Draft Report to

Queensland Competition Authority

Demand Forecasts for Distribution Network Services in Queensland

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GLOSSARY

ABS	Australian Bureau of Statistics
AGO	Australian Greenhouse Office
Bulk Transfers	Wholesale electricity sales from one distribution business to another distribution business.
C&I	Commercial and Industrial
CAGR	Compound Annual Growth Rate
CDD	Cooling Degree Day is an estimate of the extent of cooling required each day. It is calculated for each day as the minimum of zero or the difference between the average daily temperature and 18.3C
DNSP	Distribution Network Service Provider
GSP	Gross State Product
GWh	Gigawatt Hour
HDD	Heating Degree Day is an estimate of the amount of heating required each day. It is calculated for each day as the minimum of zero or the difference between 18C and the average daily temperature.
kWh	Kilowatt Hour
M	Million
MD	Maximum Demand
MMA	McLennan Magasanik Associates
MWh	Megawatt Hour
NIEIR	National Institute of Economic and Industry Research
NR	Non-residential
pa	Per Annum
ppc	Persons per (electricity) customer. The population in a DNSP's region or zone divided by the number of electricity

	customers in that region or zone.
Ppd	Persons per dwelling
QCA	Queensland Competition Authority
QEC	Queensland Electricity Commission
QLGP	Queensland Department of Local Government and Planning
SEQ	South East Queensland
SMP	System Marginal Price or pool price for electricity

EXECUTIVE SUMMARY

Independent demand forecasts

The Queensland Competition Authority (the Authority) is currently undertaking a review of the regulatory arrangements to apply to the distribution network service providers (DNSPs) commencing 1 July 2005. Energex and Ergon Energy are the two DNSPs servicing the Queensland electricity distribution network area. Forecasts of maximum demand, energy consumption and customer numbers for the DNSPs play an important part in setting the regulatory arrangements for the next regulatory period.

McLennan Magasanik Associates (MMA) was commissioned by the Authority to produce an independent set of electricity growth forecasts for the DNSPs, for the period 2005/06 to 2009/10. MMA was asked to forecast for Energex and Ergon Energy including Ergon Energy's East, West and Mount Isa zones.

Forecasting methodology

In setting the revenue caps for the regulatory period commencing 1 July 2005, the Authority must have regard to the demand growth the DNSPs are expected to service on their networks. The DNSPs have provided their forecasts of demand growth to the Authority.

Much of the information required in the construction of detailed network forecasts is available only to the DNSPs. MMA requested information from the DNSPs which included economic and demographic historical and forecast data that influence electricity demand and consumption. The information requested also included the methodologies and key assumptions used by the DNSPs in determining their forecasts.

During this review process, MMA held discussions with the DNSPs in order to understand their forecasting methodology and data sources in determining their energy and demand forecasts. MMA's understanding of the DNSPs' methodologies and comments are provided in Exec Table 1.

Exec Table 1 DNSP forecasting methodologies and assumptions

Residential	Non-residential	Maximum Demand	MMA comments
Energex			
Customer numbers by polynomial relationship. Energy by trend analysis.	C&I numbers by time trend analysis. Sales by time and GSP trend analysis and discussions with large customers.	Bottom up and top down approach with reconciliation and some estimates.	Methodology appears reasonable in most cases but assumptions made do not assess impacts of changes to key drivers.

Residential	Non-residential	Maximum Demand	MMA comments
	Rural energy using polynomial trend.		
Ergon Energy			
Customer numbers: trend analysis based on limited data Energy based on trend analysis of limited data plus local knowledge	Trend analysis of limited data plus local knowledge.	Bottom up approach using trend forecast by bulk supply point.	Severe data limitations for customer numbers and consumption. Unable to separate out residential from rural customers. No analysis of changes to key drivers.

MMA considers that the Energex methodologies generally appear reasonable but the underlying assumptions do not adequately take into account changes to key drivers, for example, changing penetration rates of air conditioners and conservation measures likely to be undertaken.

The methodology used in producing Ergon Energy's customer numbers and energy sales is based on inadequate historical data and customer disaggregation. It also does not take into account expected changes to key drivers. MMA considers that Ergon Energy's forecasting methodology for maximum demand is generally acceptable but also does not adequately take into account changes to key drivers.

MMA Forecast methodologies

Due to limitations in the information available from the DNSPs, MMA forecasts could only be produced for two electricity markets, residential and non-residential. Neither of the DNSPs could provide any useful appliance penetration or usage data which was unfortunate given the importance of air conditioning growth in setting maximum demand. Ergon Energy had particular difficulty in providing consistent historical data by zone, meaning that we have less confidence in the zone forecasts produced than for Ergon Energy as a whole.

Residential forecasts

MMA produced its residential forecasts through forecasting separately residential customer numbers and average usage per customer.

Customer number forecasts were derived from:

- population forecasts by Local Government Area (LGA) produced by the Queensland Department of Local Government and Planning (QLGP); multiplied by

- the ratio of persons per customer (ppc) derived from analysis of recent trends by DNSP and zone.

Customer number growth over the period to 2010 is expected to be slower than over the past five years due to reductions in both population growth and the change in ppc ratio. Because of a flattening in the latter, customer number growth is expected to be only slightly higher than population growth.

Average residential usage forecasts were derived through a combination of analysis of recent historical trends and the construction of an appliance model for each of the DNSPs, calibrated against recent history. Average residential usage has been growing at between 1.1% and 1.5% per customer pa. Future growth is expected to be at a slightly slower pace due to conservation regulations related mainly to water heating which have been foreshadowed by Queensland local governments.

Non-residential forecasts

Forecasts were prepared for the non-residential sector as a whole, comprising commercial and industrial, rural, public lighting, traction and others. As a strong relationship was observed between state GSP and non-residential consumption for each DNSP, GSP was used as the explanatory variable. The GSP elasticity of demand for Energex was 1.07 while that for Ergon Energy was 0.75. We have used the relation derived for Ergon Energy as a whole for each of the Ergon Energy zones.

GSP forecasts over the medium term from three independent forecasts were compared. While they varied in timing, overall, growth rates from the three were similar. We have used the GSP forecast prepared by the National Institute of Economic and Industry Research (NIEIR), which sat between the other two forecasts, as the basis for forecasting non-residential usage. While Queensland GSP growth is expected to slow from the 5% pa growth seen in recent years, it is still expected to average about 3.6% pa over the period to 2010.

Summer Maximum Demand (MD)

We have forecast a P50 MD (the maximum demand with a probability of exceedance of 50%) for each DNSP and zone through:

- using a trend rate to determine the P50 starting year value

- estimating the residential and non-residential components of this
- factoring in changed non-residential usage assuming the continuation of the current load factor
- factoring in changed residential usage through the appliance model. Air conditioning plays a key part in the growth of maximum demand. We have forecast air conditioning penetration rates to continue to grow at about 3.5 percentage points per annum for both DNSPs.

Summer MD has been growing strongly over recent years and is forecast to continue to grow strongly.

Forecasts for Energex

MMA forecasts of total (residential and non-residential) customer numbers, total sales and summer MD for the years 2005/06 to 2009/10 and the compound annual growth rate (CAGR) over that period are provided in Exec Table 2 with a comparison against those provided by Energex. Note that the starting points in the year 2005/06 are different as forecasting has been required from the base year (2002/03). The forecasts from 2002/03 are included in the body of the report.

Exec Table 2 MMA forecasts for Energex customers, sales and Summer MD and growth and Energex forecasts

MMA for Energex	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**CAGR***
Customer numbers, ‘000	1213	1239	1265	1290	1315	2.0%
Sales, GWh	20362	21093	21699	22404	23288	3.4%
Summer MD, MW	3971	4191	4388	4619	4887	5.3%
Energex forecasts	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**CAGR***
Customer numbers, ‘000	1219	1246	1277	1310	1340	2.4%
Sales, GWh	20480	21305	22250	23170	24085	4.1%
Summer MD, MW	4162	4433	4698	4957	5230	5.9%

* CAGR is over the period 2005/06 to 2009/10

MMA forecasts customer number growth, dominated by residential customers, to grow at 2% pa, just slightly over the rate of population growth over the period. This is lower than the customer numbers forecasts of both Energex (2.4%) and NIEIR in a report to Energex (2.7%) due mainly to higher population growth expected by Energex and NIEIR.

MMA's forecasts of total sales growth (3.4% pa) is also lower than that of Energex (4.1%) and NIEIR (4.3%). The difference is largely in the residential area and is due mainly to different customer numbers forecasts, together with the impact of MMA assumptions about conservation measures on average usage growth. MMA non-residential sales growth forecasts are also slightly lower than those of Energex and NIEIR.

MMA's forecast growth of summer maximum demand growth (5.3% pa) falls between that of Energex (5.9% pa) and NIEIR in its report to Energex (5.2%). Despite MMA forecasting lower residential sales than Energex and NIEIR, the sales reductions have been mainly in off-peak hot water and have largely not impacted the peak summer usage.

Forecasts for Ergon Energy

MMA forecasts of total (residential and non-residential) customer numbers, total sales and summer MD for the years 2005/06 to 2009/2010 and the CAGR over that period are provided for each of the Ergon Energy zones and Ergon Energy in total in Exec Table 3 to Exec Table 6. Ergon Energy forecasts are also provided. Note that the starting points in the year 2005/06 are different as forecasting has actually been required from the base year (2002/03). The forecasts from 2002/03 are included in the body of the report.

Exec Table 3 MMA and Ergon Energy forecasts for Ergon East customers, sales and Summer MD and growth

MMA for Ergon East	2005/06	2006/07	2007/08	2008/09	2009/10	CAGR*
Customer numbers, '000	531	540	550	558	567	1.7%
Sales, GWh	11671	11990	12143	12462	12861	2.5%
Summer MD, MW	2081	2160	2210	2295	2392	3.5%
Ergon for Ergon East	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**CAGR***
Customer numbers, '000	541	552	562	573	585	2.0%
Sales, GWh	12287	12560	12839	13468	13747	2.8%
Summer MD, MW	2057	2115	2179	2285	2347	3.4%

* CAGR is over the period 2005/06 to 2009/10

Exec Table 4 MMA and Ergon Energy forecasts for Ergon West customers, sales and Summer MD and growth

MMA for Ergon West	2005/06	2006/07	2007/08	2008/09	2009/10	CAGR*
Customer numbers, '000	49.5	49.9	50.3	50.7	51.1	0.8%
Sales, GWh	960	985	1002	1028	1059	2.5%
Summer MD, MW	201	210	217	227	237	4.3%
Ergon for Ergon West	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**CAGR***
Customer numbers, '000	47.3	47.6	47.8	48.0	48.3	0.5%
Sales, GWh	914	931	944	961	977	1.7%
Summer MD, MW	206	213	221	228	236	3.5%

* CAGR is over the period 2005/06 to 2009/10

Exec Table 5 MMA and Ergon Energy forecasts for Ergon Mount Isa customers, sales and Summer MD and growth

MMA for Mount Isa	2005/06	2006/07	2007/08	2008/09	2009/10	CAGR*
Customer numbers, '000	10.1	10.2	10.3	10.4	10.5	1.0%
Sales, GWh	154	157	159	161	165	1.8%
Summer MD, MW	36	38	40	41	43	4.2%
Ergon for Mount Isa	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**CAGR***
Customer numbers, '000	10.0	10.1	10.1	10.2	10.2	0.5%
Sales, GWh	157	159	161	163	165	1.3%
Summer MD, MW	35	36	36	37	38	2.1%

* CAGR is over the period 2005/06 to 2009/10

Exec Table 6 MMA and Ergon Energy forecasts for Ergon Total customers, sales and Summer MD and growth**

MMA for Ergon Total	2005/06	2006/07	2007/08	2008/09	2009/10	CAGR*
Customer numbers, '000	591	601	610	619	629	1.6%
Sales, GWh	12784	13132	13304	13651	14085	2.5%
Summer MD, MW**	2319	2408	2466	2562	2672	3.6%
Ergon for Ergon Total	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**CAGR***
Customer numbers, '000	598	609	620	632	643	1.8%
Sales, GWh	13358	13650	13944	14592	14889	2.7%
Summer MD, MW**	2298	2364	2435	2550	2621	3.3%

* CAGR is over the period 2005/06 to 2009/10. ** Note that this is the addition of the Maximum Demands for the three zones, and not the expected coincident demand.

Over the period 2005/06 to 2009/10 MMA forecasts customer number growth for Ergon Energy as a whole, dominated by residential customers, to grow at 1.6% pa overall. However, this is the result of growth of about 1.2% in population (mostly in Ergon East) plus a decline in ppc ratio at about -0.4%. This is slightly lower than the customer numbers forecasts of Ergon Energy which has forecast customer growth of about 1.8% pa.

MMA's forecasts of total sales growth across all regions (2.5% pa) is lower than Ergon Energy's (2.7%) and that of NIEIR in a report to Ergon Energy (2.9%). However, the growth rates for this period by themselves do not reveal the whole picture. For example, the NIEIR report forecast from a different (lower) starting point, meaning that actual sales forecast by NIEIR in 2010 are lower than those forecast by both MMA and Ergon Energy.

Despite very different methodologies and sales growth forecasts, MMA's forecast growth of summer maximum demand in Ergon East and Ergon West are similar to those of Ergon Energy. MMA's Mount Isa forecast is higher than that of Ergon Energy's because of the MMA assumption that non-residential growth in the region will be at the same rate as in the other regions.

1 INTRODUCTION

The Queensland Competition Authority (the Authority) is the jurisdictional regulator of electricity distribution prices for the two Queensland distribution network service providers (DNSPs), Energex and Ergon Energy.

The Authority is currently undertaking a review of the regulatory arrangements to apply to the DNSPs commencing 1 July 2005. The review is seeking to obtain revised forecasts of demand for distribution network services provided by Energex and Ergon Energy for use in setting the regulatory arrangements for the next regulatory period.

Under Clause 6.10.5 of the National Electricity Code (the Code), the Authority is required to specify the form of economic regulation to be applied to the DNSPs to be in the form of either:

- A revenue cap; or
- Weighted average price cap; or
- A combination of the above.

In June 2003, the Authority made a decision not to change the form of the next regulatory period commencing 1 July 2005. The decision was for revenue caps to be applied to the DNSPs, Energex and Ergon Energy.

The revenue cap regulatory regime is sensitive to the energy and demand growth forecasts for the regulatory period under consideration. There may be an incentive for the DNSPs to produce optimistic forecasts to maximise allowable operating and capital cost expenditures. Consequently the Authority commissioned McLennan Magasanik Associates (MMA) to provide independent forecasts of demand for services on the Energex and Ergon Energy networks for the period commencing financial year 2005/06 to 2009/10 inclusive.

The Energex network covers the South East Queensland distribution region, which is a single zone for pricing purposes. Ergon Energy is made up of the 6 former distribution regions: Far North, North Queensland, Mackay, Capricornia, Wide Bay and South West. In 1999 Ergon Energy has 3 network pricing zones: East, West and Mt Isa.

