weather normalise and two stated they could not separate out the impact of weather on the different customer classes.

Table 11: Non-residential sales by class, GWh, not weather adjusted

Year ending June 30	1998	1999	2000	2001	2002	2003
EnergyAustralia	13770	14417	15645	15881	15835	16031
Integral Energy	10101	10781	9468	10529	10527	10727
Country Energy			5560	5500	5343	
Australian Inland				282	304	

Trend analysis shows growth in the EnergyAustralia network to have been about 3% pa over the period. Growth in the Integral Energy network appears to have been much slower, about 1% pa) but this may have been confused by the incorporation of significant levels of IDTs (inter-distributor transfers) within total non-residential, movements between customer classes, sector consolidation and data problems experienced in 2000.

Country Energy data suggests that Country Energy is losing load in this sector. This may be due to the impact of the drought. However, this is far from clear as Country Energy has also experienced data problems. Australian Inland's business sector has grown slightly, but is dominated by one customer.

4 KEY DRIVERS

This section of the report assesses the key drivers for electricity sales in NSW over the past few years and over the review period. The Chapter provides background information and considers different approaches to forecasting both the drivers and their impacts on electricity sales.

The key drivers considered are:

- demographic (population, households)
- appliance penetration and usage and average usage per customer
- economic indicators (Gross State Product (GSP) and its division between regions)
- fuel prices
- weather conditions
- major new developments and cogeneration
- demand management measures

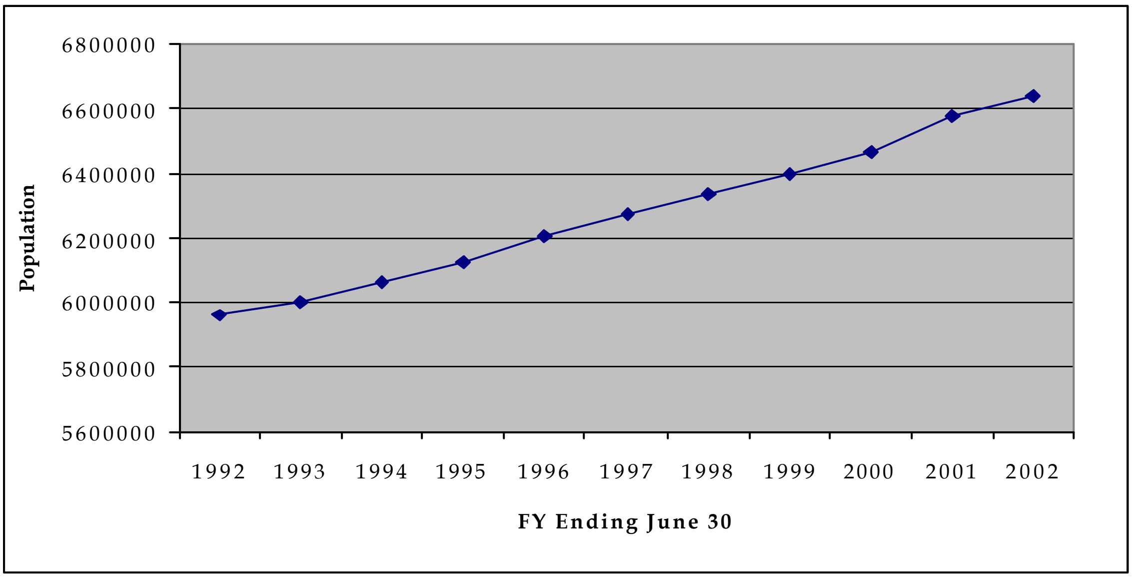
Many of the key drivers are then used in deriving the growth forecasts in later Chapters.

4.1 DEMOGRAPHICS

4.1.1 Population

Growth in the NSW population since 1991 is illustrated in Figure 1.

Figure 1: Growth in NSW population, 1992 to 2002



Source: ABS Publication 3101.0

Population growth for NSW as a whole has been 1.1% pa over the period 1992 to 2002. Growth over the latter half of the period has been slightly higher than over the former half. Preliminary population estimates for March 2003[3] suggest that the annualised growth for the 2002/03 year will be of the order of 1% pa.

The National Institute for Economic and Industry Research (NIEIR) has forecast for the medium case in the 2003 NEM Statement of Opportunities[4] that NSW population growth between 2002/03 and 2006/07 will continue at between 0.9% and 1.1% pa. According to Transgrid, NIEIR has forecast an average 1% pa population growth between 2002/03 and 2012/13[5]. An average annual population growth rate of 1% pa is also consistent with the NIEIR forecasts for NSW provided in the report to Country Energy[6].

4.1.1.1 Population growth for different DNSPs

Population growth is not evenly distributed across the DNSPs. Over recent years there has been a trend towards faster population growth in the Sydney Statistical region and coastal areas than in the rest of NSW.

Estimates of population growth rates between the periods 1997 and 2002 for the different DNSPs are provided in Table 12.

Table 12: Estimated population growth rates between 1997 and 2002

DNSP	Estimated % growth 1997 to 2002	As proportion of NSW growth
EnergyAustralia	1% pa	90%
Integral Energy	1.5% pa	133%
Country Energy	0.9% pa	82%
Australian Inland	-0.6% pa	-54%
New South Wales	1.1% pa	100%

3 6.691 M NSW population according to ABS Publication 3101.0

4 National Institute of Economic and Industry Research, "The economic outlook for the NEM states to 2012-13" report to the National Electricity Market Management Company, June 2003

5 Transgrid, NSW Annual Planning Report, Table A2.2.

6 National Institute of Economic and Industry Research, "Electricity forecasts for the Country Energy region to 2012" report to Country energy February 2003.

Source: ABS estimated resident population (ERP) by local government area (LGA) 1997, 2001 and estimated 2002, Publication 3218.1, MMA estimates of LGA population distribution by DNSP, See Appendix B.

Over the period 1997 to 2002 the population contained within the Integral Energy DNSP has grown at a rate approximately one third greater than that for NSW as a whole, populations in the EnergyAustralia and Country Energy DNSPs have grown at 80% – 90% that of NSW as a whole while population in the Australian Inland region has declined.

In its report to Country Energy, NIEIR has forecast that population in the Country Energy DNSP area will grow at around 0.5% pa between 2002 and 2009. According to EnergyAustralia, in a draft report NIEIR has forecast the NSW population to grow at around 1% pa between 2002 and 2009 but has forecast growth in the EnergyAustralia region to be only 0.8% pa. According to Integral Energy, NIEIR has forecast population growth for its region to be 1.7% pa.

4.1.2 Dwelling and household numbers

The ABS has collected information about the number of dwellings in its 1991, 1996 and 2001 censuses. Growth rates in dwellings for NSW as a whole over the period 1991 to 2001 were 1.6% pa. At 1.8% pa, growth over the latter part of the period (1996 to 2001) was somewhat higher than the 1.5% pa seen over the initial part of the period (1991 to 1996).

The number of dwellings is growing at a rate significantly faster than the population rate. This is understood to be due largely to a continuing reduction of average household size.

As is the case for population, dwelling growth rates are uneven across DNSP regions. The MMA estimates of dwelling growth rates for each of the DNSPs over the period 1991 to 2001 are provided in Table 13.

Table 13: Estimated dwelling number growth rates between 1991 and 2001, % pa

DNSP	1991 to 2001	1996 to 2001	1991 to 1996
EnergyAustralia	1.5%	1.8%	1.2%
Integral Energy	2.1%	2.2%	2.1%
Country Energy	1.5%	1.5%	1.5%
Australian Inland	-0.3%	0.2%	-0.8%
New South Wales	1.6%	1.8%	1.5%

Source: ABS census data by local government area (LGA) 1991, 1996, 2001 Publication 2015.1 and Basic Community Profiles. MMA estimates of LGA dwelling distribution by DNSP, see Appendix B.

For both Country Energy and EnergyAustralia NIEIR appears to have forecast that dwelling numbers for the state as a whole will increase by about 1.5% pa between 2001/02 and 2008/09, although the timing differs. This is somewhat lower than the recent growth in dwelling numbers seen in Table 13, in line with slightly reduced forecast population growth.

However, according to the DNSPs, NIEIR has forecast dwelling numbers to increase at only 1.1% to 1.2% pa for both Country Energy and EnergyAustralia between 2002 and 2009. This implies that the remainder of the market, consisting mainly of Integral, will grow at around 2.4% pa over this period. While this is in line with NIEIR's expectation that growth over the period will be focused in the western part of Sydney it does not seem to reconcile with relatively strong recent growth experienced by EnergyAustralia.

4.1.2.1 NSW Planning forecasts

The NSW Department of Infrastructure, Planning and Natural Resources has prepared a metropolitan development program (MDP) for the Sydney region. According to the Department, the MDP coordinates the planning, funding, servicing and development of all major new urban projects in the Sydney region[7].

The MDP estimated historical net dwelling increases in the inner, middle and outer ring suburbs of Sydney and some Illawarra areas, annually from 1998/99 to 2001/02 and then forecast annually to 2006/07.

The MDP covers some two thirds of total NSW households comprising over 80% of the EnergyAustralia DNSP region and 90% of the Integral Energy DNSP region. None of the Country Energy or Australian Inland regions are covered.

Results from the MDP combined with dwelling numbers from the 2001 census provide the following average annual growth rates for the historical and forecast periods for EnergyAustralia and Integral Energy.

Table 14: Estimated average annual growth rates according to the MDP

	Historical (1999 – 2002)	Forecast (2003 – 2007)
EnergyAustralia	2.1%	1.7%

[7] NSW Department of Infrastructure, Planning and Natural Resources, "Managing Sydney's Urban Growth, 2002 Metropolitan Development Program", Residential forecasts and data book, NSW Department of Infrastructure, Planning and Natural Resources, June 2003.

Integral Energy	2.4%	1.8%
Sydney + Illawarra MDP	2.2%	1.7%

Source: Managing Sydney's Urban Growth, ABS Census, MMA estimates

These figures exclude growth outside the MDP area. If it is assumed that growth in the non-MDP areas will slow down in similar proportion to the slow-down expected in the MDP area (around 75% of recent historical), then the combined estimated growth rates are provided in Table 15.

Table 15: Estimated average annual growth rates

	Historical (1996 – 2001)	Forecast (2003 – 2009)
EnergyAustralia	1.8%	1.6%
Integral Energy	2.2%	1.9%
Country Energy	1.5%	1.1%
Australian Inland	0.2%	0.1%

4.2 APPLICANCE USAGE: RESIDENTIAL USAGE PER CUSTOMER

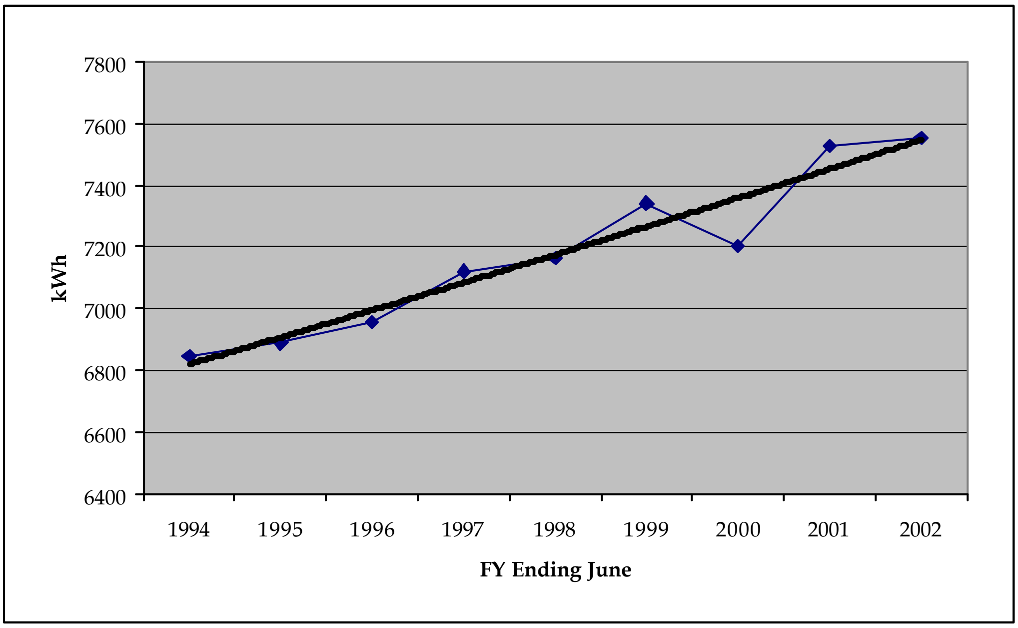
Both EnergyAustralia and Integral Energy have forecast declining average usage per domestic customer with the key reasons being the changed appliance mix, including reduced penetration of electric off-peak water heating and increasingly energy efficient appliances over time.

Both have modelled the residential appliance market for their region. However, the forecasts provided appear to be based on assumed appliance efficiency and penetration considerations alone. No quantitative data has been provided to suggest consideration of factors such as changing house size, "comfort" and new appliance impacts. This has resulted in the forecasts by these two businesses being at odds with recent trends in average appliance usage across the state.

4.2.1 Overall changes

The ESAA produces historical information about usage of electricity in the NSW and ACT by residential and business customers. The history of average usage per residential customer between 1993/94 and 2001/02 is illustrated in Figure 2.

Figure 2: Average usage per residential customer in NSW/ACT, kWh pa



As can be seen in Figure 2 average usage per residential customer in NSW/ACT has increased in every year apart from 1999/2000 which we understand had a milder than average summer.

Average electricity usage per customer increased by about 1.3% pa over the period.