Major industries in Queensland include tourism, mining, agriculture and base metals. In addition, Queensland population levels are increasing above the Australian average due to high levels of interstate migration. In recent times it has experienced a housing boom, one of the chief factors in growth of the Gross State Product (GSP).

1.1 REVIEW PROCESS

In this report, MMA has prepared its own forecasts for the Energex and Ergon Energy networks and compared these against the forecasts prepared by the networks and forecasts prepared by other parties.

The forecasts cover the following distribution network pricing zones:

1. Energex
2. Ergon East
3. Ergon West
4. Ergon Mt Isa

The MMA forecasts have been based on a combination of desk-top review and interaction with the DNSPs.

1.2 CONVENTIONS

Historical and forecast information provided by both DNSPs have been for financial years. Information provided in this report is also in financial year terms unless otherwise stated. The convention followed in the report has been to refer to the financial year as either both the years covered or as the year which contains the 30th June. Thus, the financial year commencing 1 July 2003 and concluding on 30 June 2004 is referred to in the text as either 2003/04 or 2004.

Although we do not believe this report contains confidential information this should be checked with the DNSPs prior to any public release.

1.3 LAYOUT

This report is organized as follows:

- Section 2 describes the assignment and the approach taken by MMA.
- Section 3 reviews historical information for the DNSPs in the residential and non-residential categories.
- Section 4 examines the expected key drivers of electricity growth over the period to 2009/10 and provides forecasting inputs.
- Section 5 reviews the Energex forecasting methodology, provides MMA forecasts for the Energex DNSP and compares these against the forecasts prepared by the company and other sources.

- Section 6 reviews the Ergon Energy forecasting methodology, provides MMA forecasts for the Ergon Energy DNSP as a whole and for each of its three zones and compares these against the forecasts prepared by the company and other sources.

2 APPROACH

2.1 SCOPE

MMA's brief has been to independently forecast the key demand parameters, energy consumption, maximum demand and customer numbers over the period 2005/06 to 2009/10. This section of the report considers the approach adopted by MMA in its forecasting.

2.2 INFORMATION REQUEST AND ASSESSMENT

It must be recognised that most of the information required for forecasting electricity demand at a disaggregated level is not available in the public arena. Consequently, MMA has had to ask the DNSPs for information which would allow such forecasting.

A request for information was placed with each of the DNSPs on December 1, 2003. Each DNSP was asked to supply (for each zone) historical, forecast methodology and forecast information.

Energex and Ergon Energy provided an initial response to the request by the end of January 2004. The responses were incomplete and in some cases inconsistent with MMA's request for information. Due to the recent history of the establishment of Energex and Ergon Energy, the DNSPs had to access their legacy information systems and databases to enable them to provide the information requested. Ergon Energy had significant difficulty in collecting reliable and consistent customer number and sales data.

MMA analysed the historical information obtained from the respondents and conducted a number of telephone discussions and follow-up meetings with staff of the DNSP to clarify information supplied through the information request submissions.

It quickly became apparent that the DNSPs could not provide coherent data sets in many of the areas of interest. Neither DNSP could separate out non-residential customers into commercial and industrial. Neither DNSP could provide any relevant appliance models which, given the impact of air conditioning sales, is unfortunate. Neither DNSP could provide key weather sensitivity data[1]. As well, the historical data provided by Ergon Energy was inconsistent.

The lack of appliance penetrations and usage data for both DNSPs and the lack of coherent data sets, especially zonal information for Ergon, has limited the methodology available to MMA in producing its forecasts. Recommendations aimed at improving this data

[1] Ergon Energy did provide some temperature sensitivity data in respect of both energy dispatched and network demand.

availability and quality for future reviews are provided in Sections 5.1 and 6.1 and Appendix D together with a review of the DNSP forecasting methodologies.

2.3 MMA METHODOLOGY

The MMA forecast methodology has been to:

- Assess recent historical trends
- Consider key drivers for the future
- Balance recent historical trends and expected changes to key drivers in forecasting at a level of disaggregation supported by data availability.

MMA has, consequently, forecast:

- Only for the residential and non-residential customer classes.
- For Energex as a whole, for Ergon Energy as a whole and then, with less confidence, for each of the Ergon Energy zones.

2.4 PERIOD AND CURRENCY OF DATA

The period under review covers financial years 2005/06 to 2009/10 inclusive.

The base year used by the DNSPs to produce their forecasts is financial year 2002/03 as actual data became available for this year at the time the DNSPs prepared their demand forecasts submission. Both the DNSPs and MMA have, consequently, needed to forecast from the base year, 2002/03 through to 2009/10.

It is important to note that all data reported in this review are based on financial years ending 30th of June, unless stated otherwise.

2.5 FORECASTS

The Authority required the DNSPs forecasts to be disaggregated at the pricing zone levels, that is, one Energex zone and three Ergon Energy zones.

The derived forecasts are to be used mainly as a check on the DNSPs' own demand forecasts, which underpin their own capital and operating expenditure forecasts.

Given the new structure of the zonal boundaries, specifically for Ergon Energy, it was difficult to disaggregate the historical data by each zone due to availability of data.

3 OVERVIEW AND RECENT HISTORY

3.1 SCOPE OF DNSP OPERATIONS

In 2002/03, the DNSPs distributed about 18,000 GWh of electricity to some 1.6 M customers. Around two thirds of the customers and sales are in the Energex region, with the Ergon East zone dominating the Ergon Energy remainder. The approximate number of customers, sales (including distribution between residential and non-residential) and service regions of the DNSPs and zones are provided in Table 3-1.

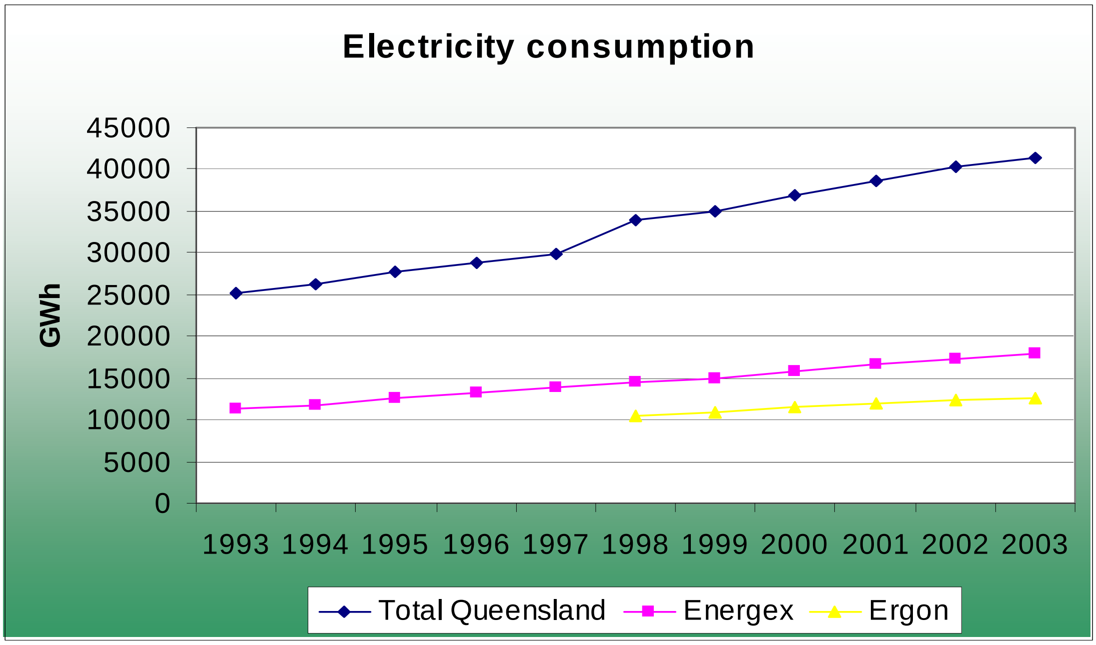
Table 3-1 Overview of DNSP operations, 2002/03

Distributor	Customers	Sales, GWh	Servicing
Energex	1,130,000	17,900 GWh, 40% residential	SE Queensland (SEQ)
Ergon Energy East	500,000	11,200 GWh, 33% residential	Eastern Queensland exc SEQ
Ergon Energy West	50,000	900 GWh, 48% residential	Central and western Queensland exc SEQ
Ergon Energy, Mount Isa	10,000	140 GWh, 60% residential	Mount Isa

3.2 QUEENSLAND ELECTRICITY CONSUMPTION

Total Queensland electricity consumption over the period 1994 to 2003 is illustrated in Figure 3-1. Over the period, total Queensland electricity consumption has grown at 5% pa. Over the past five years the growth has been slightly slower, at 4% pa.

Figure 3-1 Electricity consumption for total Queensland and supplied by the DNSPs



The graph includes consumption by transmission customers and customers supplied from embedded scheduled generation as well as from the distribution networks. Electricity supplied by the distribution networks is estimated to constitute some 73% of total sales, having remained at approximately this proportion of total delivered energy for the past five years.

Growth in consumption by distribution customers over the past five years has been 3.7% pa, a little slower than overall consumption growth. Consumption within the Energex network (4.2% pa) was higher than that for the Ergon Energy network (3.1% pa).

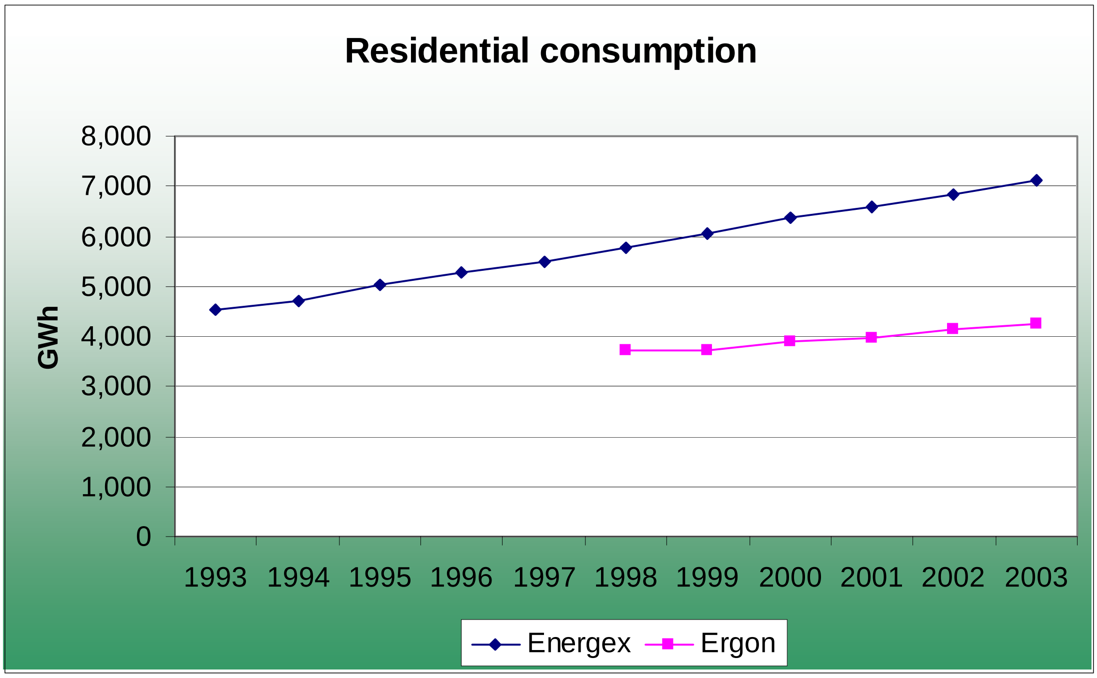
3.3 GROWTH IN THE RESIDENTIAL MARKET[2]

Growth in the residential market between 1993 and 2003 for Energex and 1998 to 2003 for Ergon Energy is illustrated in Figure 3-2. Over the past five years growth in the Energex residential market has been 4.2% pa (a reduction from the 4.9% pa seen over the previous five years) while the Ergon Energy network as a whole has seen residential growth at a slower rate of 2.7% pa.

Within the Ergon Energy network residential consumption in the three zones has grown at different rates with Ergon East at 2.7% pa, Ergon West at 2.9% pa and Ergon Mt Isa at less than 1% pa.

Figure 3-2 Residential market growth

2 Note that the disaggregation of historical customer numbers and sales into residential and non-residential sectors for Ergon Energy is based on MMA assumptions due to the inconnsistency of data provided by Ergon Energy and the unavailability of data disaggregated in this way.



It is instructive to split historical growth in the residential market into growth in customer numbers and growth in average usage per customer. Growth in customer numbers and average usage per residential customer between 1998 and 2003 are provided in Table 3-2.

Table 3-2 Growth in residential customer numbers, average usage per customer, 1998 to 2003, % pa

	Customer numbers	Average usage	Overall
Energex	2.7% (down from 3.6% in previous 5 years)	1.5%	4.2%
Ergon Total*	1.6%	1.1%	2.7%
Ergon East*	1.7%	1.0%	2.7%
Ergon West*	1.1%	1.8%	2.9%
Ergon Mount Isa*	0.3%	0.5%	0.9%

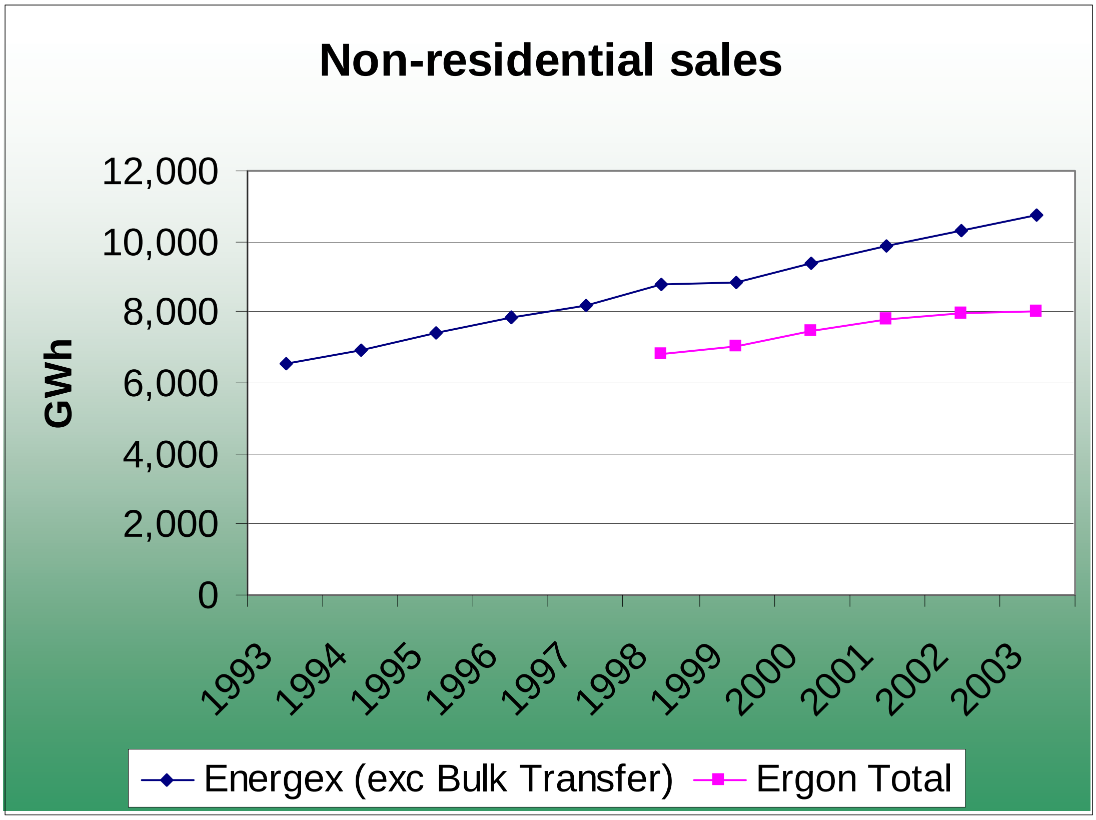
* After subtracting estimated rural usage;

Energex has been growing at a faster rate than Ergon Energy both in terms of customer numbers and average usage, resulting in an overall growth rate some 60% higher that for Ergon Energy. However, this is based on comparison of actual results in 1998 and 2003. If trend results for average usage are analysed the difference between Energex and Ergon Energy narrows with average usage for both growing at 1.3% to 1.4% pa.