4.2.2 Appliance models

MMA has tested the ability of appliance usage models to explain the historical growth in average usage. MMA has constructed its own appliance-based model to estimate residential energy usage for NSW as a whole for the period 1993/94 to 2001/02. The model is very similar in structure to the DNSPs' models, relying upon the relationship:

> Average usage per customer = ? (average appliance usage * appliance ownership per customer)

where the sum is for all appliance types. Changes in usage are explained by changes in appliance usage due to efficiency, size of homes etc and by changes in appliance ownership. The MMA model uses the following data:

- Appliance penetration – ABS[8] survey data from 1994 and 2002, with changes averaged across the period. The usage weighted average increase in penetration is 0.6% pa (compared to 0.4% pa used by EA).

- Initial appliance usage – AGO[9] estimates for water heating, EA and IE values for other appliances adjusted to fit the 1994 trend estimate. The adjustment required was less than 1%.

- Appliance efficiency trends – AGO new appliance estimates converted to appliance stock estimates using a simple stock replacement model

- Appliance utilisation trends – growth in housing floor area (AGO data) is assumed to drive increases in heating, cooling and lighting use. The decline in household size is assumed to reduce usage of most other appliances.

- Appliance size trend – Using ABS data on the trend to ducted air-conditioning an increase in average unit size from 2 kW to 2.33 kW over the period has been estimated. It is recognised that this may be double counting the floor size utilisation trend.

Appliance model output is compared with actual and trend average usage in Figure 3. It is clear that the model substantially fails to explain the growth in average usage between 1994 and 2002. Of the 728 kWh growth in annual usage, the model accounts for only 258 kWh or 35%. It is concluded that in addition to the factors considered in such models, other factors are influencing usage growth. These factors could be one or more of:

- increases in the number and/or usage of minor appliances in the "other" category.

- increases in usage of major appliances, for example due to increasing comfort levels.

The average growth of comfort factor usage for non- water heating appliances (usage for water heating appliances is directly measured and is not at issue) required to explain the growth trend is 1.2% pa.

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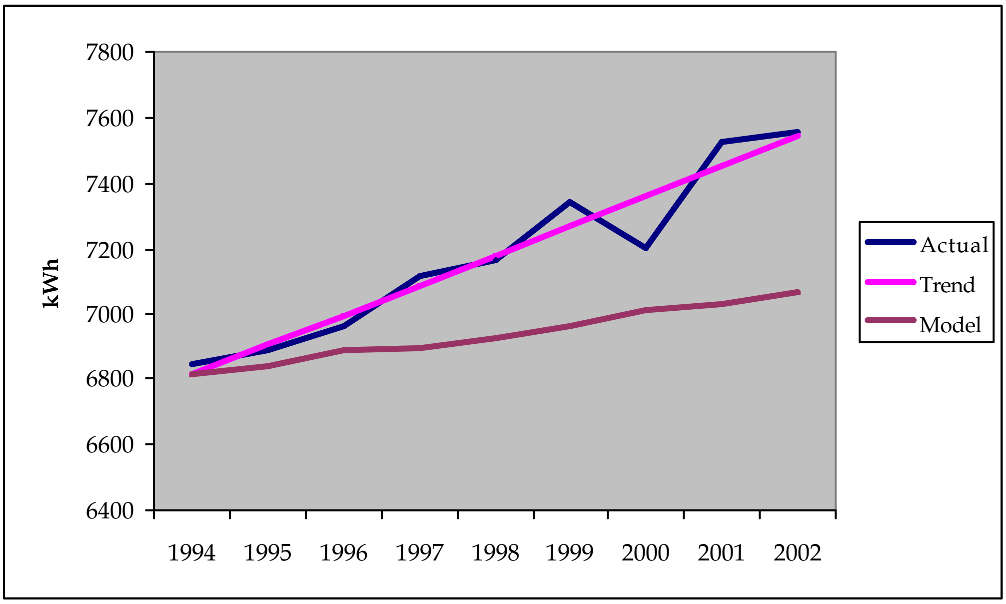
8 ABS 4602.0, March 2002.

9 Australian Residential Building Sector Greenhouse Gas Emissions 1990-2010, AGO 1999.

Figure 3: NSW residential average usage – actual, trend and appliance model prediction



Although EnergyAustralia has stated that it has "calibrated" its appliance model to its actual average usage from 1993 to 2002, this calibration appears to involve ad hoc increases in appliance usage[10]. Without modelling these increases the model has limited predictive value, and while it can be argued that similar increases in usage will occur in future the model is unable to predict them. MMA has introduced the "comfort factor" to ensure its model does fit the data and has predictive value.

It is notable that without the above increases, ie with appliance usage fixed at initial levels, the EA model would underestimate 2002 consumption by 537 kWh, a very similar level of under estimation as the MMA model (without comfort factor) of NSW average usage as a whole. While Integral Energy has also supplied an appliance model there is no evidence of calibration against historic trends. Clearly using models with appliance usage fixed at 2003 levels has the potential to significantly underestimate future average usage.

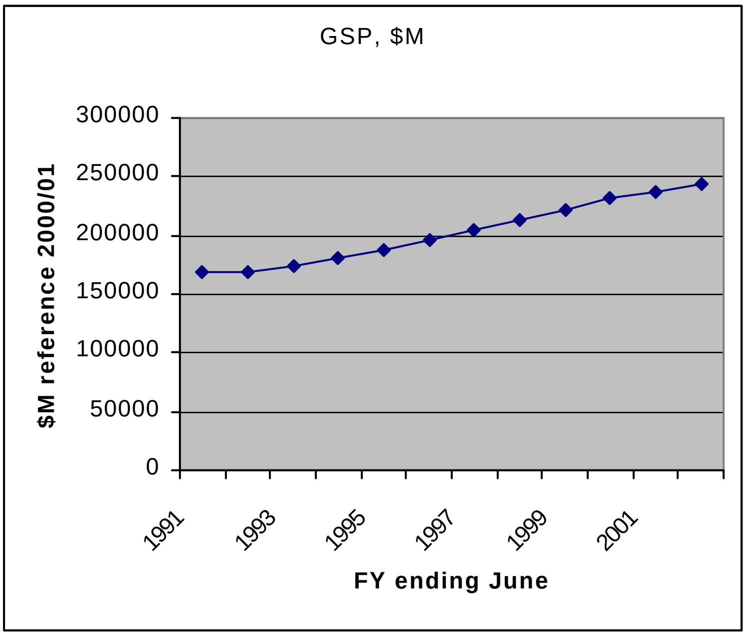
4.3 ECONOMIC FACTORS

According to both EnergyAustralia and Integral Energy, the Gross State Product (GSP) plays a significant role in determining non-residential consumption. NIEIR has also incorporated the impacts of state and regional GSP changes in its forecasts for Country Energy.

[10] For example, increase in heater usage from 450 to 610 kWh, cooking from 360 to 500 kWh, TV from 160 to 174 kWh, dryer from 125 to 200 kWh, microwave from 70 to 130 kWh and other from 146 to 343 kWh.

Historical GSP for NSW over the past decade is illustrated in Figure 4. Although tapering off in the last couple of years, over the period 1991 to 2002 GSP growth has been reasonably strong at about 3.4% pa.

Figure 4: Growth in GSP, 1991 to 2002



Source: NIEIR, ABS Cat 5220.0

Growth in NSW GSP is forecast by NIEIR to slow somewhat in 2002/03 and 2003/04 before increasing again in 2004/05. There is, however, some difference between the economic forecasts provided by NIEIR to each of the DNSPs and to NEMMCO. While this is likely to be due to timing (of forecasting) differences and possibly incorporation of the ACT in some cases, it may result in significant impacts on the forecasts. Different growth rate assumptions attributed to NIEIR are provided in Table 16.

Table 16: GSP growth rates for NSW forecast by NIEIR, % pa

	2002	2003	2004	2005	2006	2007	2008	2009
NEMMCO (NSW/ACT)	2.4%	1.9%	2.7%	3.4%	3.5%	2.3%	2.9%	3.3%
EnergyAustralia	2.4%	2.0%	2.4%	3.1%	2.8%	2.6%	2.4%	3.6%
Integral Energy	2.7%	2.5%	2.9%	3.6%	3.3%	2.7%	2.2%	3.5%
Country Energy	2.4%	2.2%	2.7%	3.7%	2.9%	2.7%	2.3%	3.7%

Despite the difference in individual years, by the end of the period there is relatively little difference between the outcomes.

4.3.1 GSP forecasts from other forecasters

The above GSP forecasts have all been derived by NIEIR. The NEMMCO 2003 Statement of Opportunities[11] provided a comparison with an alternative economic outlook for the first few years of the period from Access Economics. The results of the comparison are provided in Table 17.

Table 17: Comparison of forecast economic growth rates for NSW/ACT

Year Ending	NIEIR Medium	NIEIR High	NIEIR Low	Access Economics
30 June 2004	2.7%	3.8%	2.2%	3.6%
30 June 2005	3.4%	4.5%	2.5%	3.4%
30 June 2006	3.5%	4.3%	2.1%	1.9%
30 June 2007	2.3%	3.4%	2.4%	3.5%

Source: NEMMCO 2003 Statement of Opportunities Table 7.9

Overall, according to NEMMCO, the NIEIR forecast has lower growth in 2004 while Access Economics has low growth in 2006.

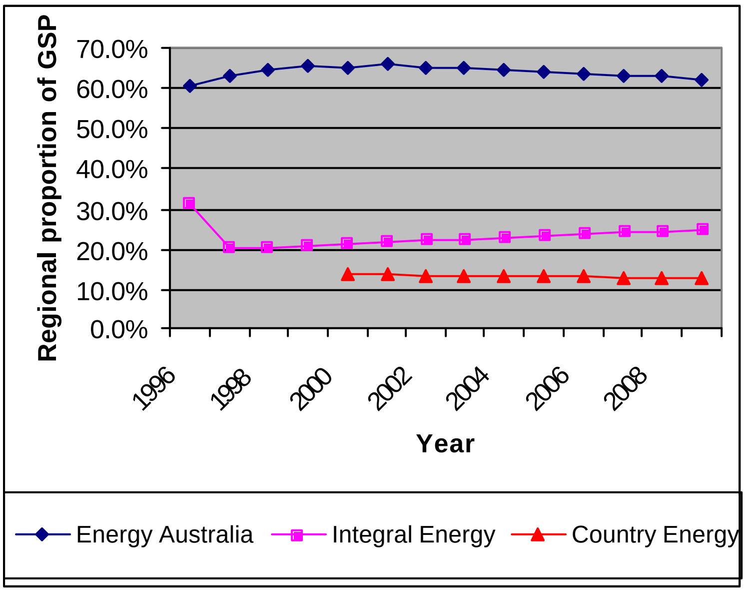
Despite the differences in timing, the cumulative difference between the NIEIR medium forecasts and the Access Economics outlook by end 2007 is relatively small. We consider the NIEIR forecasts provided to NEMMCO or similar, or more recent forecasts for NSW to be reasonable GSP forecasts on which to base demand forecasting.

4.3.2 Regional composition of NSW GSP

Three of the DNSPs have provided information about their regional share of state GSP, here called Network Region Gross Product (NRGP). This information, all derived from NIEIR analysis, is illustrated in Figure 5.

11 NEMMCO "2003 Statement of Opportunities for the National Electricity Market", July 2003.

Figure 5: Regional shares of GSP, historical and forecast



Source: NIEIR reports or draft reports as quoted by the DNSPs

According to these figures the EnergyAustralia share of GSP has increased slowly over the past six to seven years, as has the Integral Energy share of GSP after an apparently severe, initial drop in 1997 which may be due to issues of definition rather than regional GSP changes. While less information is available about the Country Energy share of NSW GSP, over the past year or two it appears to have reduced slightly.

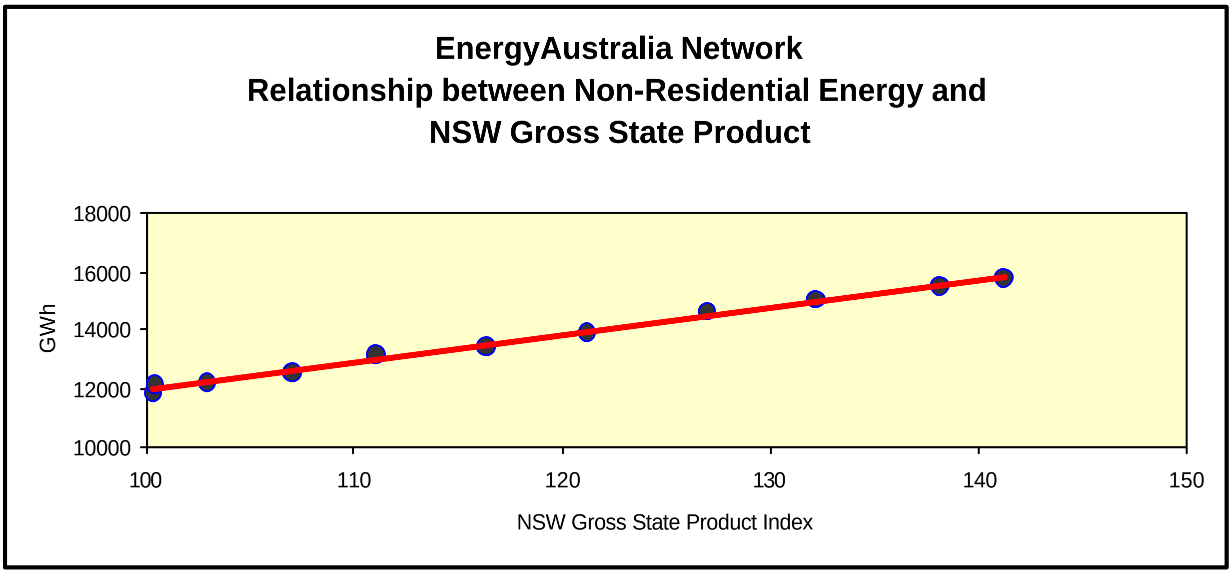
According to the information supplied by the DNSPs, the EnergyAustralia and Country Energy shares of state GSP are forecast by NIEIR to continue to decline while the Integral Energy share is expected to grow.

There are some uncertainties in this assessment. For example, the NIEIR report for EnergyAustralia is draft only and the sums of the shares from the three reports exceed 100% even without Australian Inland being included. Indeed, EnergyAustralia has cast some doubt on the shares allocated, inflating the EnergyAustralia share in its own analysis. Despite this, the expectation is that the Integral Energy share of GSP will increase somewhat at the expense of the EnergyAustralia and Country Energy shares.

4.3.3 Relationship between GSP and non-residential usage

According to EnergyAustralia a strong correlation exists between its non-residential energy usage and NSW GSP. EnergyAustralia has provided a graph (reproduced as Figure 6 below) which shows a strong relationship between NSW state GSP and non-residential electricity consumption for the network. The data provided by EnergyAustralia has supported the analysis.

Figure 6: Relationship between EnergyAustralia non-residential electricity usage and NSW GSP



Source: EnergyAustralia submission Attachment 3, Figure 5.1

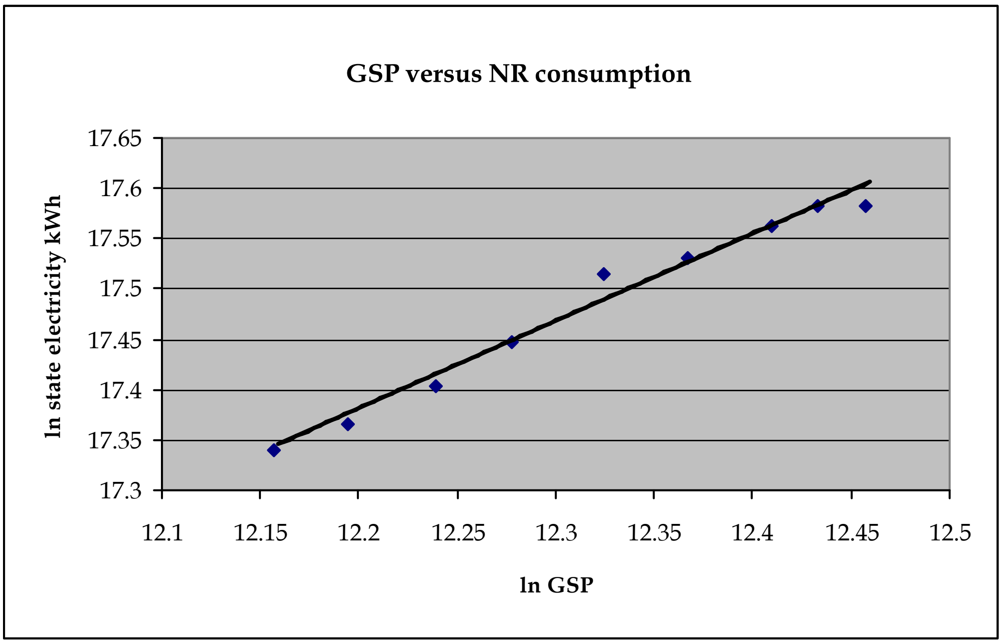
According to EnergyAustralia the relationship is best described by:

ln Non-Residential Energy = 5.70 + 0.80 *ln* GSP

This relationship means that a 1% increase in GSP would result in a 0.8% increase in non-residential electricity consumption.

MMA has analysed the relationship between overall GSP and non-residential consumption in the NSW/ACT combined. The log-log relationship is shown in Figure 7.

Figure 7: Relationship between NSW/ACT non-residential electricity usage and NSW/ACT GSP



Source: ABS, NIEIR for GSP and ESAA for non-residential electricity consumption

Again, the relationship is strong, with an r^2 of over 0.98. The relationship shows 1% change in GSP resulting in a corresponding 0.87% change in non-residential electricity consumption. The outliner in the graph for the year 1997/98, may be due to the weather conditions experienced, as discussed in Section 4.5.

4.4 PRICE IMPACTS

While changes in real electricity prices are expected to result in changes to consumption, there is significant uncertainty as to both what changes in prices will eventuate over the forecast period and the elasticity to apply to the price changes.

4.4.1 Expected retail price changes

Historical and forecast real electricity prices for NSW have been provided in a report to EnergyAustralia by NIEIR. These are provided in Table 18. They suggest electricity retail prices increasing by an average of 1.75% pa in real terms from 2003/04 to 2008/09.

Table 18: Real retail electricity price changes, historical and forecast for NSW, %

EnergyAustralia	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03
	0.0%	4.0%	0.4%	0.1%	-0.3%	-0.5%
EnergyAustralia	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**	**2008/09**
	1.6%	2.9%	1.5%	1.2%	2.2%	1.0%
Integral Energy	**1997/98**	**1998/99**	**1999/00**	**2000/01**	**2001/02**	**2002/03**
	0.0%	4.0%	0.4%	0.1%	-0.2%	-0.5%
Integral Energy	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**	**2008/09**
	-0.2%	0.5%	0.4%	0.2%	1.4%	1.1%

Source: Draft NIEIR report to EnergyAustralia, March 2003 and information supplied by Integral Energy to MMA

Integral Energy has also quoted NIEIR in providing the estimated historical and forecast real annual electricity price increases also provided in Table 18. The forecasts are clearly quite different from those provided by EnergyAustralia, with a forecast average increase of 0.5% pa in real terms over the same period.

Finally, the NSW Annual Planning Report 2003 has medium case forecasts which show real electricity prices increasing by an average of 1.4% pa between 2002/03 and 2012/13 and real gas prices increasing by about half this amount over the same period[12].

4.4.2 Wholesale electricity prices

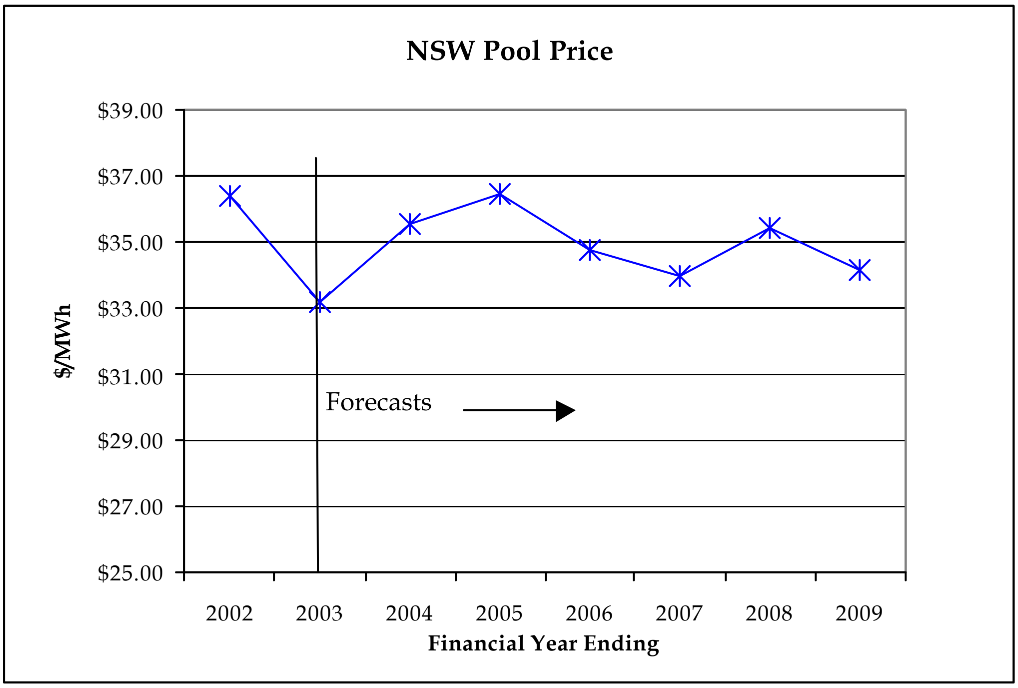
MMA routinely models spot market energy prices in the NEM markets. Although these prices exclude transmission, distribution, NEMMCO and retail components, they represent a potential source of significant price change over the coming regulatory period.

Some recent MMA price forecasts shown in Figure 8. The prices are in June 2003 dollars. Actual prices are included for financial years 2001/02 and 2002/03. The NSW prices show lower actual prices in 2003 than 2002 due to mild weather conditions across the NEM.

MMA expects wholesale pool prices in NSW over the next regulatory period to fluctuate between $34/MWh and $36.50/MWh.

[12] Transgrid, NSW Annual Planning Report 2003, Table A2.2.

Figure 8: Annual spot market prices ($/MWh) in NSW – ($ June 2003)



From the 2001/02 base year, spot prices have reduced in 2002/03 but are expected to recover to approximately 2001/02 levels by 2004/05 before again reducing slightly in real terms over the period. The price rise in 2003/04 and 2004/05 seen in this figure is prior to the expected completion of Basslink in December 2005. The use of hedging contracts by retailers is expected to smooth price changes. For example, the low spot price in 2001/2002 would not necessarily have been reflected in a low contract price for the year.

Overall, the likely impact of spot market changes on retail prices from 2001/02 is expected to be relatively minor over the regulatory period.

4.4.3 Distribution price

While some of the DNSPs have asked for substantial real price increases for the coming regulatory period it is unclear what, if any, price increases will be approved. If substantial price increases are approved this would be expected to result in retail price increases which could have a material impact on demand forecasts.

4.4.4 Price elasticity

As well as uncertainty about the extent of price changes over the forecast period, there are also significant differences between the DNSPs on the likely impact of price changes.

EnergyAustralia has not incorporated electricity prices in its forecasting methodology for either the residential or non-residential sectors. According to EnergyAustralia it has assessed the impact of electricity price but decided not to include it as an explanatory variable as it was not a statistically significant relationship and reduced the GSP elasticity[13]. For these reasons, EnergyAustralia chose to use the model that relied solely on economic activity[14].

Conversely, Integral Energy has incorporated price elasticity into its forecasting methodology for the non-residential category. The elasticity is assumed to reduce from –0.78 in 2002/03 to –0.66 in 2008/09. No justification is provided for either the initial elasticity assumed or its reduction over time.

Country Energy has relied on the NIEIR forecasts which, we understand, incorporate price elasticity impacts. The extent is not, however, transparent.

Australian Inland has not incorporated any price elasticity impacts.

In a report to NEMMCO dated June 2002[15], NIEIR estimated that the long-run own price elasticity of electricity demand for NSW lied within a range of –0.22 and –0.52 with a mean of –0.37.

In its econometric modelling of the NSW market, Transgrid has assessed the long-run elasticities provided in Table 19 applicable to per capita electricity consumption for the state as a whole apart from major industrial load and distributed generation.

Table 19: Long-run elasticities estimated by Transgrid

Elasticity of demand with respect to:	
Electricity price	-0.06
Natural gas price	0.06
Real income	0.91
Interest rates	0.05

Source: Transgrid NSW Annual Planning Report 2003, Table A2.3

While these results need to be treated with some caution as they are on a per capita basis, for the state as a whole and for the residential and only some of the non-

13 EnergyAustralia response to questions put by IPART/Meritec.

14 Note that the price elasticity in the EnergyAustralia non-residential model was estimated at –0.12.

15 National Institute of Economics and Industry Research, "The price elasticity of demand for electricity in NEM regions" report for the National Electricity Market Management Company, June 2002.

residential markets, they suggest an almost elastic linkage between electricity consumption (and GSP) and weak linkages with electricity and gas prices.

4.4.5 Price changes and impact

In conclusion, there is significant uncertainty about both the future direction of real electricity prices and the applicable elasticity to price.

For the business sector much of any changes to real prices would be expected to derive from changes to wholesale prices. We do not expect significant real price changes to spot prices as a whole over the coming regulatory period. Changes to distribution and transmission pricing will be regulator determined and DNSP specific. If these change substantially they may need to be incorporated into demand forecasts.

The price elasticity in the non-residential sector is expected to lie between 0 and –0.5.

4.5 WEATHER

Both residential and non-residential electricity loads are impacted by weather. As well, both hot and cold weather have an impact on electricity usage. Given the impact of weather, it is generally considered important to correct for weather in assessing historical trends and forecasting.

Both EnergyAustralia and Integral Energy have stated that they correct for both weather and the type of day (ie working or non-working) when carrying out normalisations. However, both DNSPs said they could not with any accuracy separate out the impacts of weather on residential versus non-residential classes. This has made it difficult to "weather correct" historical consumption by sector.

EnergyAustralia and Integral Energy utilise different methodologies and baseline parameters for weather normalisation. While EnergyAustralia uses conventional heating degree days (HDD) and cooling degree day (CDD) analysis[16], Integral Energy uses temperature difference from a monthly average for nine months of the year and from maximum average for the three summer months. The normalisations resulting from the Integral Energy methodology are low, much lower than those suggested by using the EnergyAustralia methodology. Although this could be due to the DNSPs having different regions and weather measuring stations, we have more confidence in the EnergyAustralia methodology.

16 Refer to the glossary for definitions of these terms.

EnergyAustralia provided weather corrected consumption for its system as a whole and the following parameters for weather normalisation.

Table 20: Standard monthly weather conditions according to EnergyAustralia

Month	Heating Degree days (HDD)	Cooling Degree Days (CDD)
January	0	96
February	0	88
March	1	51
April	21	9
May	78	0
June	159	0
July	187	0
August	156	0
September	88	2
October	38	13
November	17	29
December	2	69
Total	747	357

Source: EnergyAustralia

EnergyAustralia also provided the following weather sensitivities applied to its network:

Table 21: Sensitivity to weather according to EnergyAustralia

Year	Winter sensitivity GWh/HDD	Year	Summer sensitivity GWh/CDD
2000	2.24	1999/2000	1.33
2001	1.78	2000/2001	1.78
2002	2.02	2001/2002	1.63
2003	1.94	2002/2003	1.65

Source: EnergyAustralia

In terms of energy consumption, the network sensitivity to cold weather (HDD) for EnergyAustralia appears to be greater than its sensitivity to hot weather. Despite recent increases in air-conditioner penetration no trend in weather sensitivity is apparent from the limited data provided above.