3.4 GROWTH IN THE NON-RESIDENTIAL MARKET[3]

The non-residential market in this report includes all sales apart from residential and bulk transfers. It therefore includes commercial and industrial, rural, traction and street lighting. Growth in the non-residential market between 1993 and 2003 is illustrated in Figure 3-3. Over the period 1998 to 2003, non-residential growth in the Energex network has been 4.2% pa (a reduction from the 6% pa seen from 1993 to 1998) while the Ergon Energy network has seen non-residential growth at a slower rate of 3.3% pa.

Figure 3-3 Non-residential market growth



3.5 MAXIMUM DEMAND

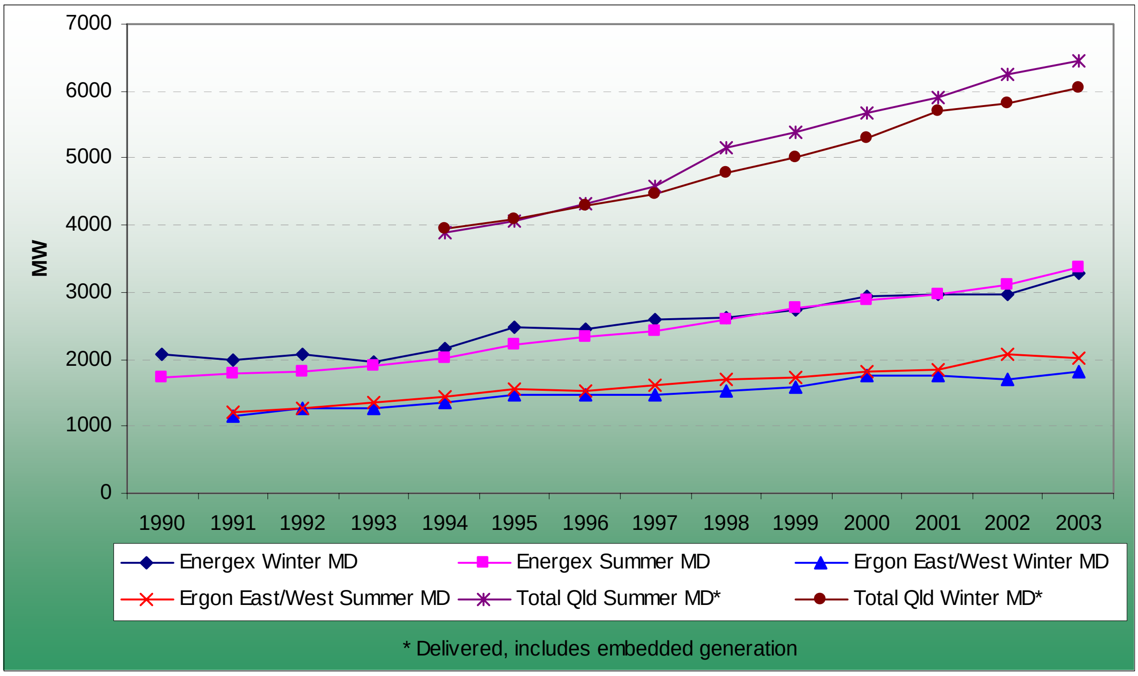
The recent history of maximum demand in both summer and winter for the Energex network as a whole and Ergon Energy East/West regions (comprising 99% of demand in total Ergon) is illustrated in Figure 3-4. Summer maximum demand has been growing more quickly than winter maximum demand for both Energex and Ergon Energy. Over the period 1998 to 2003 Energex summer maximum demand grew at 5.4% while its winter demand grew at 4.7% pa. For Ergon Energy East/West, summer maximum demand

3 Note that the disaggregation of historical customer numbers and sales into residential and non-residential sectors for Ergon Energy is based on MMA assumptions due to the inconnsistency of data provided by Ergon Energy and the unavailability of data disaggregated in this way.

growth was 3.6% pa while winter maximum demand growth was 3.3% pa. As a result Queensland's maximum demand is now experienced in summer, not winter.

Growth in summer maximum demand was significantly greater than growth in total energy consumption which, as seen in Section 3.2, was 4.2% pa for Energex and 3.1% pa for Ergon Energy.

Figure 3-4 Maximum Demand History



3.6 CUSTOMER NUMBERS

Customer numbers for Energex, largely residential, have grown rapidly over the past five years at 2.6% pa while Ergon Energy customer numbers have grown more sedately at 1.6% pa, with most growth being in Ergon East. This difference reflects the strong population growth in the southeast corner of Queensland over this period.

4 KEY DRIVERS OF ELECTRICITY DEMAND

Key drivers of electricity demand generally include:

- Demographics, in particular population growth and changes to household size.
- Appliances. Trends in appliance penetration, efficiency and use – for example, penetration and use of air conditioners, environmental and energy policies.
- Weather.
- Economic factors particularly changes in output, measured as Gross State Product (GSP)
- Energy pricing – real price of electricity, impact of a competitive market, pricing relative to other fuels and price elasticities.
- Cogeneration and embedded generation, which may reduce network sales
- Demand side management which may impact on peak demand.
- Major new industry or commercial developments.

We discuss some of these drivers and their relationship with demand in the following sections.

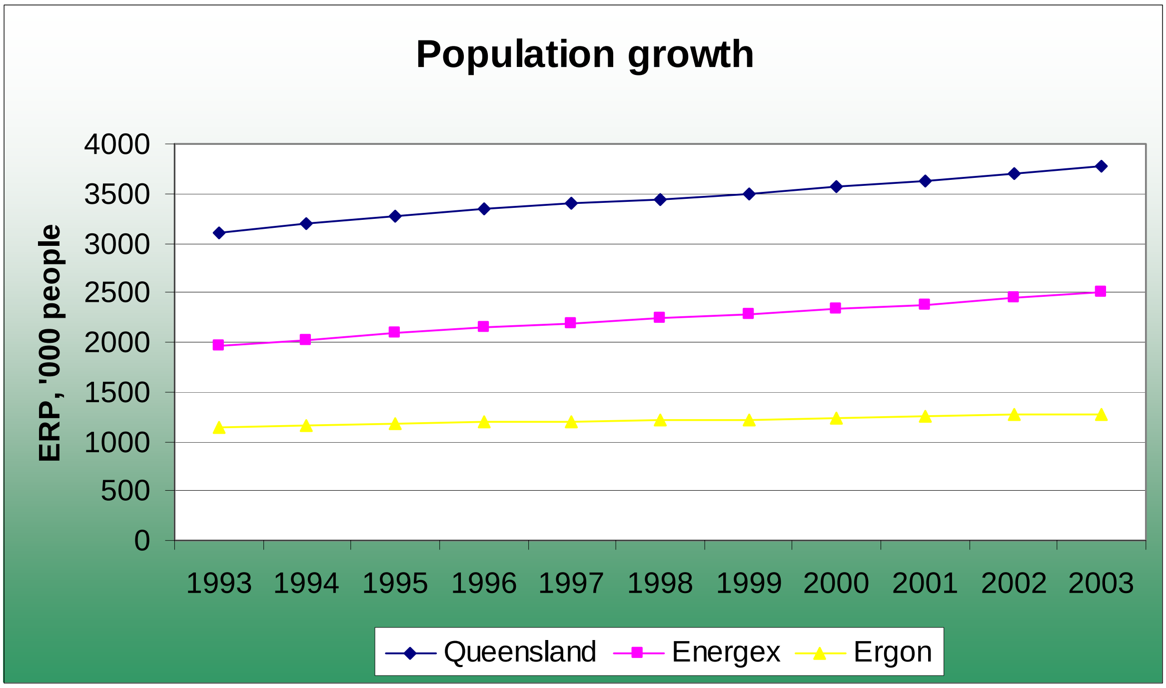
4.1 DEMOGRAPHICS

As virtually every household is an electricity customer, the combination of population growth and changes to persons per dwelling (ppd) are often used as key inputs into estimating customer connection growth. A related parameter, persons per customer (ppc), measures not only the change in household size (ie persons per dwelling) but also takes into account other considerations such as changing occupancy rates and holiday houses (see Section 4.1.2).

4.1.1 Population

Figure 4-1 shows the growth in estimated resident population (ERP) over the last decade for Queensland as a whole, in the Energex network area and in the Ergon network areas.

Figure 4-1 Queensland Population Growth



Source: ABS data & BIS Shrapnel

Over the ten-year period population growth has been about 2% pa for Queensland as a whole, with a slight slow down over the last five years (1.9%) compared to the first five years of the period (2.1%). Growth of population in the Energex network area (2.5% pa over the decade) has been significantly greater than that in the Ergon Energy areas (1.1% pa over the decade). In both cases population growth has slowed slightly in the second half of the period as compared to the first half.

The Queensland Department of Local Government and Planning (QLGP) has forecast population growth by Local Government Area (LGA) between 2003 and 2026. The medium case forecast is for Queensland population to grow at 1.7% pa between 2003 and 2010 with a further decline in growth rate to 1.4% pa over the period 2010 to 2020[4]. The QLGP forecast compares reasonably well with BIS Shrapnel population growth forecasts (1.9% pa between 2003 and 2008 and 1.7% pa between 2003 and 2013[5]), but is somewhat lower than the NIEIR forecasts of 2.1%[6] pa.

MMA has been required to provide forecasts by DNSP and by pricing zone. In order to do this MMA needed to have histories and forecasts of population growth at least by DNSP and zone and also a linkage between population change and customer numbers. The only credible and current source of forecast population information we could find at the LGA level was the Queensland Department of Local Government and Planning (DLGP) which

4 Queensland Local Government and Planning Department (QLGP) medium case population forecast, December 2003

5 BIS Shrapnel, State Industry Prospects, Table 3.4, update provided

6 National Institute of Economic and Industry Research, "Electricity consumption and maximum demand projections for the Energex region to 2013", December 2003, Table 3.3.

produced a report for MMA in October 2003. MMA has used the QLGP forecast of growth rates by LGA in its forecasting of customer numbers.

Population growth over the period 2003 to 2010 is expected to differ quite markedly between regions. While population in the Energex region is forecast to grow at 2% pa, the Ergon Energy network region is forecast to grow at only 1.3% pa, with growth in Ergon East expected to be about 1.4% pa and in the other two regions virtually flat.

The difference between MMA and DNSP assumed population growth rates is a key contributor to the difference in forecast customer numbers for both DNSPs.

4.1.2 Persons per customer

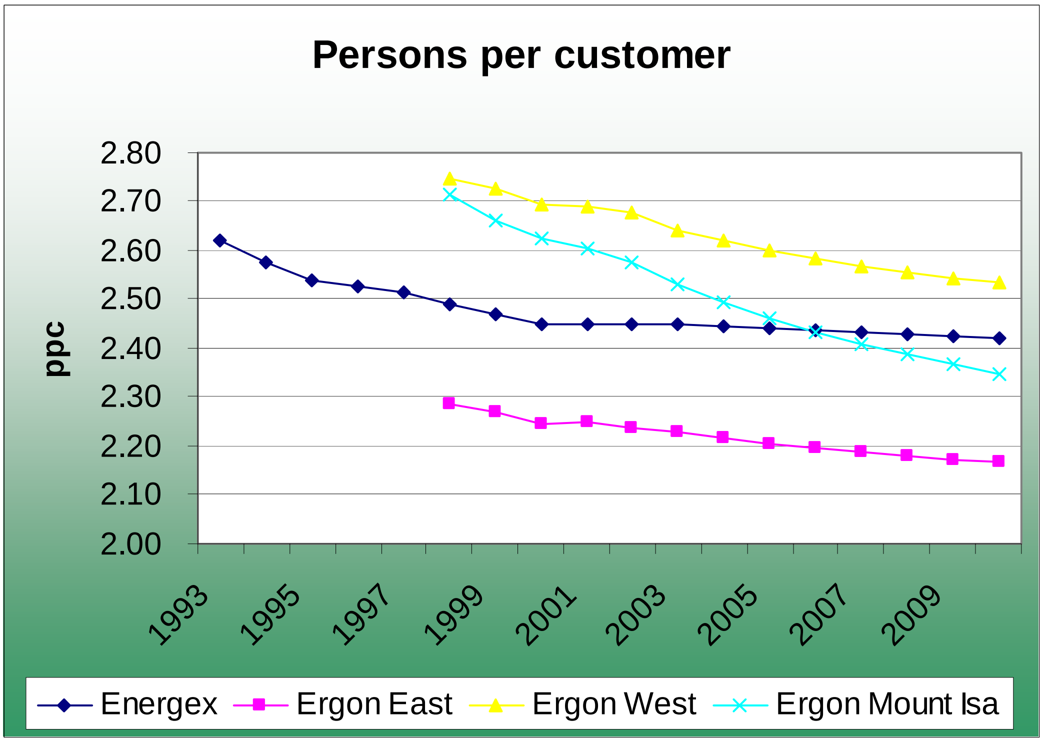
The link between population and residential customer numbers is the number of persons per customer (ppc). Persons per customer estimation is important in two areas. Firstly it is an input into expected customer numbers. The combination of population growth and changes in ppc is a good indicator of changes to residential customer numbers. Secondly the changes to ppc also impacts on expected appliance usage.

The major determinant of ppc is household size. There has been a trend to reduced household size over time and this is expected to continue, although at a reduced level. However, while household size is a major determinant of persons per customer there are also other factors which impact on ppc such as changes to the level of investment properties and rental stock, occupancy rates and holiday homes. A ppc link measures changes to these as well as to household size and is therefore likely to be a better determinant of customer numbers than household size alone. We have used ppc, defined as the population in the DNSP (from QLGP data) divided by the customer numbers as the forecasting parameter.

Figure 4-2 indicates how average persons per customer (defined as population in the DNSP’s region divided by the number of the DNSP’s residential customers) has been changing since 1993 in the Energex region and since 1998 in the Ergon zones. While there has been a reducing trend in persons per customer to 2003 for both DNSPs, there is evidence of flattening in the reduction for both DNSPs, particularly Energex.