EnergyAustralia has also provided weather corrections for the network as a whole over the period 1999/2000 to 2002/03. According to EnergyAustralia, demand in 1999/2000 and 2000/01 was higher than expected by about 0.5%, while demand in the years 2001/02 and 2002/03 was lower than expected (again by about 0.5%) due to milder weather conditions.

MMA has not been able to reproduce these normalisations based on weather patterns provided by EnergyAustralia for the past 10 years. According to the MMA analysis of EnergyAustralia weather data and sensitivities, weather normalisation would have increased demand over that seen in the years 1999/2000, 2001/02 and 2002/03 and reduced demand compared to that seen in 1997/98 and 2000/01.

MMA's simple assessment of heating and cooling degree days for the four weather stations used by EnergyAustralia and their impact based on indicative EnergyAustralia weather sensitivities are provided in Table 22. A negative sign in the last column means that actual demand is less than normalised demand.

Table 22: Heating and cooling degree days and expected impact on EnergyAustralia network as estimated by MMA from average of four station data provided

	CDD	HDD	Expected impact, GWh*
1997/98	247	1	+>400
1998/99	44	-20	+0 to +50
1999/00	-66	19	-50 to –100
2000/01	90	-30	+50 to +100
2001/02	-34	-35	- 100 to –150
2002/03	18	-86	- 100 to –150
Average (10-years)	**366**	**727**	
Standard deviation	**108**	**45**	

Source: MMA analysis, EnergyAustralia average sensitivities

* A negative sign means that normalising weather would increase load compared to that observed.

The year 1997/98 stands out as a year when extreme temperature conditions are expected to have resulted in demand significantly greater than expected with normal weather conditions. In recent years 2000/01 had higher than expected usage while 1999/2000, 2001/02 and 2002/03 had milder than expected weather and, we presume, lower than expected usage.

Note that these results do not reflect those presented by EnergyAustralia. In part this may be due to EnergyAustralia also normalising for daytype.

The above analysis of weather normalisation together with uncertain allocation between customer classes has resulted in MMA using trend-line analysis to calculate weather normalised usage by customer class for the base year.

Country Energy and Australian Inland have stated that they do not use weather normalisation. Again trend-line data would be expected to result in a better outcome than using actual numbers for the base year.

4.6 MAJOR NEW DEVELOPMENTS

Some of the major new developments which could have a significant impact on NSW's electricity consumption over the next regulatory period include:

- The Austeel and Protech steel related developments planned for Newcastle
- Aluminium smelter expansions/upgrades at the Kurri Kurri and Tomago plants in the Hunter Valley
- Major cogeneration plants potentially located at Wollongong, Botany and Kurnell
- Small scale cogeneration projects.

4.6.1 New projects

Most of the major new developments need not be included specifically within DNSP forecasts because:

- There is significant uncertainty about the development proceeding
- There is significant uncertainty about timing, and in any case this may be outside of the next regulatory period
- They will be supplied directly from transmission lines
- They are included as part of overall economic growth.

We have not specifically identified and included any major new projects within the DNSP forecasts. [redacted].

4.6.2 Cogeneration

Although cogeneration is expected to increase across Australia and NSW over the next decade, largely due to environmental drivers, the timing and extent of such an increase is uncertain. Several large projects which had been planned have now been apparently shelved, including some in NSW.

In terms of energy demand forecasting for DNSPs, the only amount of relevance is cogeneration which displaces "own-use" consumption and hence reduces electricity supplied through the network.

In a report to NEMMCO[17] NIEIR has projected own-use in NSW to increase from 911 GWh in 2002/03 to 1350 GWh in 2008/09. The location of expected additional own-use generation has not been specified.

Given the incentives we expect that cogeneration and own-use will increase over the next regulatory period, although the extent and location is uncertain. We have utilised the NIEIR projected increase in own-use[18] and assumed that this is allocated to DNSPs in proportion to their other non-residential usage. The increase in own-use is subtracted from forecast usage in the non-residential sector for each DNSP.

4.7 DEMAND MANAGEMENT MEASURES

Demand management programs, apart from improving appliance efficiency, are relatively immature. After discussions with some of the DNSPs we have decided that demand management will not impact largely on total energy usage, apart from changes to appliance efficiency.

However, to allow for some further demand management initiatives, for example moves to increase mandatory energy star rating of houses, we have factored in a "comfort" factor which is somewhat less than recent history suggests (see Section 5.3).

We have also not factored in any impact on maximum demand, again apart from appliance efficiency changes and changes to comfort factors.

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17 National Institute of Economics and Industry Research, "Projections of cogeneration and embedded generation in the NEM region", report for the National Electricity Market Management Company, June 2003.

18 After subtracting a baseline estimate of own-use growth already taken into account in correlating GSP and consumption for the state.

5 RESIDENTIAL FORECASTS

5.1 APPROACH

MMA's residential annual load forecasts are based on forecasts of:

- Customer numbers – linked to a combination of recent history, economic growth factors and planning expectations at local government level. These have been discussed in Section 4.1.2.
- Average usage per customer – based on analysis of past trends and linked to appliance usage and efficiency factors.

5.2 CUSTOMER NUMBERS

5.2.1 Baseline numbers

MMA has used the following customer numbers, provided in regulatory account submissions, as the base year data for forecasting:

- EnergyAustralia: 1346056 residential customers at 30/6/2003
- Integral Energy: 726600 residential customers at 30/6/2003
- Country Energy: 628422 residential customers at 30/6/2002
- Australian Inland: 15516 residential customers at 30/6/2002.

5.2.2 Growth in customer numbers

We have applied the forecast growth factors derived in Table 15 to the base year forecasts. We have used NIEIR forecasts of household growth for NSW as a whole to phase housing growth for each DNSP.

Over the period 1997/98 to 2002/03 compound growth in EnergyAustralia residential customer numbers has been 1.9% pa. We estimate that this will slow to 1.6% pa over the forecast period.

Over the period 1997/98 to 2002/03 compound growth in Integral Energy's residential customer numbers has been 2.3% pa, including a very strong 2002/03. We estimate that this will slow to 1.9% pa over the forecast period.

Historical data provided by Country Energy are too poor to allow historical customer growth for this DNSP to be reasonably assessed. Based on dwelling number growth between 1991 and 2001 we expect real customer growth to have been about 1.5% pa (see Table 13). We estimate that this growth will reduce to about 1.1% pa over the regulatory period.

Historical data provided by Australian Inland and analysis of census data suggest that there is very little customer growth expected in the DNSP area. We have estimated a growth rate in customer numbers of 0.1% pa.

EnergyAustralia has changed its timing for customer number reporting from end of the year to average for the year. Integral Energy has used end of year customer numbers for its historical data but average of year numbers for forecasting purposes. While changes to the basis of collecting and reporting are acceptable, there needs to be consistency in interpretation and extrapolation of historic and forecast trends. Our methodology provides customer number at the end of the year and average usage growth rates based on end of year customer numbers.

5.3 AVERAGE ANNUAL USAGE

Annual usage for each DNSP varies around the trend line due to variations in weather and other factors. The appropriate initial (2002/03) usage level for forecasting is the 2002/03 weather normalised annual usage, that is the 2002/03 actual usage corrected for variations in 2002/03 weather, measured by heating and cooling degree days, from average levels. However the DNSPs have not been able to provide MMA with weather normalised residential sales or average usage.

Absent weather-normalised usage in which we have confidence, we have used the 2002/03 trend estimates. Figure 9 and Figure 10 compare residential usage per customer for general tariff and controllable load actual, and trend usage with first year forecast levels selected by EnergyAustralia and Integral Energy for 2003/04. Owing to patchy historical data, no meaningful trends are available for Country Energy and Australian Inland.

Figure 9: EnergyAustralia average residential actual, trend and first year forecast usage levels

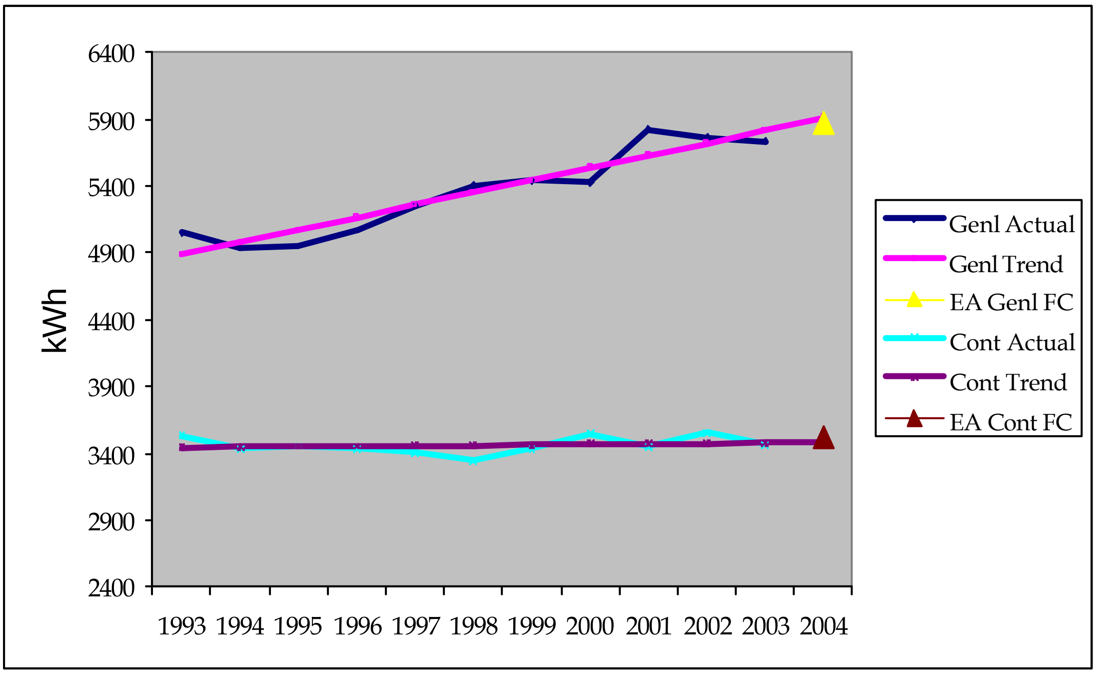
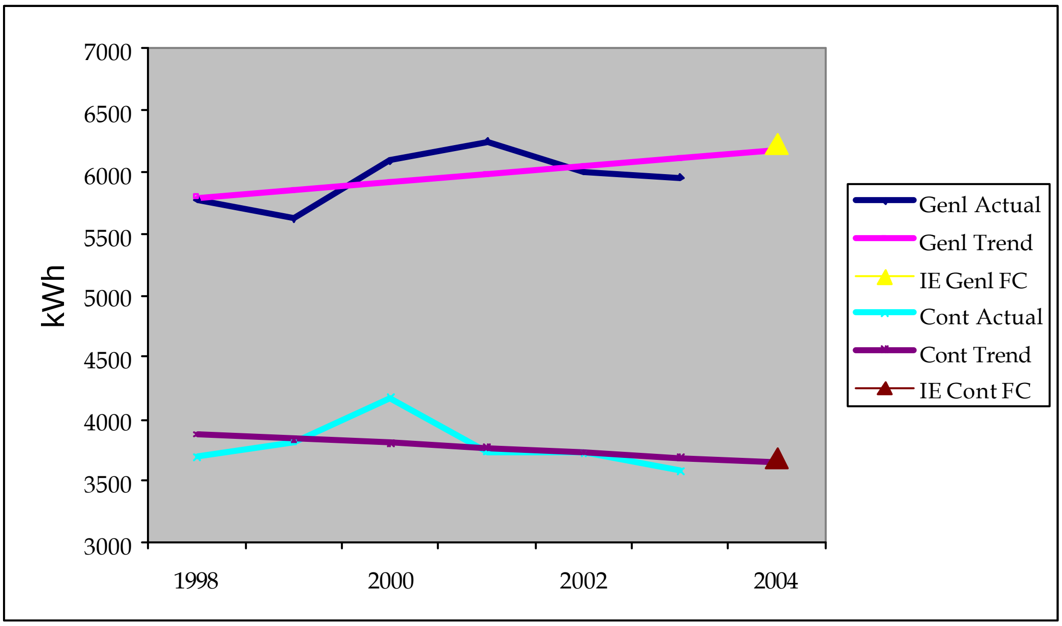


Figure 10: Integral Energy average residential actual, trend and initial usage levels



Notable features are:

- For both EnergyAustralia and Integral Energy there is a strong upward trend in general tariff usage of 60 to 90 kWh pa
- For EnergyAustralia there is negligible movement in controllable load but for Integral Energy there is a downward trend
- Both EnergyAustralia and Integral Energy have forecast 2003/04 values approximately at the trend levels.

MMA has selected the initial usage levels for EnergyAustralia and Integral Energy based on trend values shown in Table 23. For Country Energy and Australian Inland MMA has used the values estimated by the companies.

Table 23: Estimated residential usage per customer in 2002/03 (kWh)

	Energy Australia	Integral Energy	Country Energy	Australian Inland
General Tariff	5814	6109	4934	5264
Controllable Load	3476	3693	3389	2906
Average per Customer	7228	7887	7376	6872

5.3.1 Forecasts

In view of the appliance penetration model's limited ability to explain historical changes in average usage (refer to Section 4.2) it would seem reasonable to use a simple trend model to forecast average usage. Nevertheless MMA has found it useful to develop and apply modified appliance penetration models incorporating features that overcome its weaknesses:

- Changes in usage drivers such as housing floor area and household size
- "Comfort factors" that capture usage growth not explained by other factors.

Models have been derived principally for EnergyAustralia and Integral Energy, which have developed their own appliance models. Models for Country Energy and Australian Inland have been developed by adjusting the EnergyAustralia and Integral Energy models to fit Country Energy and Australian Inland initial data. Forecast parameters have been selected as follows:

- Appliance penetration – initial values as per EnergyAustralia and Integral Energy, determined by adjustment for Country Energy and Australian Inland. For off-peak water heating we have used actual 2002/03 penetration whereas the DNSPs have used 2001/02 data as later data were not available at the time of forecasting.
- Appliance penetration changes – based on ABS survey information and data supplied by the DNSPs. Table 24 shows EnergyAustralia and Integral Energy values – Country Energy and Australian Inland changes are similar except there is expected to be limited loss of off-peak water and 1% pa growth in air-conditioning).
- Appliance usage – initial usage to match average usage per customer.
- Appliance efficiency trends – Australian Greenhouse Office (AGO) new appliance estimates converted to appliance stock estimates using a simple stock replacement model
- Appliance utilisation trends – housing floor area and household size based on AGO projections for NSW.

Table 24: MMA forecast annual changes in appliance penetration, percentage points, applying from the base year

Appliance	Energy Australia	Integral Energy	Comment
Off-Peak Water	-0.25%	-1.00%	Losses continuing
Peak Water	0.00%	0.00%	
Pool Pump	0.00%	0.00%	
Air Conditioning	1.64%	0.90%	Integral currently above NSW average
Refrigerator	0.46%	0.46%	Nearly saturated
Waterbed	0.00%	0.00%	No data
Freezer	-0.74%	-0.74%	Steady losses
Lights	0.00%	0.00%	
Heater	-0.25%	-0.25%	Losses to gas slowing
Cooking	-0.50%	-0.50%	Losses to gas slowing
Dishwasher	1.63%	1.63%	Steady growth
TV	0.00%	0.00%	Saturated
Video	0.33%	0.33%	Nearly saturated
Dryer	0.99%	0.99%	Steady growth

Appliance	Energy Australia	Integral Energy	Comment
Microwave	0.70%	0.70%	Nearly saturated
Wash Machine	0.11%	0.11%	Nearly saturated
Computer	2.50%	2.50%	Penetration slowing
Other/Standby	0.00%	0.00%	

Source: ABS 4602.0 and DNSP data.

These numbers refer to percentage point changes per annum. For example, heaters in the EnergyAustralia region are estimated to have a baseline penetration of 64.5% in 2002/03, reducing to 64.25% in 2003/04 and to 63% by 2008/09.

Initial assumed appliance energy usages and penetration rates for EnergyAustralia and Integral Energy are provided in Appendix C - .

MMA forecasts of average usage for EnergyAustralia and Integral Energy under three different assumptions regarding the "comfort factor" are presented in Figure 11 and Figure 12. The divergence of MMA and Integral values for 2003 is due to MMA's use of actual 2003 off-peak penetration, which fell significantly that year, whereas Integral has started from the 2002 value.

Figure 11: MMA forecasts of EnergyAustralia average residential usage

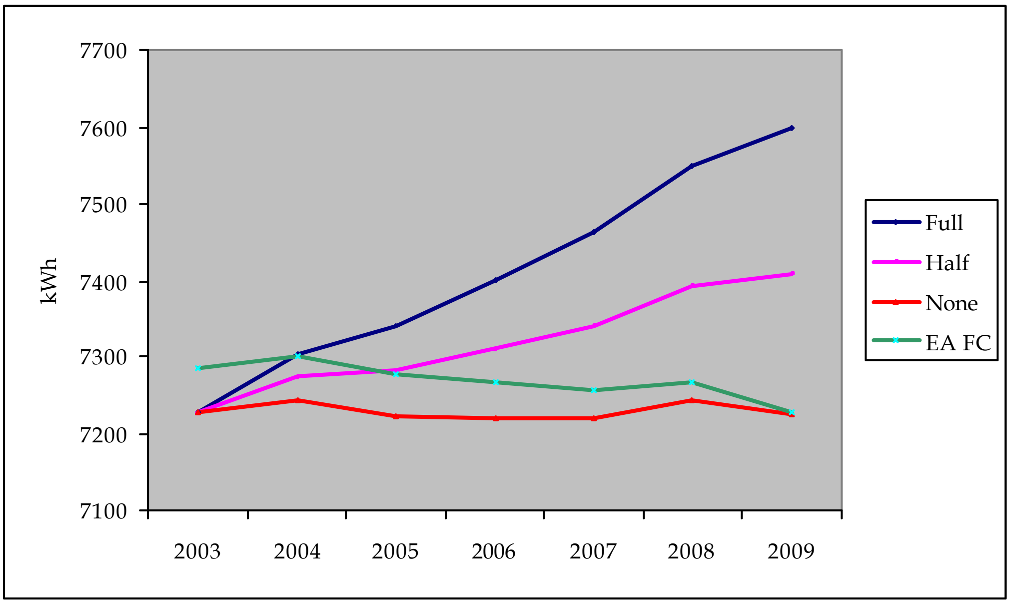
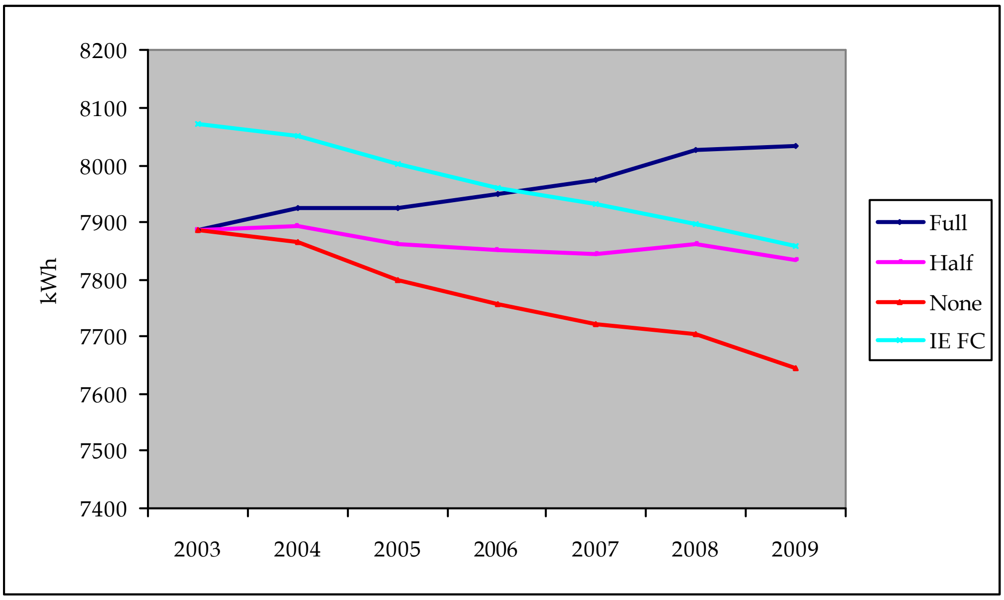


Figure 12: MMA forecasts of Integral Energy average residential usage



The MMA "Full", "Half "and "None" forecasts represent full continuation of the historical "comfort factor" trend, 50% continuation of the trend ie only 50% of the growth impact, and no continuation of the trend. Without a full understanding of the causes of the trend and what could cause it to accelerate or slow down, complete discontinuation over a short period is highly implausible. MMA therefore believes that the "Full" and "Half" outcomes are more likely. As the "Half" forecast allows for the impact of some further demand management initiatives over the forecast period we have selected these forecasts as most likely.

For EnergyAustralia the MMA forecast represents an average 0.4% growth in usage compared to EnergyAustralia's forecast of –0.1%.

For Integral Energy the MMA forecast represents an average –0.1% growth in usage compared to Integral Energy's forecast of –0.4%.

Forecasts of average residential usage for Country Energy and Australian Inland are presented in Figure 13.

Figure 13: MMA forecasts of Country Energy and Australian Inland average residential usage

Note that incorporation of the "Full" instead of "Half" trend would represent an additional 0.4% p.a. growth in average customer usage above the MMA forecasts.

5.4 MMA FORECASTS OF THE RESIDENTIAL SECTOR

MMA forecasts for the residential sector are provided in Table 25. Over the period 2002/03 to 2008/09 these show the following growth rates:

- EnergyAustralia a compound growth rate of 2% pa, made up largely of growth in customer numbers (1.6% but also with some growth in average usage per customer (0.4%).
- Integral Energy a compound growth rate of 1.7% pa, made up of a more rapid growth rate in customer numbers (1.9%) mitigated by a slight reduction in average usage per customer (-0.1%).
- For Country Energy a compound growth rate of 1.4% pa made up of a 1.1% pa growth in customer numbers and a 0.3% pa increase in average usage per customer
- For Australian Inland a compound growth rate of 0.8% pa made up of a 0.1% pa growth in customer numbers and a 0.6% pa increase in average usage per customer.

Table 25: MMA residential sector forecasts, GWh

	2003	2004	2005	2006	2007	2008	2009
EnergyAustralia	9729	9935	10090	10311	10497	10764	10973
Integral Energy	5731	5926	5984	6079	6153	6273	6358
Country Energy	4694	4767	4815	4888	4950	5043	5108
Australian Inland	107	108	108	109	110	111	112

5.5 COMPARISON WITH DNSP FORECASTS

The DNSP medium forecasts (actual or forecast for 2003) are provided in Table 26.

Table 26: DNSP medium forecasts, GWh

	2003	2004	2005	2006	2007	2008	2009
EnergyAustralia	9609*	9813	9873	9972	10035	10153	10196
Integral Energy	5583*	5925	6010	6125	6252	6369	6486
Country Energy	4700	4780	4861	4944	5028	5113	5200
Australian Inland	107	103	106	108	111	113	116

- EnergyAustralia and Integral Energy provided actual sales for 2003. Remaining numbers are sourced from DNSP forecasts provided to MMA

[redacted]

The key differences between the two forecasts are:

- EnergyAustralia forecasts result in a compound growth rate of 1.0% between actual 2002/03 and forecast 2008/09. This is a combination of assumed slow customer growth and little or negative growth in average usage per customer. This forecast is significantly less than the MMA forecasts in both customer number growth and base year level and growth in average usage per customer. By 2008/09 the MMA residential forecast is 7.6% greater than the EnergyAustralia forecast.

- Integral Energy has forecast a high customer growth rate combined with a falling average usage per customer. MMA has estimated that customer growth will be less than forecast by Integral Energy but that the decline in average usage per customer will also be less. Overall, MMA has forecast less residential usage than Integral Energy. By 2008/09 the MMA residential forecast is 2% less than the Integral Energy forecast.

- At 1.7% pa the Country Energy residential forecasts are slightly higher than the MMA forecasts, largely because of different assumptions about customer number growth rates. By 2008/09 the MMA residential forecast is 1.8% less than the Country Energy forecast.
- Despite Australian Inland assuming no growth in residential customers, at 1.4% pa the residential forecast is generally slightly higher than the MMA forecasts. This is due to Australian Inland assuming higher growth rates in average usage than MMA. By 2008/09 the MMA residential forecast is 3.2% less than the Australian Inland forecast.

5.6 FORECASTS OF RESIDENTIAL CUSTOMER NUMBERS

MMA's forecasts of residential customer numbers are provided in Table 27.

Table 27: Forecast residential customer numbers

	2003	2004	2005	2006	2007	2008	2009
EnergyAustralia	1346056	1367677	1389644	1411965	1434644	1457687	1481101
Integral Energy	726600	740086	753822	767814	782065	796580	811365
Country Energy	635414	642485	649633	656862	664171	671561	679033
Australian Inland	15538	15560	15582	15604	15627	15649	15671

6 NON-RESIDENTIAL USAGE

EnergyAustralia, Integral Energy and Country Energy provided information about energy sales to the non-residential sector divided into:

- Business customers including most commercial and industrial customers
- Inter-distributor transfers (IDT). These re bulk transfers of electricity from one distribution area to another. Most of the IDT exports are from Integral Energy to EnergyAustralia and Country Energy.
- Public lighting
- Sales to very large industrial customers

As data on some of these categories have not previously been provided, there is a need to ensure consistency with previous data. There is also a need to ensure confidentiality.

6.1 DRIVERS OF NON-RESIDENTIAL ELECTRICITY CONSUMPTION

In Section 4.3 the relationship between state GSP and non-residential electricity usage was assessed. A strong relationship was found to exist between state GSP and electricity consumption by non-residential consumers with an elasticity of about 0.87 for the NSW/ACT as a whole.

Where evidence has been provided to justify the use of a DNSP-specific relationship between State GSP and non-residential electricity consumption we have used this relationship. Where such data have not been provided we have applied the state-wide relationship to the DNSP.

We have used the NIEIR GSP forecasts contained in the NEMMCO 2003 Statement of Opportunities[19].

We have for all DNSPs reduced the non-residential demand forecasts by the expected increase in own-use by additional cogeneration as described in Section 4.6.2.

[19] National Institute of Economic and Industry Research, "The economic outlook for the NEM states to 2012-13" report to the National Electricity Market Management Company, June 2003.

6.2 ENERGYAUSTRALIA

As discussed in Section 4.3, EnergyAustralia has established a strong relationship between State GSP and its non-residential sector consumption, with an elasticity of 0.8.

In forecasting EnergyAustralia has used estimates of changes in the Network Region Gross Product (NRGP) specific to the DNSP to forecast its non-residential electricity usage. NIEIR has forecast the NRGP for EnergyAustralia as it did for Integral Energy and Country Energy. However, both Integral Energy and EnergyAustralia have stated that they believe NIEIR's forecasts to overstate a shift in economic activity to the Integral Energy area. EnergyAustralia has consequently amended upwards NIEIR's NRGP forecasts for its area prior to applying the 0.8 elasticity.

While it appears reasonable to accept that economic activity may be growing more quickly in the Integral Energy region than in the other DNSP regions, there is significant uncertainty about the pace of the shift and no analysis, as we understand it, which correlates regional growth with changes in electricity consumption. MMA's analysis of EnergyAustralia's NRGP against electricity consumption showed a much poorer correlation and also a higher elasticity.

Until there is more certainty about the shift of GSP in the first place and its impact on electricity consumption in the second, we believe that the analytically demonstrated relationship between state GSP and EnergyAustralia's non-residential consumption is the best to utilise.