We have used a logarithmic trend to estimate future changes to ppc for each DNSP and region as also shown in Figure 4-2.

Figure 4-2 Historical and forecast changes to persons per customer



Source: Population data from QLGP, DNSP customer numbers, MMA analysis

4.2 APPLIANCES

The type of appliances used, penetration, extent of usage and efficiency of appliances all change constantly. For example, there is evidence to show that the residential penetration of air conditioners has increased rapidly over the past decade. Along with this comes increased energy consumption and especially changes to summer peak day contribution.

Some changes to appliances or appliance usage parameters (such as increasing appliance penetration and house size) act to increase usage while others (such as a reduction in persons per dwelling, increase in appliance efficiency and changes to new house energy and water sustainability requirements) act to reduce usage. Over any period, changes to the average usage per residential customer act as a measure of the net direction of appliance change. Use of trend average usage per customer values also acts to eliminate the impact of atypical weather in the base year.

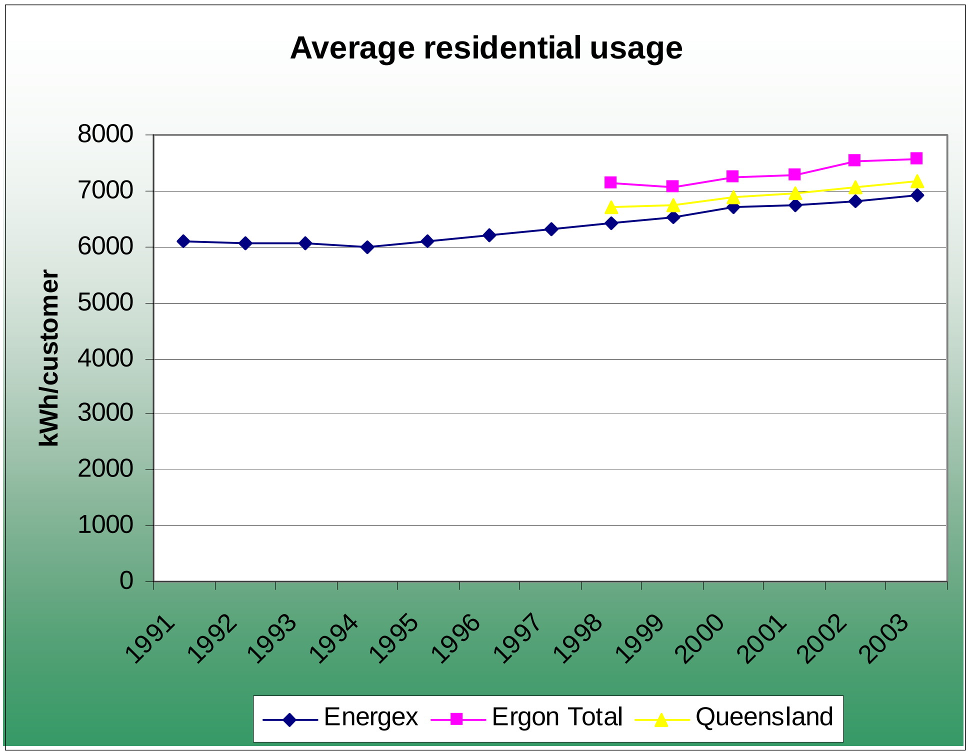
We have analysed changes to appliance efficiency and usage in two ways. In the first instance we have examined changes to the residential average usage per appliance. This global measure enables an overall view of the direction of change to be gained and allows calibration of other models.

In the second instance we have built a residential appliance model using available appliance data and trends in penetration and efficiency. We have calibrated this against recent trends in average usage per customer in each DNSP and zone.

4.2.1 Average usage per residential customer

Results from calculating the average usage per customer in the residential sector (excluding rural use for non-residential purposes[7]) for Energex, Ergon and Queensland as a whole are provided in Figure 4-3.

Figure 4-3 Average residential usage



Source: Data supplied by DNSPs, ESAA, MMA analysis

Energex has provided the most complete and consistent set of data. While this shows an initial reduction, from 1994 average residential usage has increased steadily. Over the ten year period since 1993, average Energex residential usage has increased at an average rate of about 1.4% pa.

7 While Energex provided residential consumption separately, Ergon Energy could only provide results for residential and rural customers combined. MMA has made assumptions about the number and average usage of Ergon Energy's rural customers based largely on Electricity Supply Asscoiation of Australia (ESAA) rural consumption numbers. According to the ESAA statistics, there were about 32,000 rural customers in Queensland. Of these about 8,065 are in Energex' area, leaving an estimated 24,000 in Ergon Energy area. These have been subtracted from the Residential and Rural Customer numbers provided by Ergon. We have also estimated average rural usage.

While data provided by Ergon are less reliable and consistent they also show an increase in average usage per residential customer (after subtracting estimated rural usage). Since 1998 the average usage for Ergon Energy as a whole has increased at about 1.1% pa.

4.2.2 Appliance model

Appliance usage models are used to project average consumption on the basis of trends in electricity usage in each appliance category, for example due to changes in appliance efficiency or the size of homes, and in levels of appliance ownership. Such models are particularly relevant to assessing the impacts of growth in air-conditioner ownership and demand management initiatives on energy consumption and peak demand. While the absence of DNSP specific information on these parameters appears to preclude construction of fully detailed models, MMA believes there is sufficient data for Queensland as a whole to construct models that provide insights into consumption behaviour.

MMA has constructed an appliance-based model to estimate recent changes in residential energy usage for the Queensland DNSPs. The model relies upon the relationship:

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

where the sum is for all appliance types. The MMA model uses the following data:

- Appliance penetration – ABS[8] survey data from 1994, 1999 and 2002. This is used to estimate penetration in 1997/98 and subsequent changes.
- Initial appliance usage – AGO[9] and DNSP estimates for water heating, QEC[10] values for other appliances. The latter estimates date from 1992 and have been adjusted so that average usage per customer calculated using the model matches 1998 trend estimates of average usage.
- 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.

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8 ABS 4602.0, March 2002.

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

10 Included in Australian Residential Building Sector Greenhouse Gas Emissions 1990-2010, Australian Greenhouse Office, 1999 Appendix G.

- In addition to penetration, efficiency and utilisation trends we have incorporated an additional factor to capture usage growth that these trends may not. Our experience with appliance based models suggests that the increases in usage illustrated in Figure 4-3 are partly due to factors for which there are no data, such as increases in the number of minor appliances in the "other" category and general increases in usage, perhaps due to increasing comfort levels. In view of the latter, we have called this growth factor the "comfort factor" and have assumed it is the same for all appliances other than water heating appliances, for which current usage is directly measured by off-peak meters. An update of the 1992 QEC study of appliance usage would be most useful in establishing where usage growth has actually occurred.

MMA has estimated appropriate comfort factors using Energex and Ergon average consumption trends between 1998 and 2003. The resulting appliance model outputs are compared with actual average usage in Figure 4-4 and Figure 4-5. The "No Comfort Factor" estimates show that the appliance trends themselves explain between 25% and 45% of the growth in average usage between 1998 and 2003. Estimated "comfort factor" growth rates are 1.6% p.a. for Energex and 1.0% p.a. for Ergon.

Figure 4-4 Energex residential average usage actual and appliance model prediction

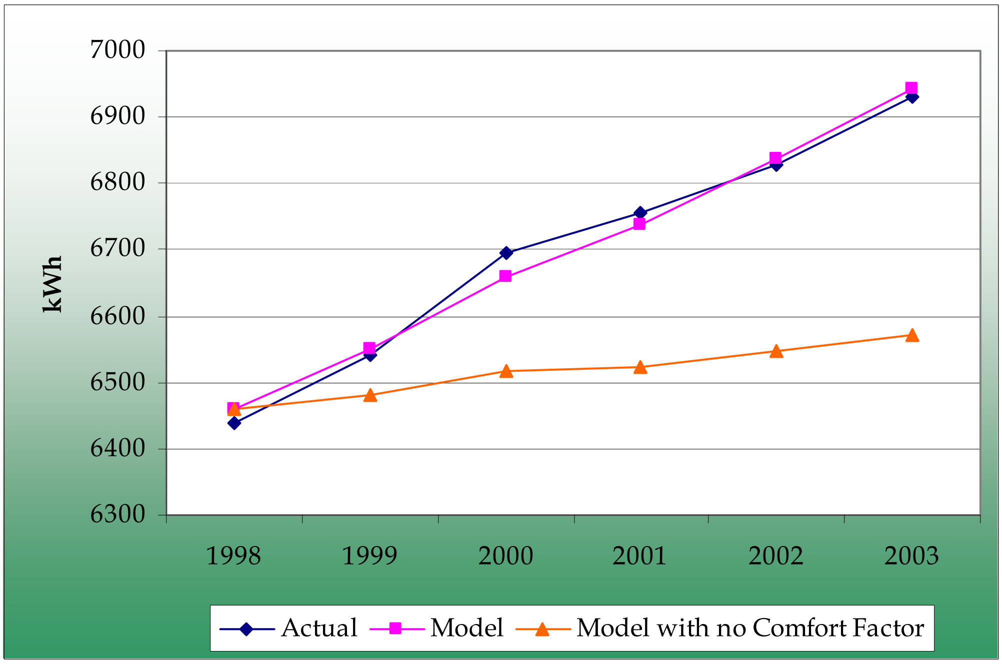
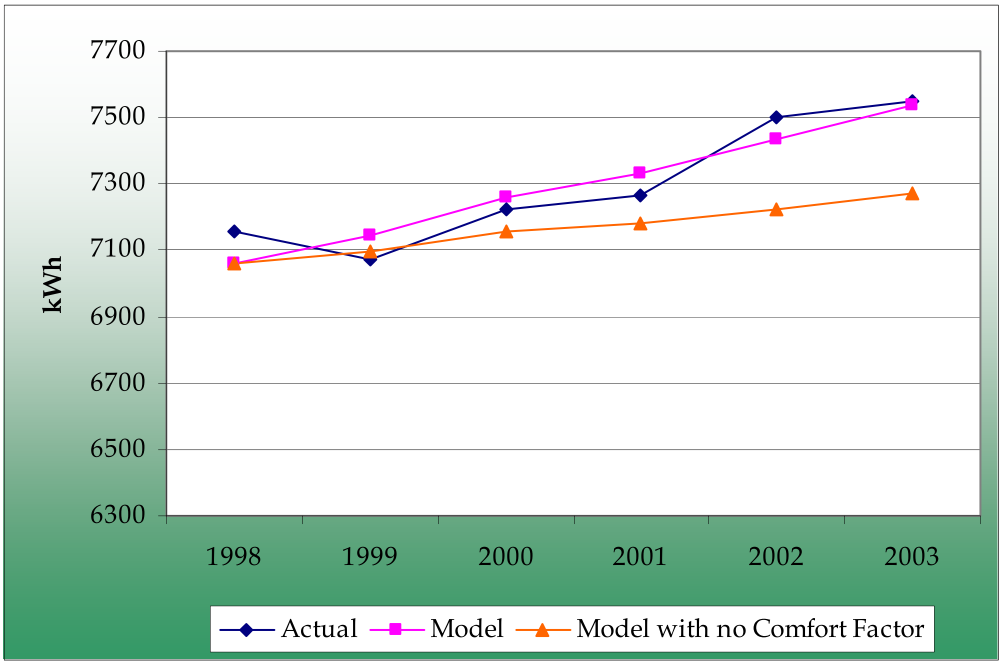


Figure 4-5 Ergon residential average usage actual and appliance model prediction



4.2.2.1 Air conditioning

A significant contributor to changes in appliance usage and especially Maximum Demand is increased use in air-conditioning. There has been a boom in air conditioning sales in Australia and Queensland over the past seven years. Table 4-1 indicates the estimated growth in penetration rate of air conditioners in Queensland between 1994 and 2002.

Table 4-1 Queensland Air-conditioning Penetration Rates

Year	**1994**	**1999**	**2002**
Air-conditioning penetration % (QLD)	17.6%	24.8%	38.5%

Source: ABS document 4602.0 "Environmental Issues- Peoples' Views and Practices", March 2002

According to the ABS surveys, the penetration rate of air conditioning in Queensland increased by an average 1.5 percentage points per year between 1994 and 1999 but then by almost 5 percentage points per year between 1999 and 2002. Over the period 1994 to 2002 the average increase in penetration rate was 2.6 percentage points pa. Over the period 1998 to 2003 we estimate growth in penetration to have averaged some 3 to 4 percentage points per year.

Reliable air conditioning sales data are difficult to source. According to NIEIR data, based on unit quarterly sales from an industry market monitor program, annual unit sales of air conditioning in Queensland have increased from around xxxx[11] units in 1993 to well over xxxx units in 2003. However, sales in 2000 and 2001 were xxxx.

Data supplied by the Brisbane City Council[12] for the Brisbane area also shows a rapid increase, from about 14,000 units in 1994 to almost 80,000 units in 2000, before dropping slightly to 72,000 units in 2001. No data have been available after 2001.

It is clear that the number of units sold has increased rapidly and that the penetration rate of air conditioners has similarly increased rapidly over the past few years. However, the level of penetration of air conditioners in Queensland is still relatively low compared to penetration in relevant parts of the USA, and indeed in many other parts of Australia.

According to the US Energy Information Administration:[13]

- In 1978 56% of US households had air conditioning. By 2001 this had risen to 75.5%.
- Two of the four most populous states in the USA: Florida and Texas, with climatic conditions similar to those seen in the warmer parts of Queensland, had air conditioning penetration of over 90% in 1997 while the other two most populous states, with cooler climates, had air conditioning penetration rates of 62% in New York and 40% in California. By 2001 the penetration rates in all these states had increased by between 2 and 6 percentage points. In 2001 Florida and Texas each had over 95% penetration rates.
- In the surveyed climatic category most closely allied to the Brisbane region[14], 64% of households had air conditioning.

Some of the data from the USA studies are provided in Table 4-2. For comparison, estimated Cooling Degree Days (CDDs), a measure of the amount of cooling required during a year for some major Queensland cities are:

- Brisbane 1000 CDDs
- Rockhampton 1500 CDDs
- Townsville 2100 CDDs
- Charters Towers 2000 CDDs
- Mount Isa 2350 CDDs

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11 Material marked xxxx has had information removed from the public report for reasons of confidentiality.

12 Sourced from the Energy Development Association of Australia Inc.

13 Energy Information Administration, 2001 and 1997 residential energy consumption surveys, material available from www.eia.doe.gov/emeu/recs.

14 More than 2000 Fahrenheit CDDs and < 4000 Fahrenheit HDDs. Note that for the same threshold temperature, one CDD = 1.8 Fahrenheit CDD.