This is the methodology adopted by MMA in its forecasting. Please note that for the sake of consistency with historical records, EnergyAustralia's two largest customers, Hydro Aluminium and BHP have not been included within these forecasts. Forecasts for these two customers are discussed in Section 6.2.1. Street lighting has been included within the totals. IDT exports have not been included in these or, as we understand it, the EnergyAustralia figures. Although relatively minor, about 60 GWh, it is unclear whether they should be excluded from Tribunal calculations.

We provide our forecasts from 2002/03 in Table 28. As non-residential sales are likely to be less influenced by weather than residential sales we have used actual 2002/03 sales as the basis for forecasting.

Table 28: MMA forecasts for non-residential sales compared to those of EnergyAustralia, GWh

	2003*	2004	2005	2006	2007	2008	2009
MMA	16031	16377	16789	17254	17561	17946	18358
EnergyAustralia	16031	16396	16789	17152	17495	17897	18398

- Actual

** Forecasts from 2003 contained in Table 9 of information supplied to MMA by EnergyAustralia

Note again these do not include the two largest industrial customers or IDT exports.

6.2.1 EnergyAustralia's sales to large customers

EnergyAustralia has supplied separately some historical information about recent history of supply to "transmission customers", large industrial customers, Hydro Electric at Kurri Kurri, BHP in Newcastle and several IDTs. These apparently totalled some [redacted] GWh in 2002 and, [redacted].

The "transmission" sales to large customers and IDTs have, as we understand it, traditionally not been covered by the Tribunal in its regulation of the networks. It is not clear to us whether this situation will continue. Sales to these customers were not included within the EnergyAustralia consumption versus GSP trend analysis.

[redacted].

While it is difficult to forecast growth at the largest customers without talking to them, we understand that [redacted].

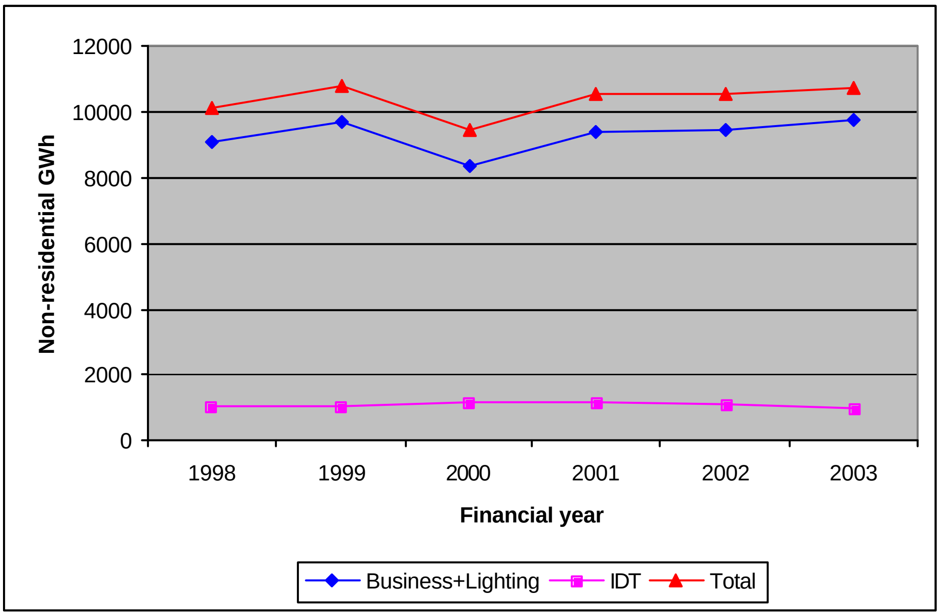
If this demand is of concern to the Tribunal we shall speak directly to the customers concerned.

It should be noted that we have included IDT exports for Integral Energy.

6.3 INTEGRAL ENERGY

Integral Energy's non-residential data has been separated into Business (including street lighting) [20] and Inter Distributor Transfers (IDTs) as Integral Energy is the only network with significant IDT exports. Sales to business and IDTs may have different drivers. The history of sales for these classes is illustrated in Figure 14.

Figure 14: Integral Energy sales to business and IDT, GWh



Integral Energy could not account for the drop in non-residential usage in the 1999/2000 year which coincided with a significant drop in customer numbers recorded in the same year. This may be accounted for by data problems that Integral Energy has reported or, alternatively, by a loss of one or more customers.

We have forecast separately the business sales, including all direct business sales through IDTs and the IDT sales to other distributors. The IDT sales include both peak/shoulder and off-peak IDTs. As data on some of the IDT categories has not previously been provided in regulatory accounts there is a need to ensure consistency with previous data.

Integral Energy has forecast its non-residential sales by:

- Assuming an elasticity of non-residential sales to state GSP of 1.01 in 2002/03 reducing annually to 0.80 in 2008/09

[20] Including those handled through an IDT mechanism.

- Assuming an elasticity of non-residential sales to changes in real electricity prices of –0.78 in 2002/03 reducing to –0.66 in 2008/09
- Applying these elasticities to NIEIR forecasts of GSP and real prices over the forecast period.
- Assuming a higher starting IDT usage than in 2003 and an annual growth rate of non-business IDTs of 1.4% pa.

This has resulted in a forecast compound growth rate of about 2% pa across the whole non-residential sector (excluding off-peak IDTs).

According to Integral Energy elasticities are based on judgement and recent experience of changes in the non-residential customer class. However no quantitative substantiation has been provided for this approach. No analysis has been provided of the relationship between GSP and business sales. Nor has there been any quantitative substantiation for the reducing elasticity over time. No analysis has been provided of the relationship between real electricity prices and business sales. Nor has there been any quantitative substantiation for the reducing elasticity over time. As stated previously, the future direction of average real electricity prices for any particular distributor or customer sector is not clear. For example, the average price changes assumed by Integral Energy are quite different to those assumed by EnergyAustralia although both are referenced to NIEIR.

6.3.1 MMA methodology

The lack of reliable historical data has meant that it is difficult to discern any reasonable trends in non-residential sales over the past few years. Consequently the MMA methodology has been to apply the state-wide elasticity to GSP of 0.87, (see Section 4.3) to business and public lighting sales by Integral Energy[21]. This includes sales to both the customers in the Integral Energy area and directly to business customers through IDTs.

We have not applied any price elasticity. This is because of the lack of certainty about price directions and elasticity. As well, there is some evidence that the impacts of price changes and changes in GSP are not independent.

The IDT sales to other distributors showed some growth over the period 1998 to 2001 but apparently reduced in 2001/02 and 2002/03. The reason for the reduction is not clear and may be anomalous. Integral Energy is forecasting these IDT sales to

[21] Note that this is slightly lower than the elasticity of 0.9 estimated for no-residential consumption apart from EnergyAustralia.

commence at a higher level than in 2003 and to grow at about 1.4% pa. We expect that, unless there is a shift in supply sourcing strategy, the growth rates should be intermediate between those for the residential sector and those for the non-residential sector in the EnergyAustralia and Country Energy region. Given the recent reduction in IDTs and our lack of understanding of the fundamental drivers, we have accepted the Integral Energy forecast for IDTs.

We have again reduced our non-residential forecasts to account for expected increases in own-use by additional cogeneration over the period.

We provide our forecasts from 2002/03 in Table 29.

Table 29: MMA forecasts for non-residential sales, (first three rows) compared to those of Integral Energy, GWh

Category	2003*	2004	2005	2006	2007	2008	2009
Business	9737	9966	10239	10546	10750	11007	11280
IDT	990	1,109	1,125	1,140	1,156	1,172	1,189
Total	10,727	11,075	11,363	11,687	11,907	12,179	12,470
Integral**	10727	11136	11428	11701	11931	12046	12273

- Actual

** Forecasts from 2003 contained in Table 9 of information supplied to MMA by Integral Energy

6.4 COUNTRY ENERGY

Country Energy has provided only limited historical information and this has been internally inconsistent and not permitting sensible analysis. Country Energy states that it has used as its basis for forecasting independent NIEIR forecasts. However, while the growth rates adopted for the different sectors may be similar, the actual numbers generated are very different as can be seen in Table 30.

Table 30: Comparison of the NIEIR, Country Energy and MMA forecasts for Country Energy, GWh

	2002	2003	2004	2005	2006	2007	2008	2009
NIEIR								
Residential	4181	4236	4314	4389	4476	4555	4630	4698
Business + Lighting	5756	5928	6034	6169	6280	6385	6467	6392
Total	9965	9993	10242	10423	10645	10835	11014	11166
Country Energy								
Residential	4622	4700	4780	4861	4944	5028	5113	5200
Business	5343	5434	5526	5620	5716	5813	5912	6012
Total	9965	10134	10306	10482	10660	10841	11025	11213
MMA								
Residential	4622	4694	4767	4815	4888	4950	5043	5108
Business	5343	5432	5559	5712	5884	5998	6142	6297
Total	9965	10126	10326	10527	10773	10949	11185	11405

We understand that the amalgamation of the regional distributors to form Country Energy has created significant difficulties in extracting data. We also understand that NIEIR took several months to interpret the data and produce forecasts.

We have used the baseline information available from the 2002 Regulatory Accounts as the most likely to be representative of the real situation. As can be seen from Table 30 while the total differences between the three forecasts is relatively small, the division between customer classes is very different.

We have, as for Integral, forecast the non-residential sector to grow with an elasticity of 0.87, the average for the state as a whole. We have again taken into account some increasing own-use from additional cogeneration. We note that NIEIR, which may apply more region-specific elasticities has forecast slower non-residential growth rates, although applying these from a higher base.

Overall for the Network as a whole, using the MMA approach results in an outcome which is not dissimilar to that forecast by Country Energy. The Country Energy result is also intermediate between that forecast by NIEIR and that forecast by MMA.

There is uncertainty about sector division of base numbers. It may be reasonable for the Tribunal to check Country Energy's 2002/03 Regulatory Accounts data for consistency in division of loads between residential and non-residential customer classes prior to selecting or approving forecasts.

6.5 AUSTRALIAN INLAND

Australian Inland non-residential consumption can be divided into two almost equal components: major mine customer and remaining business and lighting. While MMA's forecasts for the second component are similar to those of Australian Inland, we have assumed a higher level of consumption from 2003/04 for the major mine company.

6.5.1 Large customer

Actual mine consumption is understood to have been [redacted] GWh in 2001/02 and is forecast by Australian Inland to [redacted] The mine has recently gone through a change in ownership and also a period of down-time due to maintenance. However, the new mine owners have expressed confidence that the mine throughput will average 2.4 Mt. The owners also believe that the mine life will extend beyond 2009.

As we understand it, the mine throughput was about 2.8 Mtpa in full production but is only expected to have steady state production under the new ownership of about 2.4 Mtpa from mid-2003. We would expect the electricity consumption to drop because of this. However, the year 2001/02 on which forecasts appear to be based was typical as the mine was not producing at expected levels for a significant period.

Australian Inland has stated that [redacted].

6.5.2 Other non-residential

We have, as for Integral and Country Energy, forecast the remaining non-residential sector to grow with an elasticity of 0.87, the average for the state as a whole. We have again taken into account some increasing own-use from additional cogeneration.

This has resulted in forecasts for the non-residential sector similar to those of Australian Inland.

6.6 MMA FORECASTS OF THE NON-RESIDENTIAL SECTOR

MMA forecasts for the non-residential sector are provided in Table 31. Over the period 2002/03 to 2008/09 these show the following growth rates:

- EnergyAustralia a compound growth rate of 2.3% pa
- Integral Energy a compound growth rate of 2.5% pa
- Country Energy a compound growth rate of 2.5% pa
- Australian Inland a compound growth rate of 1.8% pa.

Table 31: MMA non-residential sector forecasts, GWh

	2003	2004	2005	2006	2007	2008	2009
EnergyAustralia	16031	16377	16789	17254	17561	17946	18358
Integral Energy	10727	11075	11363	11687	11907	12179	12470
Country Energy	5432	5559	5712	5884	5998	6142	6297
Australian Inland	296	309	313	318	321	325	329

6.7 COMPARISION WITH DNSP FORECASTS

The DNSP forecasts (actual or forecast for 2003) are provided in Table 32.

Table 32: DNSP non-residential forecasts, GWh

	2003*	2004	2005	2006	2007	2008	2009
EnergyAustralia	16031	16396	16789	17152	17495	17897	18398
Integral Energy	10727	11136	11428	11701	11931	12046	12273
Country Energy	5434	5526	5620	5716	5813	5912	6012
Australian Inland	307	302	305	309	313	317	321

* Actuals for 2003 for EnergyAustralia and Integral Energy. DNSP forecasts for remaining entries.

The key differences between the forecasts are:

- EnergyAustralia forecasts and MMA forecasts are similar. The impact of the higher growth rate estimated by MMA because of the correlation of growth with state GSP rather than regional NRGP is reduced over time as more own-use from additional cogeneration is assumed to come on-line. By the year 2008/09 the MMA non-residential forecast is 0.2% less than the EnergyAustralia forecast.

- The Integral Energy and MMA forecasts are also similar. The Integral Energy forecasts are higher in the early years but this reverses in the later years. This is because Integral Energy has assumed a reducing elasticity to state GSP and price over time while MMA has assumed a constant elasticity to state GSP. By the year 2008/09 the MMA non-residential forecast is 1.6% greater than the Integral Energy forecast.

- At 1.7% pa the Country Energy non-residential forecasts are significantly lower than MMA's forecast growth rate of 2.5% pa. By the year 2008/09 the MMA non-residential forecast is 4.7% greater than the Country Energy forecast.

- MMA has forecast slightly faster growth than Australian Inland, largely because of assumptions about major customer use. By the year 2008/09 the MMA non-residential forecast is 2.7% greater than the Australian Inland forecast.