Table 4-2 Air conditioning penetration and average usage in areas of similar climate in the USA

Location	Indicative annual CDDs	Airconditioner penetration	Average Usage/household, kWh
Texas	1500-1700	90%	3520
California	100 – 800	40%	1170
Florida	1800-2300	95%	3800
New York	600	62%	590
<1111 CDDs* and < 2222* HDDs	730	64%	1700
>1111 CDDs* and < 2222* HDDs	1520	90%	3220

Source: Energy Information Administration, 2001 and 1997 residential energy consumption surveys, material available from www.eia.doe.gov/emeu/recs. * Based on Fahrenheit CDDs and HDDs.

A description and definition of Cooling Degree Days and Heating Degree Days (HDD) is provided in Section 4.3.

If we assume that the penetration rate of air conditioners follows a simple logistic curve with growth proportional to both the current penetration of the market and the difference between a saturation level and the current penetration rate, then the growth can be estimated by the following formula:

Growth = $kx(b-x)$ where k is a constant, x is the penetration rate at any time and b is the saturation level.

Based on the information contained in Table 4-2, we can also estimate that for households in milder climates such as Brisbane the level of saturation may approach 70%, while in hotter climates the ultimate level of penetration will probably approach 95%.

Unfortunately the ABS publication does not provide statistics on penetration rates in different parts of Queensland. If the penetration is spread evenly, then the growth in penetration in the Energex area is likely to have peaked while that in the Ergon Energy region should continue to accelerate. However, given that some of the regions in the Ergon Energy area have significantly higher cooling requirements, it appears reasonable to assume that the both the saturation and current penetration rate in these regions is also higher. For example, the penetration rate of air conditioners in the Northern Territory, which has a very high annual cooling requirement, was about 90% in 2002 up from 76% in 1994.

A comparison of estimated unit sales for the Brisbane area against that estimated by NIEIR for Queensland as a whole provides some evidence to support the assumption that the current penetration rate for the Ergon Energy area is higher than in the Energex area but that penetration growth rates over recent years have been similar.

We have assumed that air conditioning penetration in 2002/03 was about 39% for Energex and 48% for Ergon Energy which results in 42% for Queensland, the estimated state average. These figures imply that both the regions have already exceeded the halfway point to saturation, meaning that the penetration growth rate should reduce somewhat over the next few years.

We have assumed that over the coming period the penetration growth rate declines from the high levels seen over the past 2 to 3 years to about the average seen over the period 1998 to 2003, some 3 to 4 percentage points per year. We have assumed slightly higher growth rates for Ergon Energy (3.75%) and lower growth rates for Energex (3.25%), reflecting the differences between current penetration and estimated ultimate penetration rates of approximately 70% for Energex and 95% for Ergon Energy.

4.3 WEATHER

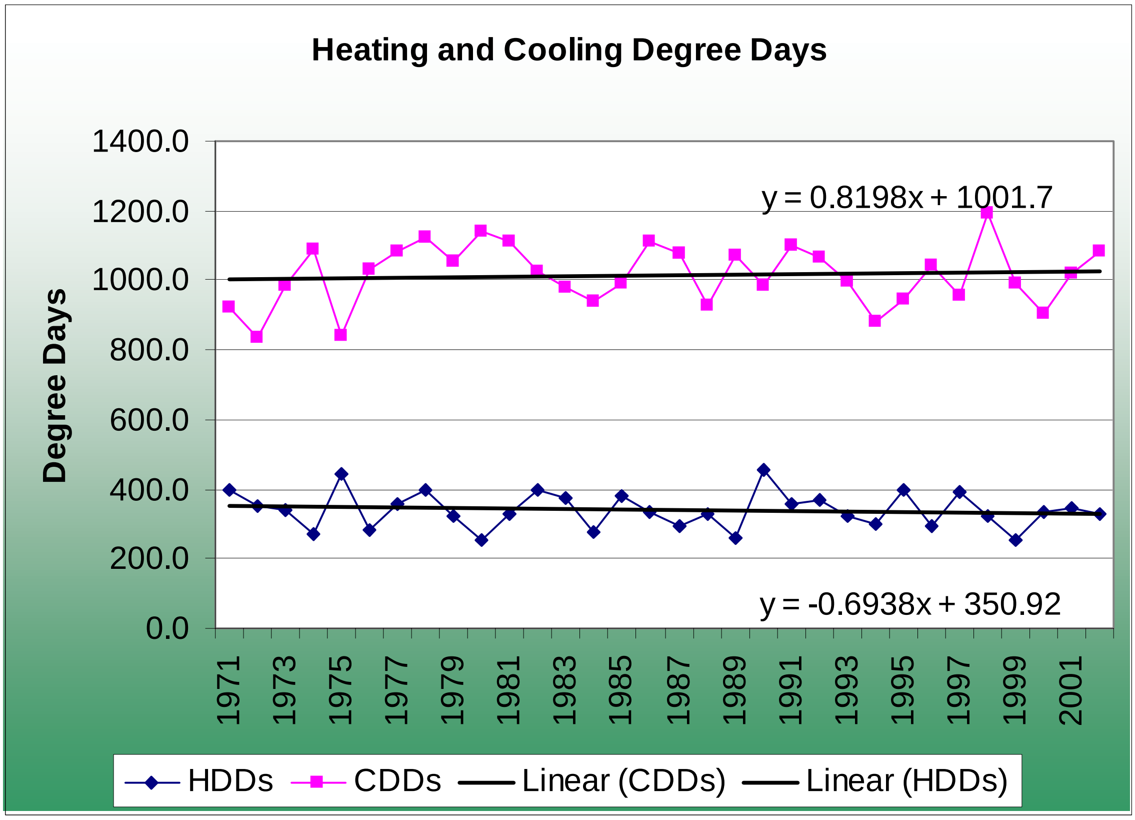
Weather has an undoubted impact on both usage by customers in any year, maximum demand and the penetration of space heating and cooling appliances.

An analysis of 3 hourly temperatures in Brisbane since 1970 has shown that while average temperatures each year has remained relatively constant, minimum winter temperatures over the period have tended to reduce slightly while maximum summer temperatures have increased slightly.

Annual Degree Day measures are generally considered to be good indicators of the extent of heating or cooling required in a year. A Heating Degree Day (HDD) is defined as the amount by which the average temperature over a day is less than a threshold temperature. A Cooling Degree Day is defined as the amount by which the average temperature over a day is greater than a threshold temperature. Thus if the HDD threshold is 18 degrees C and the average temperature on a day is 15, this is equal to 3 HDDs. Similarly, if the average temperature on a day is 23 degrees C and the CDD threshold is 18.3 degrees C then this day is assessed to have 4.7 CDDs.

The HDDs and CDDs over the period 1971 to 2002 are illustrated in Figure 4-6. Over the period CDDs have remained reasonably flat while, in common with many other areas across Australia, the extent of HDDs appears to be reducing slightly, by about (0.2% pa). The impact of these on usage of air conditioning, hot water services and other temperature-sensitive appliances is expected to be relatively small.

Figure 4-6 Heating and Cooling Degree Days, Brisbane Airport



The average CDDs over the entire 32 years is 1015. A CDD assessment of the past five financial years is provided in Table 4-3.

Table 4-3 Description of recent summers, financial years

	CDDs	Description	Hot Days (> 27°C)
1997/98	1195	Very hot	17
1998/99	989	Average	1
1999/00	903	Cold	3
2000/01	1017	Average	4
2001/02	1081	Warm	10
2002/03	969	Cool	2

Table 4.3 indicates that there has been no discernable increase in CDDs in the six years to 2002-03.

We have seen no systematic evidence from the data analysed to suggest that the weather in Brisbane at least is getting significantly warmer[15]. Conversely, as elsewhere in

15 Ergon Energy contends that the Queensland weather is getting warmer and that this is the predominant view of specialists in the field.

Australia, there appears to be a trend for slightly reduced HDDs, which is likely to have a minimal impact on energy used in heating and water heating applications.

4.4 SUSTAINABLE HOUSING PROGRAM IN QUEENSLAND

Councils in South East Queensland have announced plans to require that new housing become more sustainable. The South East Queensland Regional Organisation of Councils (SEQROC) has proposed a new draft Sustainable Housing Code to require enhanced sustainability in the areas of:

- Energy efficiency
- Water conservation
- Queensland design and living
- Universal housing design
- Safety and
- Security

According to the draft Code, new houses will be required to:

- Use an efficient hot water system, such as solar or gas
- Use at least AAA shower fittings and
- Achieve a minimum number of points from incorporating further elements from the above categories. Some of the elements included are more thermally efficient housing, gas cookers, ovens and heaters, efficient lighting and photovoltaics.

If implemented this draft Code would result in new houses being significantly less energy intensive than they are currently. Over the medium term the implementation of the draft Code would result in overall average usage per residential customer in the south east of Queensland, and potentially the rest of the state, being less than would otherwise be the case.

Although the draft Code has not yet been enacted we expect that in this area Queensland will follow developments in other states. While there is some uncertainty about the implementation of several aspects of the draft Code, we understand that two key components of the water and energy efficiency proposals – solar or gas hot heaters and AAA showerheads – are likely to be implemented in the short to medium term.

We have assumed in our appliance modeling that from 2005/06 new homes will be required to use gas, solar-electric or heat pump hot water systems instead of the current electric systems, that the amount of hot water used in new homes will also reduce because of the impact of the required AAA showerheads and that the thermal rating required of new dwellings will increase.

4.5 ECONOMIC DRIVERS

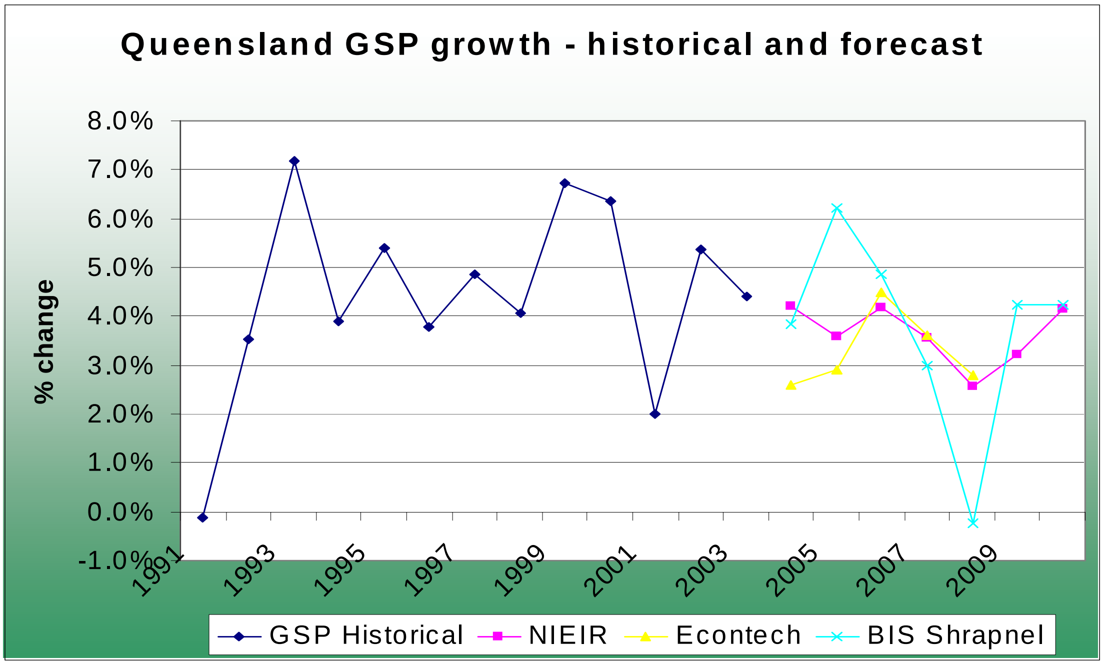
The economy is considered to be a key driver of non-residential (mainly industrial and commercial) sales in Queensland.

The history of growth of Queensland GSP and forecasts by three independent economic consulting companies from 2002/03 to 2007/08 or 2009/10 are presented in Figure 4-7. The Queensland economy has grown strongly, at 4.7% pa over the past decade, with growth over the past five years being 5% pa. The independent economists have all forecast that growth in GSP will reduce somewhat over the period 2002/03 to 2009/10. Although the forecasts differ quite widely in terms of the timing of growth, the three forecasts are similar in terms of overall growth over the period considered.

Over the period to 2008, NIEIR is forecasting average growth of 3.6% pa, Econtech 3.3% pa and BIS Shrapnel 4.5% pa. While the BIS Shrapnel forecast is noticeably stronger at this point, over the period to 2010 the BIS Shrapnel and NIEIR averages converge, with forecast compound growth rates of 3.7% and 3.5% respectively.

We have used for our forecasts the NIEIR GSP forecast. The NIEIR forecast sits approximately between the BIS Shrapnel and Econtech forecasts and is also the reference forecast used by the DNSPs and Powerlink. This suggests that GSP growth will slow over the forecast period to 3.5% pa from the 5% pa seen over the previous five years.

Figure 4-7 Queensland Gross State Product

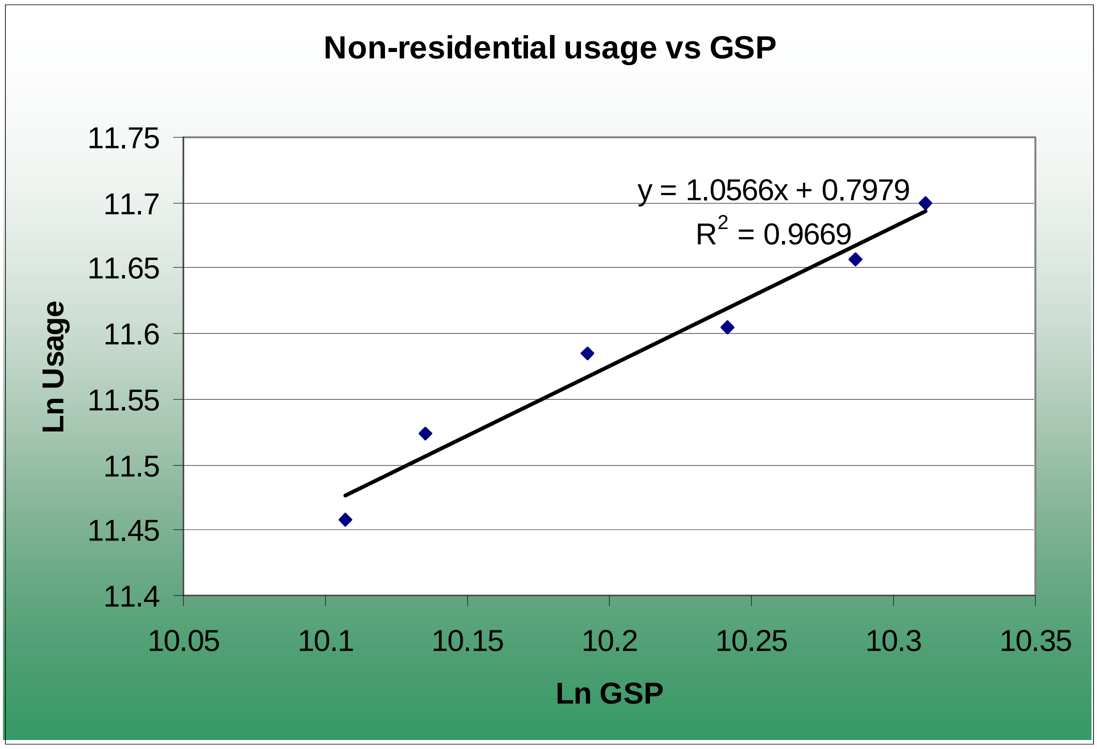


4.5.1 Relationship between non-residential usage and GSP

A strong relationship has been demonstrated in NSW between non-residential sales and state GSP[16]. A graph of a similar relationship is provided in Figure 4-8. The graph shows in a log-log form estimated non-residential (NR) usage (including estimated transmission and NR sales by distributors) in Queensland over the period 1998 to 2003.

The graph shows that, even over a five year period, there is a reasonably strong linear relationship (r2 = 0.97) between log NR usage and log GSP with an elasticity of about 1.06. As shall be seen in Sections 5.3 and 6.3, the relationship is even stronger for Energex (for whom a longer time series is available) and a little weaker for Ergon Energy.

Figure 4-8 ln NR sales and ln GSP for Queensland



4.5.2 Differential growth of the DNSPs

According to NIEIR[17], the share of Queensland GSP that is produced within the Energex region has been growing slowly while that of the remainder of the state has correspondingly been slowly declining. This is expected to continue over the remainder of the period.

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16 McLennan Magasanik Associates, "Review of demand forecasts for the 2004 electricity review", draft report to IPART, December 2003 available at www.ipart.nsw.gov.au/papers/MMA191203.pdf

17 National Institute of Economic and Industry Research, "Electricity consumption and maximum demand projections for the Energex region to 2013", December 2003, Table 3.3.

Table 4-4 Energex Percentage Share of Gross Regional Product to Queensland GSP

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
% Share	63.0%	62.7%	63.4%	63.4%	63.6%	64.1%	64.5%	64.7%	65.0%	65.4%

Such a shift is already implicitly incorporated in the energy sales trends shown by the relationship between GSP and energy sales for the individual DNSPs which sees a higher elasticity for Energex than for Ergon Energy (see Sections 5.3 and 6.3). Unless there is a significant change in the shift towards Energex percentage share of GSP, using state GSP with individual elasticities is considered a good indicator of non-residential energy sales for the DNSPs.

For both DNSPs GSP is considered to provide a good explanatory variable for changes to non-residential usage over the forecast period.

4.5.3 Base year assumptions

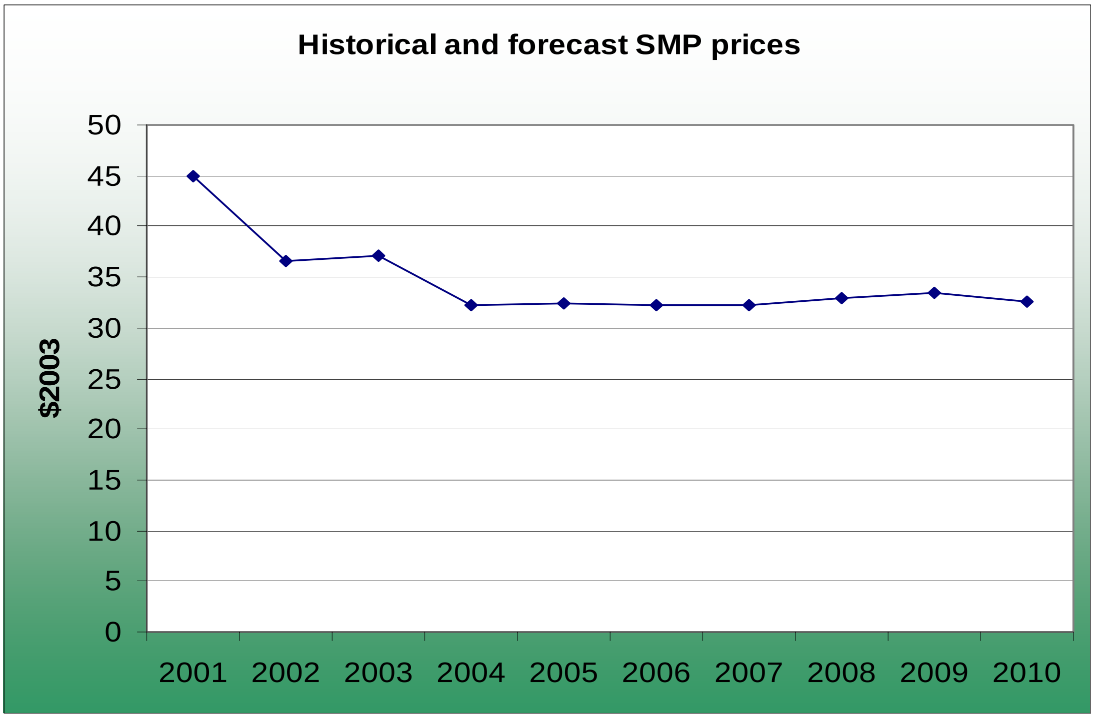
In the case of both Energex and Ergon Energy the non-residential consumption in the base year is less than would have been forecast by the relationship between NR consumption and GSP, significantly more so in the case of Ergon Energy. However, as we have seen no evidence that there is a longer-term shift towards a different relationship, we have re-set the base-line year values at the trend values as the basis for our forecasting.

4.6 PRICE CHANGES

While demand is certainly sensitive to movement in delivered prices the elasticity has generally been found to be quite low. Thus, a NIEIR study in 2002 estimated the long-run own price elasticity of demand for electricity in Queensland to be –0.29.

The key components of delivered price are energy and distribution charges. MMA forecasts of average pool price in Queensland to 2010 in real $2003 show an initial reduction in energy price in 2004 followed by a period of stable prices (see Figure 4-9).

Figure 4-9 Historical and forecast average System Marginal Price (SMP) or Pool Prices in Queensland



Source: MMA forecasts

The cost of electricity distribution is the major single component of pricing to small customers; residential and small business. Given stable distribution and transmission pricing, the impact of the reduction in the energy price in 2004 on such customers is expected to be minimal.

Energy cost is a much larger component of delivered price to large industrial and commercial customers. While the forecast energy price is expected to have some impact here we have assumed it will only be to the extent of bringing growth in the non-residential sector back to the trend levels (see Section 4.5.3).

4.7 COGENERATION

Cogeneration and independent power production is expected to increase across Australia and Queensland over the next decade, largely due to environmental drivers. However, the timing and extent of such an increase is uncertain.

In terms of energy demand forecasting for DNSPs, the only item of relevance is cogeneration/power production which displaces "own-use" consumption of electricity currently supplied through the network.

In a report to NEMMCO[18] NIEIR has projected own-use generation and consumption in Queensland to increase from 2070 GWh in 2002/03 to 2655 GWh in 2009/10. The location of expected additional own-use generation has not been specified.

MMA considers that the opportunities for significant increases in own-use generation before late in the decade will be limited. For example, the two major new plants mentioned by NIEIR, Comalco Alumina Project and the QNI Nickel refinery at Yabulu, are unlikely to commence large scale cogeneration without significant cheap gas supply, and we consider large scale supply from Coal Seam Methane or Highland Gas unlikely to become available in large quantities until 2008 at the earliest. As well, many of the bagasse cogeneration projects under consideration are expected to increase export to the grid, not own-use.

Having said this, given the incentives, we do 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[19] and assumed that this is allocated 27% to transmission customers, 60% to Ergon (in whose region most new cogeneration growth is expected) and the remainder in Energex' area. This acts to reduce the non-residential growth. As we have already assumed a relatively high baseline growth in end-use of 50 GWh pa, the reduction only acts from 2008.

4.8 DEMAND MANAGEMENT MEASURES

Demand management programs, apart from improving appliance efficiency, are relatively immature. After discussions with the DNSPs we have come to the conclusion that demand management efforts have largely been ineffective and not well promoted and have decided that demand management will not impact largely on total energy usage, apart from changes to appliance efficiency and to the sustainability requirements for new houses (see Appendix A and Appendix C).

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

18 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.

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

5 MMA FORECAST FOR ENERGEX

The first section of this Chapter provides a critique of the methodology applied by Energex to its forecasting. The following sections and related appendices then describe the MMA forecasting methodology and outcomes for the Energex DNSP.

5.1 DISCUSSION OF ENERGEX METHODOLOGY

On the basis of the information provided by Energex, our understanding is that Energex's approach to forecasting energy and customer numbers is to use various forms of time trend analysis combined with in-house knowledge. The customer numbers forecast is based on a polynomial regression of the ratio of customer numbers to population against time. A similar (i.e. trend based) approach is adopted for their energy forecast, although in the industrial and commercial markets some effort is made to individually examine large customers history and special attention is paid to block loads.

While MMA considers the use of population forecasts and ppc trend models in forecasting customer numbers to be reasonable, the assumptions made about population forecasts and trend analysis are vital. Trend forecasting of energy consumption without consideration of changes to key drivers is considered inappropriate as it may provide a forecast biased too strongly towards recent history.

The maximum demand forecast is obtained via reconciliation of two forecasting approaches. One of these approaches is based on providing a trend forecast of bulk supply point data, with an adjustment for block loads and other local knowledge. Forecasts at the bulk supply point level are combined to a total level using coincidence factors. The second approach is based on regressing total demand against population and GSP. This second approach also incorporates some estimation of the impact of air conditioning uptake. Energex has not clearly stated how it has done this, and reconciliation of this nature between two disparate forms of forecasting can provide a possible range of forecasts from which Energex can choose, which may result in a loss of objectivity in the forecasting.

The weather correction technique used by Energex in forecasting maximum demand is based on an intuitive approach.

Key areas of concern are:

- The assumption of continuation of trends
- The "intuitive" approach to weather correction of historical data
- Lack of weather correction models in determining weather effect on demand and specifically air-conditioning effect

- Lack of suitably disaggregated data
- Lack of data to support any appliance modelling.

MMA recommends that Energex should in future consider:

- Collecting data on appliance penetration and usage, in particular air-conditioning
- Collecting disaggregated sales data for the residential, commercial, industrial, large industrial and rural categories
- Developing an appliance model to better explain the effect of appliances on demand
- Correcting demand for weather effect using robust statistical techniques.

5.2 RESIDENTIAL

5.2.1 Customer numbers

Historically customer numbers have grown at a faster rate than the population. For example, in the Energex region customer growth over the past five years has been 2.7% pa with population growth only 2.3% pa. This is understood to be mainly due to reducing household size (persons per dwelling) possibly combined with more dwellings per household. However, the pace at which customer growth outstrips population growth appears to be on a decline (see Figure 4-2).

The customer numbers forecast has been developed using population forecasts and a relationship between distributor customer numbers and population referred to as persons per customer (ppc). Population forecasts were available from the Department of Planning and Local Government (QLGP) in Queensland. MMA developed its own forecast of ppc using historical data supplied by Energex and a logarithmic trend. The net result of having an 'almost flat' ppc is that the expected customer forecast will show growth only slightly above population growth.

This results in residential customer numbers growing at 2.2% pa from 1.024 M in 2003 to 1.194 M in 2010, as shown in Table 5-2.

5.2.2 Average residential usage

We have used the residential appliance model described in Appendix A to forecast growth in average usage for the Energex residential market. Average usage is forecast to grow at an average rate of 1.2% pa, down from 1.4% pa over recent years largely because of assumptions about conservation regulation. Conservation measures are projected to have the greatest impact on water heating load and lesser impacts on air conditioning and heating.

5.2.3 Forecast residential growth

The residential growth forecast for the Energex region is provided in Table 5-1 and, together with recent historical growth illustrated in Figure 5-2.

Table 5-1 Forecast residential growth for Energex, 2003/04 to 2009/10

	2004	2005	2006	2007	2008	2009	2010	CAGR
Residential market, GWh	7431	7704	7958	8217	8503	8749	9023	3.5%

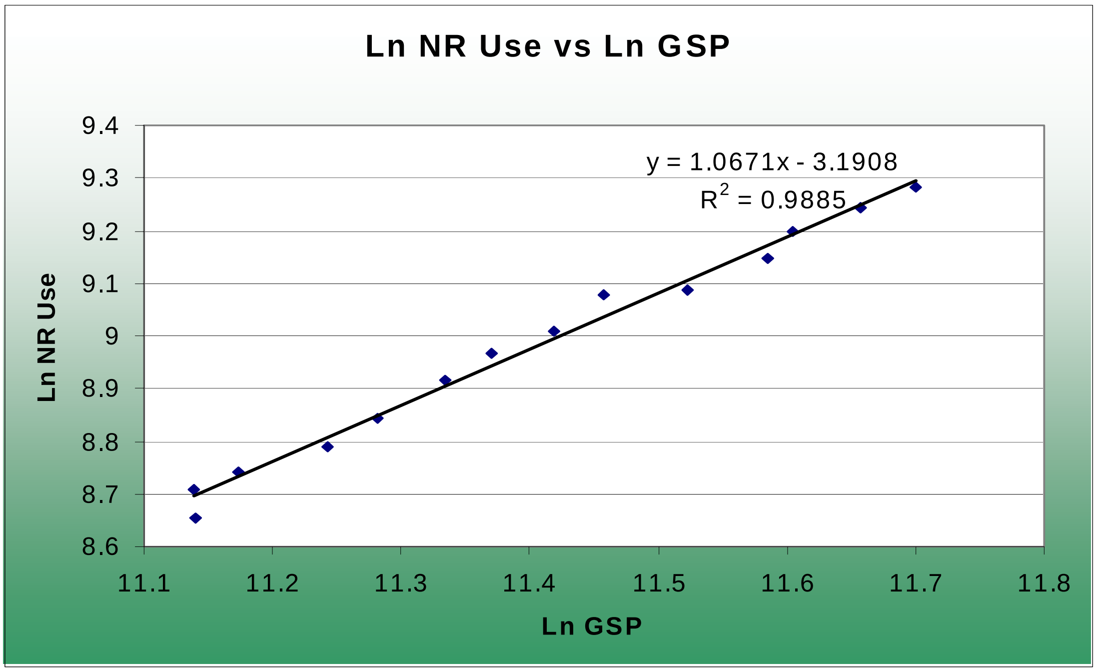
Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010.

The growth rate over the period 2003 to 2010 is 3.5% pa, which is derived 2.2% from customer number growth and 1.2% from growth in average usage per customer. This compares with a growth rate of 4.1% observed over the previous five years. The forecast reduction is due mainly to a forecast reduction in customer number growth, but also a slow-down in average usage growth rate due largely to the expected introduction of the sustainable housing program for new dwellings.

5.3 NON-RESIDENTIAL

There is a strong linear log-log relationship (r2 = 0.99) between Energex' non-residential sales and GSP, as seen in Figure 5-1. We have used this relationship together with the NIEIR GSP forecast-to-forecast non-residential usage for Energex.