6.8 FORECASTS OF BUSINESS CUSTOMER NUMBERS

Over recent years all DNSPs have reported significant shifts in customer numbers, most likely due to changes in category accounting and possibly consolidation of multiple customers onto single accounts. Despite this, all customers are forecasting increased customer numbers over the forecast period.

Business customer numbers as such are not significant drivers of DNSP revenues. We have, assumed that growth in business customer numbers is in proportion to forecast energy growth in the non-residential sector, retaining the same energy usage per customer.

Table 33: MMA forecast of business customer numbers

	2003	2004	2005	2006	2007	2008	2009
EnergyAustralia	139408	142419	146000	150027	152679	156002	159484
Integral Energy	72294	74637	76578	78752	80226	82047	83954
Country Energy	89259	91356	93870	96689	98554	100899	103383
Australian Inland	5818	6079	6160	6256	6319	6396	6470

Source: MMA estimates

7 PEAK DEMAND

7.1 APPROACH

Growth in summer and winter peak demand is related to growth in annual load and changes in the seasonal load factors. The key issue for peak demand forecasting is the change in summer peak load factor due to increasing penetration of air-conditioning. The appliance-based model used to forecast annual residential loads in Section 5.3 has been extended to forecast peak demand. Note that throughout this section peak demands are calculated on a calendar year basis for winter and a financial year basis for summer.

7.2 INITIAL LEVELS

Summer and winter peak demands for each DNSP vary around the trend line due to variations in weather and other factors. The appropriate initial (2002/03 for summer and 2003 for winter) peak demand levels for forecasting are the 2002/03 weather normalised summer peak demand and the 2003 weather normalised winter peak demand. Normalisation is undertaken by estimating peak demand sensitivity to the relevant weather parameter (eg average or maximum daily temperature weighted over a number of days), selecting the peak weather parameter value and calculating demand at that parameter value using the sensitivity analysis. Peak weather parameters are selected with regard to the probability that they will be exceeded. A P10 value, which has a 10% or 1-in-10 year probability of being exceeded, will be a higher summer temperature or lower winter temperature than a P50 value.

Figure 15 to Figure 18 compare actual, trend and normalised winter and summer peak demands for EnergyAustralia and Integral Energy. All the normalised peaks are P50 with the exception of the Integral summer peak, which is P10. Integral Energy has explained that it has used the P10 level for summer as the network is very sensitive to demand in summer. MMA has used P50 throughout for consistency. As the average actual peak over time should be P50, we have used the trends in actual peaks as estimates of P50 values. Insufficient data has been made available by Country Energy for meaningful comparison and no peak demand information has been provided by Australian Inland.

With one exception the trends confirm the reasonableness of the normalised peaks and these have been used as the initial levels for forecasting. The Integral Energy normalised winter peak (the value provided by Integral for 2003) is almost 400 MW below trend, however, and the higher trend value has been used. The Integral Energy normalised summer peak (the value provided by Integral as P10 for summer 2002/03) is approximately on the trend line of the actuals.

Figure 15: Energy Australia winter peak - actual, trend and normalised

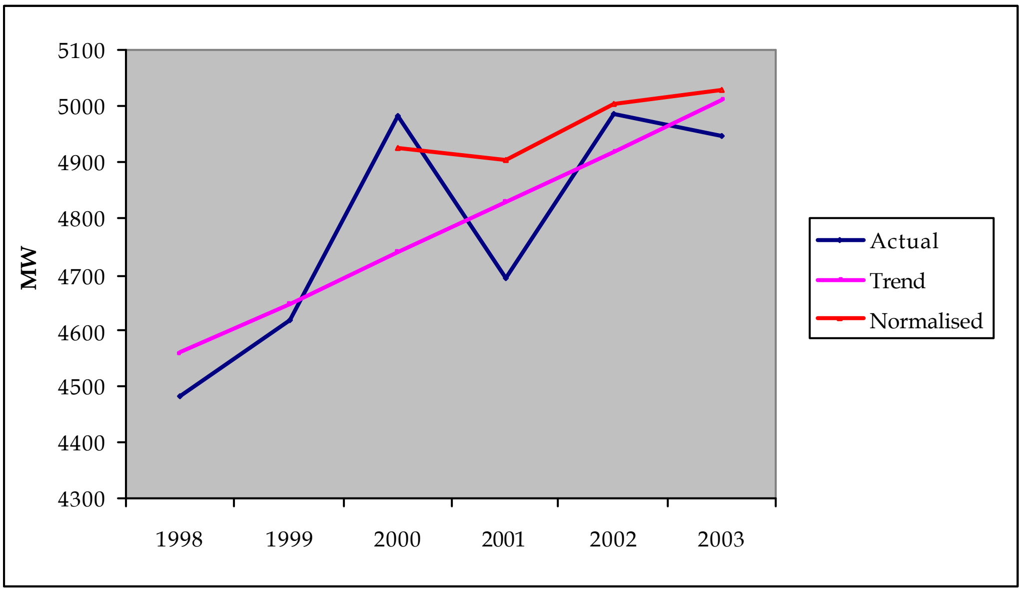


Figure 16: EnergyAustralia winter peak – actual, trend and normalised

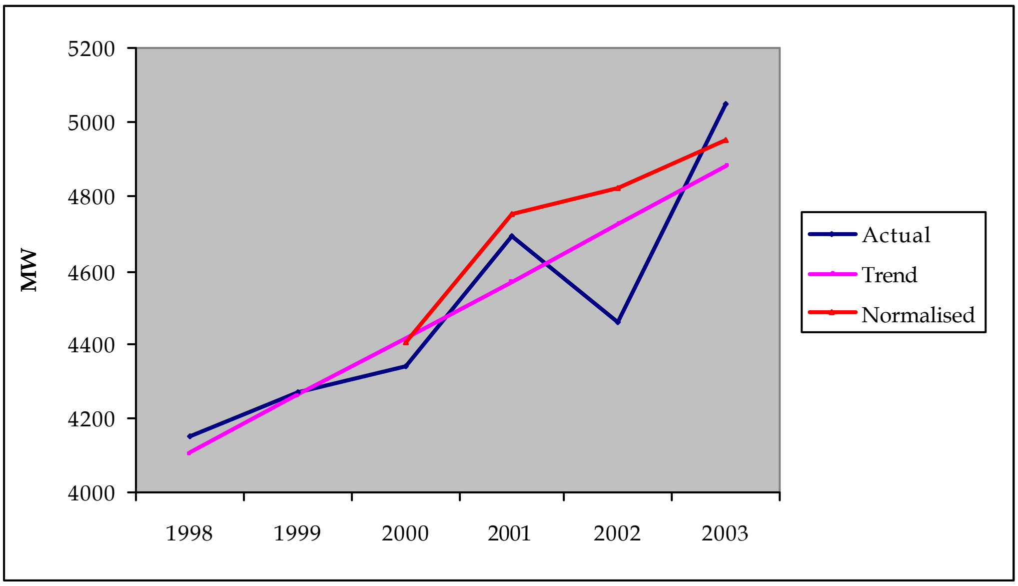


Figure 17: Integral Energy winter peak – actual, trend and normalised

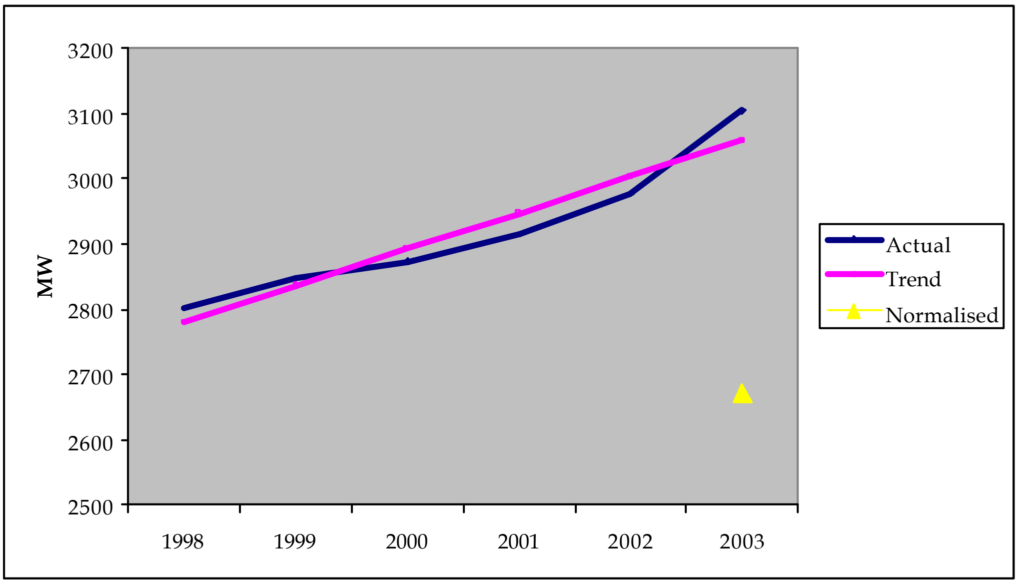


Figure 18: Integral Energy summer peak – actual, trend and normalised

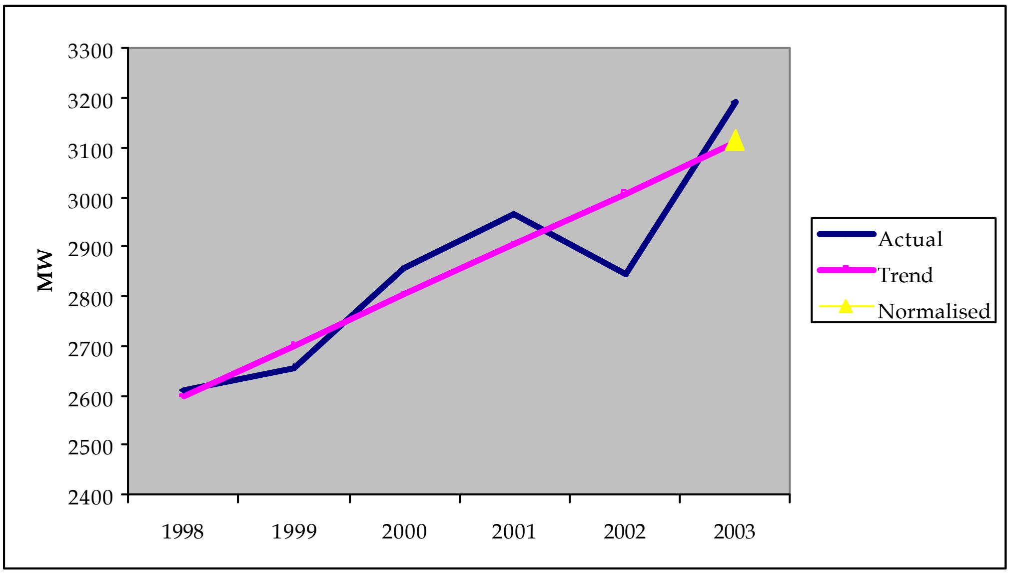


Table 34 summarises the 2002/03 peak demands used in this forecast.

Table 34: Estimated P50 peak demand in 2003 (MW)

	Energy Australia	Integral Energy	Country Energy	Australian Inland
Winter 2003	**5,029**	**3,058**	**1,990**	**N/a**
Summer 2002/03	**4,950**	**3,114**	**1,628**	**N/a**

7.3 FORECASTS

7.3.1 Peak demand sector contributions

For consistency in forecasting annual and peak demand it is important to apply similar methods, that is, to split peak demand into residential and non-residential contributions and forecast their growth separately. Relevant information has been provided by EnergyAustralia, which estimates that residential users contribute 58% to winter peaks and 34% to summer peaks. Integral has only provided some anecdotal information. Since the ratio of its residential to non-residential annual sales is about the same as EnergyAustralia's, it appears reasonable to assume the same contributions. For Country Energy the contributions have been pro-rated to relative annual consumption for each class.

Table 35: MMA estimates of P50 peak demand and contributions in 2003 (MW)

	Energy Australia	Integral Energy	Country Energy	Australian Inland
Winter Residential	2,915	1,773	**1381**	**N/a**
Winter Non-Residential	2,114	1,285	**609**	**N/a**
Summer Residential	1,682	1,059	**702**	**N/a**
Summer Non-Residential	3,268	2,055	**926**	**N/a**

It is pertinent to note that for all the DNSPs the global residential peak is significantly higher in winter than in summer, in spite of the DNSPs' emphasis on increases in air-conditioning load. Even though residential air-conditioning may be driving the growth in summer peak it does not appear to be the cause of more than 25% of summer peak for any of the DNSPs.

7.3.2 Residential Forecast Methodology

Based on the estimated market contributions presented in Table 35 the average residential customer contributions to peak demand are provided in Table 36.

Table 36: Estimated average residential customer peak demand in 2003 (kW)

	Energy Australia	Integral Energy	Country Energy	Australian Inland
Winter	2.17	2.44	2.17	N/a
Summer	1.25	1.46	1.10	N/a

MMA has modelled the average peak demands using an appliance model for which the parameters are set out in Table 37. Average appliance rating data have been derived from AGO, and appliance usage data have been derived as follows:

- Winter – for all appliances other than heater, % usage is determined from the average rating and annual consumption, allowing for seasonality of use. Heater usage is determined to fit the average in Table 36.
- Summer – for all appliances other than air-conditioning, % usage is determined from the average rating and annual consumption, allowing for seasonality of use. Air-conditioning usage is determined to fit the average in Table 36.

The similarity of the estimated heating and air-conditioning usage levels for EnergyAustralia and Integral Energy suggests that the model provides a good explanation of peak residential loads. The Country Energy parameters used are assumed to be the same as those of EnergyAustralia.