Figure 5-1 Ln Energex Non-residential sales (GWh) vs Ln Queensland GSP



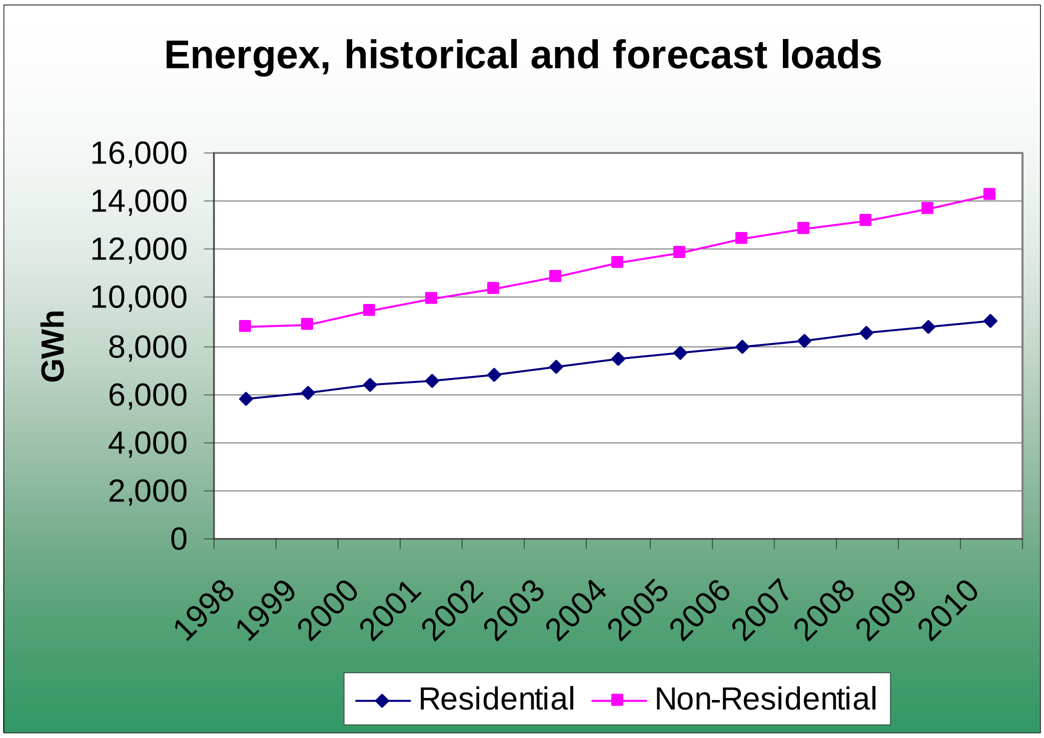
We have reduced the forecast slightly in the latter years of the forecast period to account for some expected own-use cogeneration.

Energex also had 74 GWh of bulk transfers in 2003. We have assumed that these will grow at the recent trend rate, about 3.4% pa.

Overall, the non-residential sector plus bulk transfer is forecast to grow at 4% pa between 2003 and 2010, a slight reduction on the 4.2% pa seen over the past five years because of the expected reduction in GSP growth. The year 2003/04 is expected to see a significant (5.5%) increase to bring growth back to trend levels with growth from 2004 to 2010 averaging 3.7% pa.

Recent historical and forecast growth in the residential and non-residential sectors are illustrated in Figure 5-2.

Figure 5-2 Recent historical and forecast residential and non-residential consumption for Energex, GWh



5.4 GROWTH IN RESIDENTIAL AND NON-RESIDENTIAL CUSTOMER NUMBERS

We have forecast growth in residential customer numbers to be 2.2% pa.

Non-residential customer numbers (mainly business) are much smaller than residential numbers and have not been used in our derivation of non-residential sales forecasts. In order to forecast combined total customer growth we have assumed that the growth in business customer numbers is 1.9%, in line with that seen over recent years.

MMA's forecast of residential and non-residential customers is provided in Table 5-2.

Table 5-2 Forecast customer number growth for Energex, 2003/04 to 2009/10, ('000)

	2004	2005	2006	2007	2008	2009	2010	CAGR
Residential	1052	1077	1101	1125	1149	1172	1194	2.2%
Non-residential	108	110	112	114	117	119	121	1.9%
Customers	1160	1187	1213	1239	1265	1290	1315	2.2%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010.

5.5 SUMMER MAXIMUM DEMAND

MMA has forecast summer maximum demand using the methodology described in Appendix B .

Summer maximum demand with a probability of exceedance of 50% (P50) is forecast to grow at a rate of 5.5% pa. This compares with a growth rate over recent years of 5.4% pa. This continued high growth rate is due largely to the expected continued increase in residential air conditioning load and the limited impact of conservation measures on air conditioning.

5.6 COMPARISON WITH OTHER FORECASTS

We compare in this section the MMA forecast numbers against those forecast by Energex and the report prepared by NIEIR[20] for Energex dated December 2003. Comparisons against other forecasts, such as Powerlink or NEMMCO, are generally not relevant as they are carried out for Queensland as a whole and thus include information for the other DNSP as well as for transmission customers.

Table 5-3 Comparison of customer number, sales and maximum demand forecasts, 2003/04 to 2009/10

MMA Forecasts	2004	2005	2006	2007	2008	2009	2010	CAGR
Customers, '000	1,160	1,187	1,213	1,239	1,265	1,290	1,315	2.2%
Total sales, GWh	18,871	19,580	20,362	21,093	21,699	22,404	23,288	3.8%
								5.5%

20 National Institute of Economic and Industry Research, report commissioned by Energex, "Electricity consumption and maximum demand projections for the Energex region to 2013", December 2003

MMA Forecasts	2004	2005	2006	2007	2008	2009	2010	CAGR
Summer MD, MW	3,541	3,747	3,971	4,191	4,388	4,619	4,887	
Energex Forecasts	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**CAGR**
Customers, '000	1,159	1,189	1,219	1,246	1,277	1,310	1,340	2.5%
Total sales, GWh	18,790	19,560	20,480	21,305	22,250	23,170	24,085	4.3%
Summer MD, MW	3,602	3,890	4,162	4,433	4,698	4,957	5,230	6.5%
NIEIR Forecasts	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**CAGR**
Customers, '000	1,158	1,187	1,221	1,257	1,290	1,322	1,361	2.7%
Total sales, GWh	18,727	19,503	20,591	21,585	22,339	23,276	24,363	4.5%
Summer MD, MW	3,614	3,809	4,034	4,263	4,466	4,682	4,947	5.7%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010.

MMA total sales forecasts (3.8% pa between 2003 and 2010) are lower than those of Energex (4.3%) and NIEIR (4.5%) with most of the difference in the residential area as seen in Table 5-4. MMA has a lower customer number growth (2.2%) compared to Energex and NIEIR (2.6% to 2.7%) and a lower growth in average usage per customer due to MMA's assumptions about conservation measures. MMA's non-residential sales growth forecast (4%) is also a little lower than those of Energex (4.3%) and lower than NIEIR's (4.7%).

Table 5-4 Comparison of forecast residential and non-residential sales, 2003/04 to 2009/10, GWh

MMA Forecasts	2004	2005	2006	2007	2008	2009	2010	CAGR
Residential sales	7431	7704	7958	8217	8503	8749	9023	3.5%
Non-residential sales	11,440	11,876	12,404	12,876	13,195	13,655	14,265	4.0%
Energex Forecasts	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**CAGR**
Residential sales	7,520	7,835	8,175	8,485	8,790	9,155	9,520	4.3%
Non-residential sales	11,270	11,725	12,305	12,821	13,460	14,015	14,565	4.3%
NIEIR Forecasts	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**CAGR**
Residential sales	7,388	7,691	8,033	8,407	8,738	9,078	9,496	4.2%
Non-residential sales	11,339	11,813	12,558	13,178	13,601	14,198	14,868	4.7%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010.

All three forecasts project strong summer MD growth of 5.5%or more pa. Despite the difference in load growth forecasts, the summer MDs forecast by MMA and NIEIR are quite similar, with the MMA forecast in 2010 lying just 1.3% below that of NIEIR. The Energex MD forecast is higher than the MMA forecast by some 7% in 2010 and than the NIEIR forecast by 5.7% in the same year.

Powerlink in its Annual Planning Report 2003 (page vii) noted that while average growth in summer maximum demand delivered from the transmission grid is expected to grow at 3.6% pa between 2003 and 2013, over the next three years of the period growth in south east Queensland was expected to grow at around 6% annually. This is broadly consistent with the MMA analysis.

6 FORECAST FOR ERGON ENERGY

The first section of this Chapter provides a critique of the methodology applied by Ergon Energy to its forecasting. The following sections and related appendices then describe the MMA forecasting methodology and outcomes for the Ergon Energy DNSP. Note that although we have forecast for the three zones, because of data limitations we have more confidence in the forecast for Ergon Energy as a whole and the Ergon East zone than in the other zonal forecasts.

6.1 DISCUSSION OF ERGON ENERGY METHODOLOGY

MMA understands that Ergon Energy's customer numbers and energy sales forecasts were produced using a different set of data to the final data delivered to MMA. Further, our understanding of Ergon Energy's approach to forecasting energy and customer numbers is that Ergon essentially used trend analysis based on 2 years of history, combined with some local knowledge of future developments. At a late stage of this review Ergon Energy was able to provide a longer time series of the requested data but did not review the initial forecasts because of a lack of confidence in the new data. The lack of consistent suitably disaggregated historical data creates serious concerns about Ergon Energy's methods for forecasting customer numbers and energy sales. As well, Ergon Energy does not seem to have taken into account any changes to key drivers in these areas.

A longer and more consistent historical data set was available with regard to maximum demand. The maximum demand forecast has been obtained by using a "bottom-up" approach, whereby trend forecasts are obtained at each bulk supply point (for which a longer history than 2 years is available). These have been adjusted for block loads and then combined to a total forecast using coincidence factors. MMA considers that Ergon's forecasting methodology for maximum demand is generally more acceptable, however, again it lacks any factoring in of changes to key drivers.

MMA recommends that Ergon Energy:

- Improves its historical disaggregated data by accessing (and cleansing if required) data from its legacy systems
- Collect disaggregated sales data for the residential, commercial, industrial, large industrial and rural categories
- Collect data on appliance penetration and usage, in particular air-conditioning
- Develop an appliance model to better explain the effect of appliances on demand
- Develop a weather correction model for demand forecasting.

6.2 RESIDENTIAL

We estimate residential market sales growth for Ergon Energy as a whole over the past five years to have been 2.7% pa, with differential growth rates between zones[21] (see Section 3.3).

6.2.1 Customer numbers

As for Energex, the customer numbers forecast has been developed using population forecasts and a relationship between distributor customer numbers and population referred to as persons per customer (ppc). Population forecasts were available on an LGA level from the Department of Planning and Local Government (QLGP) in Queensland. MMA developed its own forecast of ppc by zone using a logarithmic trend based on historical data supplied by Ergon. The reduction in the ppc ratio is more pronounced than was the case for Energex[22], however, a flattening ppc trend is still evident. The net result of having a relatively flat ppc ratio is that the expected customer forecast will show growth only a little above population growth.

MMA forecasts residential customer numbers in Ergon Energy Total to grow at 1.4% pa from 562,000 in 2003 to 620,000 in 2010. The growth is made up of a low 1% pa growth in population numbers and a 0.4% impact due to a reducing ppc ratio.

6.2.2 Average residential usage

We have used the residential appliance model described in Appendix A to forecast growth in average usage for the Ergon Energy residential market. Average usage is forecast to grow at an average rate of 1.1% pa, below the recent trend of 1.3% due to conservation measures. The conservation regulation modelled is expected to have similar impacts on average residential usage growth rates in the Ergon Energy region as in the Energex region.

Forecast growth rates for customer numbers and average residential usage for Ergon Energy and the three zones over the period 2003 to 2010 are provided in Table 6-1.

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21 There is some uncertainty about the growth rates, especially by zone, as Ergon Energy has not been able to provide rural and residential historical data separately.

22 Presumably because houshold size in the regional and rural areas is reducing at a faster rate than in south eastern Queensland.

Table 6-1 Forecast residential growth rates for Ergon Energy and the three zones, 2002/03 to 2009/10, % pa

	Customer Numbers	Average Usage	CAGR
Ergon Total	**1.4%**	**1.1%**	**2.5%**
Ergon East	**1.5%**	**1.1%**	**2.6%**
Ergon West	**0.6%**	**1.9%**	**2.5%**
Ergon Mount Isa	**0.9%**	**0.5%**	**1.4%**

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010

6.2.3 Forecast residential growth

The residential growth forecast for the Ergon Energy DNSP and the three zones is provided in Table 6-2 and, together with recent historical growth illustrated for Ergon Energy as a whole in Figure 6-2.

Table 6-2 Forecast residential sales for Ergon Energy, 2003/04 to 2009/10, GWh

	2004	2005	2006	2007	2008	2009	2010	CAGR
Ergon Energy Total	4312	4433	4553	4674	4811	4923	5051	2.5%
Ergon East	3803	3912	4019	4127	4248	4348	4461	2.6%
Ergon West	422	433	444	457	470	482	495	2.5%
Ergon Mount Isa	87	88	89	90	92	93	95	1.4%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010.

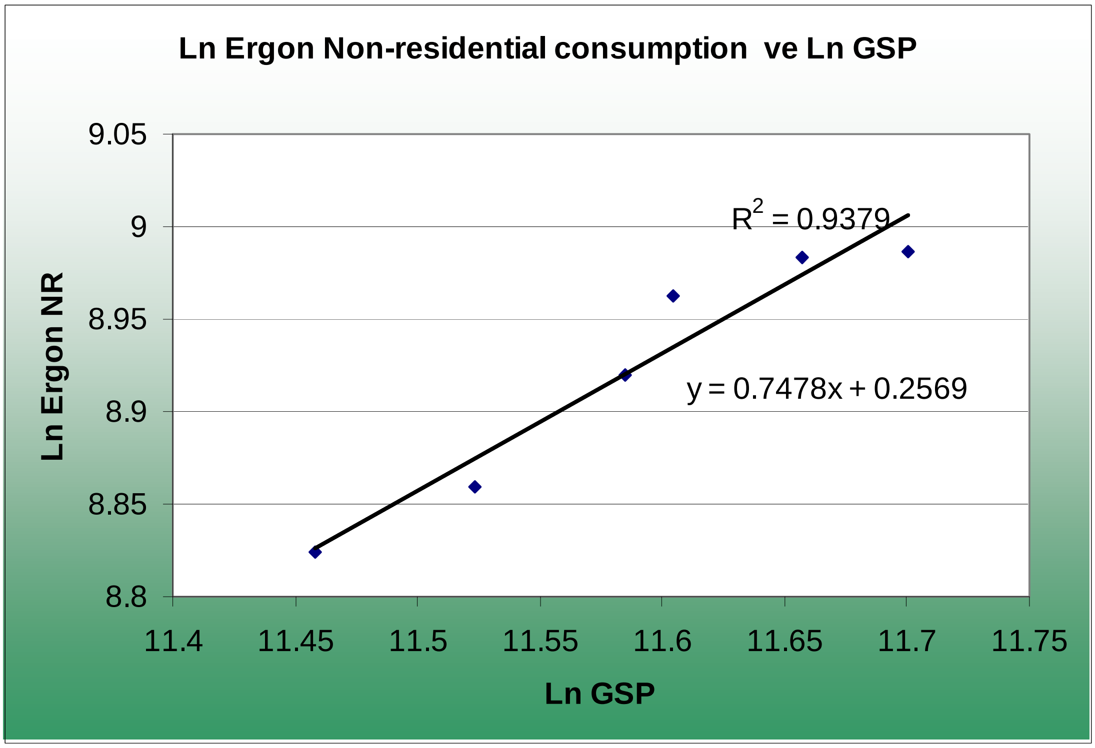
The growth rate for Ergon Energy as a whole over the period 2003 to 2010 of 2.5% pa compares with an estimated growth rate of 2.9% observed from 1998 to 2003. The forecast reduction is due to the combination of a reduction in customer number growth and a slight slow-down in average usage growth rate due largely to the expected introduction of the sustainable housing program for new dwellings.