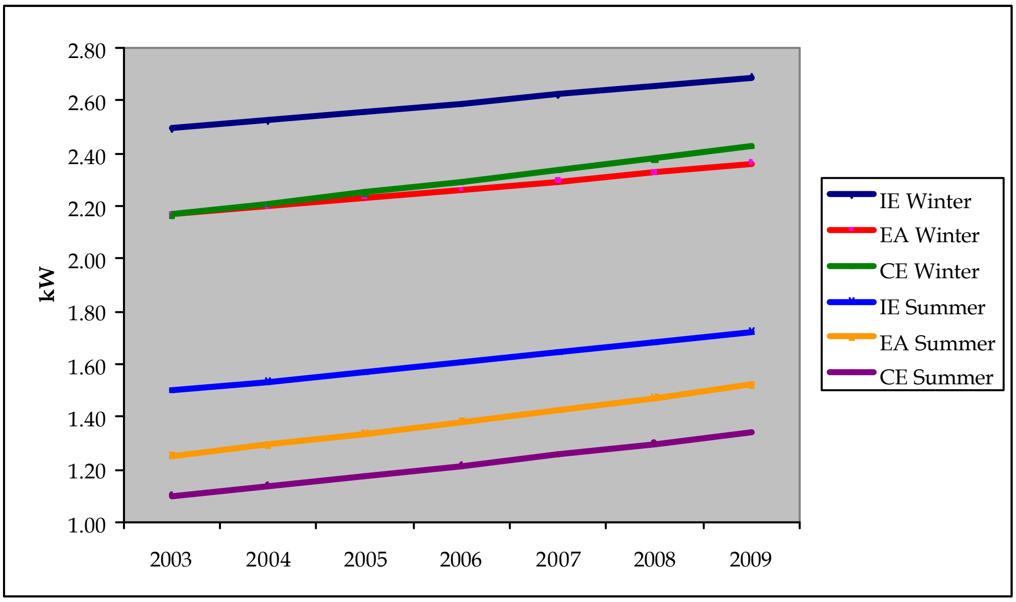
Table 37: Appliance peak demand model parameters

Appliance	Average Rating (kW)	% Usage During Peak Period			
		EnergyAustralia		Integral Energy	
		Winter	Summer	Winter	Summer
Off-Peak Water	2.00	0%	0%	0%	0%
Peak Water	1.70	20%	20%	22%	22%
Pool Pump	1.00	0%	10%	0%	10%
Air Conditioning	2.00	30%	**81%**	30%	**82%**

Appliance	Average Rating (kW)	% Usage During Peak Period			
		EnergyAustralia		Integral Energy	
		Winter	Summer	Winter	Summer
Refrigerator	0.40	25%	25%	25%	25%
Waterbed	0.60	50%	0%	50%	0%
Freezer	0.30	25%	25%	25%	25%
Lights	1.40	25%	2%	25%	2%
Heater	1.20	**64%**	0%	**68%**	0%
Cooking	2.00	30%	3%	30%	3%
Dishwasher	0.50	30%	0%	30%	0%
TV	0.11	50%	35%	50%	35%
Video	0.05	5%	5%	5%	5%
Dryer	0.50	10%	0%	10%	0%
Microwave	0.15	25%	10%	25%	10%
Wash Machine	0.20	0%	0%	0%	0%
Computer	0.30	10%	10%	10%	10%
Other/Standby	0.25	20%	20%	20%	20%

The appliance model is used to forecast the trend in residential contributions to peak demand (Figure 19), using the same projections of appliance penetration and efficiency as for annual average consumption forecasts. These assume that "comfort factor" growth is at the Half level (see Section 4.2.2), which results in increasing peak demand per customer in both winter and summer. The forecast increases in air-conditioning penetration lead to higher rates of increase in summer compared to winter, and over the forecast period summer load factor declines from 65% to 55% for EnergyAustralia, from 62% to 54% for Integral Energy and from 76% to 66% for Country Energy.

Figure 19: MMA forecasts of average residential customer peak demand



The total residential peak demands are the product of average customer peak demand and the number of customers.

7.3.3 Non-Residential Forecast Methodology

No definitive data has been provided from which trends in non-residential load factors could be estimated. Nevertheless there is anecdotal evidence that increasing air-conditioning load may be contributing to a decline in non-residential summer load factor. The decline has been projected using the following assumptions:

- Commercial load impacted by air-conditioning is approximately 25% of non-residential load (ESAA 1994 estimate)
- Growth in commercial air-conditioning will be 50% of residential growth due to greater saturation
- The declines in non-residential summer load factors will therefore be 12.5% of the declines in residential summer load factors.

It is assumed that there are no changes to non-residential winter load factors.

The total non-residential peak demands are the outcome of annual load projections and the relevant load factors.

7.3.4 Peak Demand Forecasts

MMA's P50 peak demand forecasts for all DNSPs except Australian Inland, resulting from the above methodology, are presented in Table 38. The winter peak forecast growth across the three DNSPs averages 2.7%, approximately 0.5% above the energy growth forecast. The prime causes of this appear to be falling off-peak energy sales and growth of reverse cycle air-conditioner penetration and use for heating.

The summer peak forecast growth averages 3.4%, about 1.2% above the energy growth forecast for the three DNSPs. The prime causes of this are the growth of residential air-conditioner penetration and falling non-residential load factors.

Table 38: MMA P50 peak demand forecasts (MW)

	2003	2004	2005	2006	2007	2008	2009	% p.a.
EA Winter	5030	5160	5301	5462	5592	5751	5913	2.7%
EA Summer	4951	5115	5296	5499	5666	5863	6068	3.4%
IE Winter	3058	3180	3264	3360	3437	3531	3627	2.9%
IE Summer	3114	3246	3350	3466	3560	3671	3786	3.3%
CE Winter	1990	2036	2085	2141	2187	2242	2298	2.4%
CE Summer	1628	1679	1735	1798	1849	1910	1973	3.3%

Table 39 compares MMA's peak forecast growth with that of the DNSP's. MMA's winter peak forecast growth is considerably higher than EnergyAustralia's and Integral Energy's, due to our assumption of a continuing growth trend in average usage, which translates into winter peak growth. MMA's winter peak forecast growth is very similar to Country Energy's however, because the two forecasts have similar underlying energy growth trends.

MMA's summer peak growth is approximately 0.4% higher than the DNSPs. This is due to one or more of increased energy forecasts and higher assumed usage of air conditioning.

Table 39: Comparison of MMA and DNSP forecast peak demand growth rates (%p.a.)

	MMA	DNSPs
EA Winter	2.7%	1.3%
EA Summer	3.4%	2.9%[22]
IE Winter	2.9%	2.1%
IE Summer	3.3%	2.9%
CE Winter	2.4%	2.7%
CE Summer	3.3%	2.9%

22 Based on years 2004 to 2009 owing to anomalous growth forecast from 2003 to 2004 which is atypical of growth between 2004 and 2009...

APPENDIX A - GLOSSARY

Term	Definition
ABS	Australian Bureau of Statistics
AI	Australian Inland
AGO	Australian Greenhouse Office
CAGR	Compound Average Growth Rate
CDD	Cooling Degree Day, used as a measure of the cooling effort required or "hotness" of a day. A simple version is calculated as the greater of zero and the difference between the daily average temperature and a standard temperature (eg 20°C)
CE	Country Energy
DNSP	Distribution Network Service Provider
EA	EnergyAustralia
ERP	Estimated residential Population
ESAA	Electricity Supply Association of Australia
GRP	Gross Regional Product
GSP	Gross State Product
HDD	Heating Degree Day, used as a measure of the heating effort required or "coldness" of a day. A simple version is calculated as the greater of zero and the difference between a standard temperature (eg 18°C) and the daily average temperature.
IDT	Inter Distributor Transfer, bulk supply to regions of other distribution businesses
IE	Integral Energy

Term	Definition
LGA	Local Government Area
MDP	Metropolitan Development Program
MMA	McLennan Magasanik Associates
Mtpa	Millions of tonnes per annum
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NIEIR	National Institute of Economic and Industry Research
Non-residential sector	Business plus public lighting plus inter distributor transfers
NRGP	Network Region Gross Product. The GRP of the region covered by a specific network.
NRGP	Network Regional Gross Product
Pa	Per annum
The Tribunal, IPART	Independent Pricing and Regulatory Tribunal of NSW

APPENDIX B - DNSP PROVIDERS BY LGA

Council	DNSP	Council	DNSP	Council	DNSP
Albury	Country	Goulburn	Country	Parramatta	Integral
Armidale-Dumaresq	Country	Grafton	Country	Parry	Country
Ashfield	EA	Greater Taree	Country	Penrith	Integral
Auburn	EA	Great Lakes	Country	Pittwater	EA
Ballina	Country	Griffith	Country	Port Stephens	EA
Balranald	Inland	Gundagai	Country	Pristine Waters - Nymboida, Ulmarra	Country
Bankstown	EA	Gunnedah	Country	Queanbeyan	Country
Barraba	Country	Gunning	Country	Quirindi	Country
Bathurst	Country	Guyra	Country	Randwick	EA
Baulkham Hills	EA & Integral	Harden	Country	Richmond Valley	Country
Bega Valley	Country	Hastings	Country	Rockdale	EA
Bellingen	Country	Hawkesbury	Integral	Ryde	EA
Berrigan	Country	Hay	Country	Rylstone	Integral
Bingara	Country	Holbrook	Country	Scone	EA
Blacktown	Integral	Holroyd	Integral	Severn	Country
Bland	Country	Hornsby	EA	Shellharbour	Integral
Blayney	Country	Hume	Country	Shoalhaven	Integral
Blue Mountains	Integral	Hunters Hill	EA	Singleton	EA
Bogan	Country	Hurstville	EA	Snowy River	Country
Bombala	Country	Inverell	Country	South Sydney	EA
Boorowa	Country	Jerilderie	Country	Strathfield	EA
Botany Bay	EA	Junee	Country	Sutherland	EA
Bourke	Country	Kempsey	Country	Sydney	EA
Brewarrina	Country	Kiama	Integral	Tallaganda	Country
Broken Hill	Inland	Kogarah	EA	Tamworth	Country
Burwood	EA	Ku-ring-gai	EA	Temora	Country
Byron	Country	Kyogle	Country	Tenterfield	Country
Cabonne	Country	Lachlan	Country	Tumbarumba	Country
Camden	Integral	Lake Macquarie	EA	Tumut	Country
Campbelltown	Integral	Lane Cove	EA	Tweed	Country
Canada Bay	EA	Leeton	Country	Unincorp Far West	Inland
Canterbury	EA	Leichhardt	EA	Uralla	Country
Carathool	Country	Lismore	Country	Urana	Country
Central Darling	Inland	Lithgow	Integral	Wagga Wagga	Country
Cessnock	EA	Liverpool	Integral	Wakool	Country
Cobar	Country	Lockhart	Country	Walcha	Country
Coffs Harbour	Country	Lord Howe Island	Country	Walgett	Country
Conargo	Country	Maclean	Country	Warren	Country
Concord	EA	Maitland	EA	Warringah	EA
Coolah	Country	Manilla	Country	Waverley	EA
Coolamon	Country	Manly	EA	Weddin	Country
Cooma-Monaro	Country	Marrickville	EA	Wellington	Country
Coonabarabran	Country	Merriwa	EA & Country	Wentworth	Inland
Coonamble	Country	Moree Plains	Country	Willoughby	EA

Council	**DNSP**	**Council**	**DNSP**	**Council**	**DNSP**
Cootamundra	Country	Mosman	EA	Windouran	Inland
Copmanhurst	Country	Mudgee	Country	Wingecarribee	Integral
Corowa	Country	Mulwaree	Country	Wollondilly	Integral
Cowra	Country	Murray	Country	Wollongong	Integral
Crookwell	Country	Murrumbidgee	Country	Woollahra	EA
Culcairn	Country	Murrurundi	Country	Wyong	EA
Deniliquin	Country	Muswellbrook	EA	Yallaroi	Country
Dubbo	Country	Nambucca	Country	Yarrowlumla	Country
Dungog	Country	Narrabri	Country	Yass	Country
Eurobodalla	Country	Narrandera	Country	Young	Country
Evans	Country	Narromine	Country		
Fairfield	Integral	Newcastle	EA		
Forbes	Country	North Sydney	EA		
Gilgandra	Country	Nundle	Country		
Glen Innes	Country	Oberon	Country		
Gloucester	Country	Orange	Country		
Gosford	EA	Parkes	Country		

Source: Land and property information NSW, Local energy Authority by Local Government Area

APPENDIX C - MMA APPLIANCE DATA, 2003

	Energy Australia				Integral Energy		
	Penetration	**Average Usage, kWh pa**	**Annual efficiency improvement**		**Penetration**	**Average Usage, kWh pa**	**Annual efficiency improvement**
Off-Peak Water	40.3%	3,476	0.4%		48.1%	3,693	0.4%
Peak Water	32.0%	2,968	0.4%		30.0%	3,139	0.4%
Pool Pump	15.8%	1,351	0.0%		20.0%	1,357	0.0%
Air Cond	45.7%	1,201	0.0%		57.9%	818	0.0%
Refrigerator	130.0%	888	1.5%		120.5%	879	1.5%
Waterbed	15.0%	781	0.0%		10.0%	775	0.0%
Freezer	45.0%	600	1.2%		40.3%	662	1.2%
Lights	100.0%	568	0.0%		100.0%	578	0.0%
Heater	64.5%	601	0.0%		79.5%	847	0.0%
Cooking	69.5%	501	0.0%		80.0%	311	0.0%
Dishwasher	40.0%	247	0.0%		45.9%	243	0.0%
TV	200.0%	175	-1.3%		200.0%	208	-1.3%
Video	80.0%	22	0.0%		70.0%	21	0.0%
Dryer	70.5%	200	0.8%		72.0%	126	0.8%
Microwave	95.0%	130	0.0%		98.0%	74	0.0%
Wash Machine	98.0%	75	0.0%		99.0%	73	0.0%
Computer	52.0%	242	0.0%		60.3%	155	0.0%
Other/Standby	100.0%	340	0.0%		100.0%	649	0.0%

Source: MMA estimates. Note that impacts on appliance energy usage due to changes to dwelling area, household size and "comfort" are also incorporated into modelling as discussed in the text.