6.3 NON-RESIDENTIAL

There is a reasonably strong linear log-log relationship ($r^2 = 0.94$) between Ergon Energy non-residential consumption and GSP, as seen in Figure 6-1. We have used this relationship together with the NIEIR GSP forecast in order to forecast non-residential usage for Ergon Energy as a whole.

While the relationship between Ergon Energy non-residential consumption and Queensland GSP is somewhat weaker, (r^2 = 0.94) than that for Energex this is probably due to the lack of available history for the network. The elasticity is, however, significantly weaker, at 0.75, possibly due to a combination of lower electricity intensity of GSP and the shift of GSP from the Ergon to Energex regions.

Figure 6-1 Ln Ergon non-residential consumption (GWh) vs Ln Queensland GSP



We have reduced the forecast slightly in the latter years of the forecast period to account for some expected own-use cogeneration in the Ergon Energy region.

Overall, the non-residential sector of Ergon Energy is forecast to grow at 3.0% pa between 2003 and 2010, a slight reduction on the 3.3% pa seen over the past five years because of the expected reduction in GSP growth. The year 2003/04 is expected to see a significant (5.5%) increase to bring growth back to trend levels with growth from 2004 to 2010 averaging 2.5% pa.

The data provided by Ergon Energy showed large reductions in non-residential energy in Ergon West over recent years. We can see no reason why such a trend would continue. Rather than attempt to establish a separate growth forecast for each of the zones, we have used the Ergon Energy total growth estimated above and applied the same growth rate to each zone. The forecast energy usages are provided in Table 6-3.

Table 6-3 Forecast non-residential sales for Ergon Energy 2003/04 to 2009/10, GWh

	2004	2005	2006	2007	2008	2009	2010	CAGR
Ergon Energy Total	7768	7974	8232	8458	8493	8728	9034	3.0%
Ergon East	7220	7412	7652	7863	7895	8114	8399	3.0%
Ergon West	487	500	515	529	531	546	564	2.9%
Ergon Mount Isa	61	62	64	66	66	68	71	2.9%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010

Recent historical and forecast growth in the residential and non-residential sectors for Ergon Energy as a whole are illustrated in Figure 6-2. Forecast combined residential plus non-residential sales for Ergon Energy as a whole and for each zone are provided in Table 6-4.

Figure 6-2 Recent historical and forecast residential and non-residential sales for Ergon Energy Total, GWh

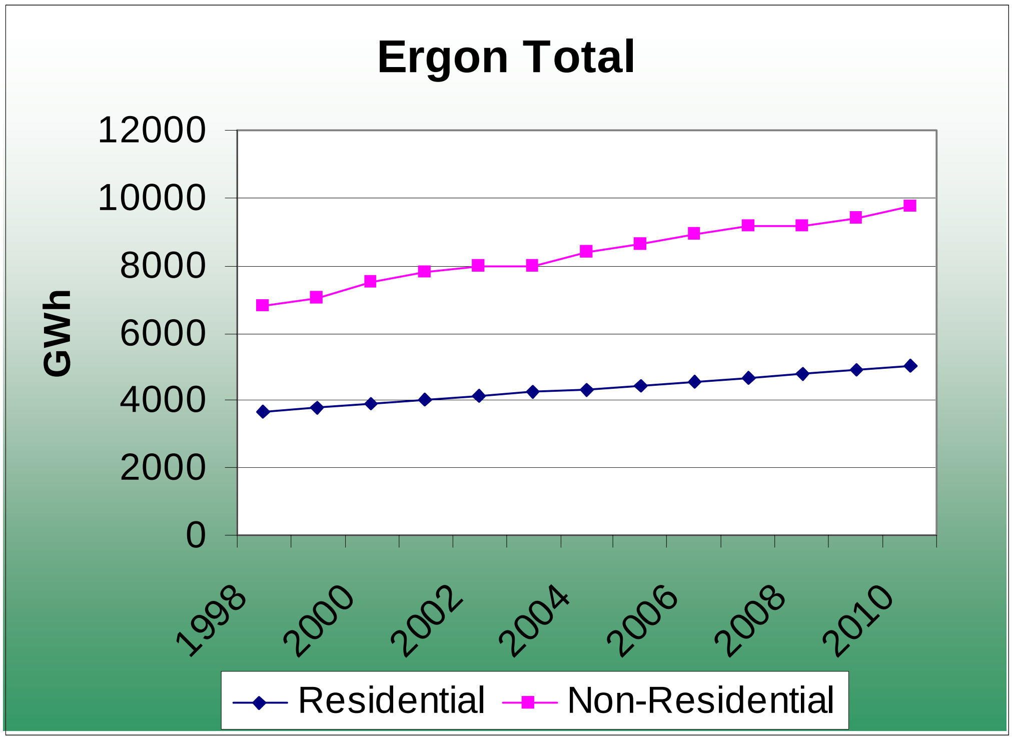


Table 6-4 Forecast total (residential plus non-residential) sales for Ergon Energy 2003/04 to 2009/10, GWh

	2004	2005	2006	2007	2008	2009	2010	CAGR
Ergon Energy Total	12080	12407	12784	13132	13304	13651	14085	2.8%
Ergon East	11024	11324	11671	11990	12143	12462	12861	2.8%
Ergon West	908	932	960	985	1002	1028	1059	2.7%
Ergon Mount Isa	148	151	154	157	159	161	165	2.0%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010

6.4 GROWTH IN TOTAL (RESIDENTIAL AND NON-RESIDENTIAL) CUSTOMER NUMBERS

We have forecast growth in Ergon Energy's residential customer numbers to be 1.4% pa. Ergon Energy has not been able to separate out its rural customers and has included them within its residential customer numbers. As well the Ergon Energy non-residential customer numbers appear low, suggesting a component of small business usage within the residential numbers.

Non-residential customer numbers (mainly business) are much smaller than residential numbers and have not been used in our derivation of non-residential sales forecasts. In order to forecast combined total customer growth we have assumed that the growth in business customer numbers is in line with that seen over recent years.

MMA's forecast of combined residential and non-residential customer numbers is provided in Table 6-5.

Table 6-5 Forecast customer number growth, ('000) for Ergon Energy 2003/04 to 2009/10

	2004	2005	2006	2007	2008	2009	2010	CAGR
Ergon Total	571	581	591	601	610	620	629	1.4%
Ergon East	512	522	531	540	550	558	567	1.5%
Ergon West	49	49	49	50	50	51	51	0.6%
Ergon Mount Isa	10	10	10	10	10	11	11	0.9%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010.

6.5 SUMMER MAXIMUM DEMAND

MMA has forecast summer maximum demand using the methodology described in Appendix B .

Summer maximum demand with a probability of exceedance of 50% (P50) is forecast to grow at a rate of about 4.2% pa, ranging between 4 – 4.5% pa, depending on the zone. This is somewhat faster than the growth rate over recent years (about 3%), however, this is due largely to the maximum demand estimate in 2002/03 being significantly below the trend value for that year. Forecast growth over the period 2004 to 2010 at 3.7% pa is around the same as trend estimates over the past five years. This continued high growth rate is due largely to the expected continued increase in residential air conditioning load and the limited impact of conservation measures on air conditioning.

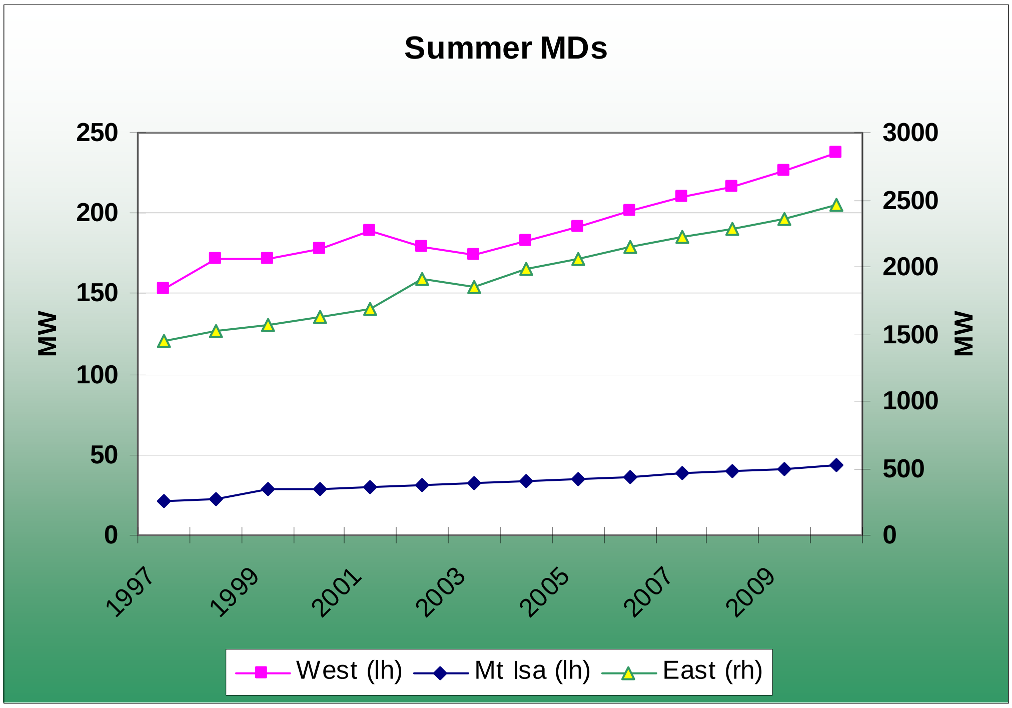
Table 6-6 Forecast summer MD for Ergon Energy 2003/04 to 2009/10, MW

	2004	2005	2006	2007	2008	2009	2010	CAGR
Ergon East	1922	1997	2081	2160	2210	2295	2392	4.2%
Ergon West	183	192	201	210	217	227	237	4.5%
Ergon Mount Isa	33	35	36	38	40	41	43	4.3%
Ergon Total*	2,138	2,224	2,319	2,408	2,466	2,562	2,672	4.2%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010. * A simple sum of the three zones

Historical and forecast summer MDs for the three Ergon Energy zones are illustrated in Figure 6-3. MMA is forecasting that from 2004 Ergon East will see summer MD growth approximately in line with recent trend. While there is less certainty with Ergon West and Ergon Mount Isa we have also forecast growth in these regions to be between 4% and 4.5% pa. This is significantly higher than recent growth in Ergon West (which reported significant loss of non-residential load between 2001 and 2003) and lower growth in Mount Isa (which reported an increase of non-residential load in 2002 and 2003). We have forecast uniform non-residential growth rates over the coming period across all zones.

Figure 6-3 Historical and forecast summer MDs for Ergon Energy zones, MW



6.6 COMPARISON WITH OTHER FORECASTS

We compare below the MMA forecast numbers against those forecast by Ergon Energy and sales and MD forecasts provided by NIEIR in its report to Ergon Energy dated June 2003[23]. Comparisons against other forecasts, such as Powerlink or NEMMCO, are not relevant as they are generally carried out for Queensland as a whole and thus include information for the other DNSP as well as for transmission customers.

We compare in the Tables below the MMA forecast numbers against those forecast by Ergon Energy.

Table 6-7 Comparison of forecasts, 2003/04 to 2009/10, Ergon East

Ergon East	2004	2005	2006	2007	2008	2009	2010	CAGR
Total customers, '000 – MMA	512	522	531	540	550	558	567	1.5%
Total customers, '000 – Ergon	520	531	541	552	562	573	585	1.8%
Total sales, GWh – MMA	11024	11324	11671	11990	12143	12462	12861	2.8%
Total sales, GWh – Ergon	11230	11912	12287	12560	12839	13468	13747	3.4%
Summer MD – MMA	1922	1997	2081	2160	2210	2295	2392	4.1%
Summer MD – Ergon	1884	1958	2057	2115	2179	2285	2347	3.8%

[23] National Institute of Economic and Industry Research, report commissioned by Ergon Energy, "Maximum demand forecasts for Ergon Energy connection points to 2013", June 2003.

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010.

As MMA and Ergon Energy have categorised customers differently, total customer numbers is a more appropriate comparison than by residential or non-residential. MMA has forecast a somewhat slower growth rate than Ergon Energy.

The categorisation of sales in forecasting by MMA and Ergon Energy is also quite different. Ergon Energy is forecasting growth in total sales at a rate of 3.4% pa, a significantly higher rate than MMA's forecast growth rate of 2.8% pa. The difference is evident in both the residential and non-residential markets. Ergon Energy is forecasting a growth rate of around 3.4% pa for both the residential and the non-residential markets, while MMA is forecasting growth of 2.6% pa in the residential and 2.9% pa in the non-residential markets.

Although the residential growth rate difference between the MMA and Ergon Energy forecasts can largely be explained by the different population growth rates forecast and the impact of the conservation measures expected by MMA, the differences in the non-residential market are due to the very different forecasting methodologies applied.

Despite the significant difference in total energy forecasts and the very different methodologies, the forecast summer MDs are similar.

Table 6-8 Comparison of forecasts, 2003/04 to 2009/10, Ergon West

Ergon West	2004	2005	2006	2007	2008	2009	2010	CAGR
Total customers, '000 – MMA	49	49	49	50	50	51	51	0.6%
Total customers, '000 – Ergon	47	47	47	48	48	48	48	0.5%
Total sales, GWh – MMA	908	932	960	985	1,002	1,028	1,059	2.7%
Total sales, GWh – Ergon	888	899	914	931	944	961	977	2.2%
Summer MD – MMA	183	192	201	210	217	227	237	4.5%
Summer MD – Ergon	186	198	206	213	221	228	236	4.4%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010.

In the Ergon West zone MMA is forecasting sales growth to be somewhat greater than Ergon, partly because of a different starting point in 2003. Again the summer MD forecasts are very similar.

Table 6-9 Comparison of forecasts, 2003/04 to 2009/10, Ergon Mount Isa

Ergon Mount Isa	2004	2005	2006	2007	2008	2009	2010	CAGR
Total customers, '000 – MMA	10.0	10.0	10.1	10.2	10.3	10.4	10.5	0.9%
Total customers, '000 – Ergon	9.9	10.0	10.0	10.1	10.1	10.2	10.2	0.4%
Total sales, GWh – MMA	148	151	154	157	159	161	165	2.0%
Total sales, GWh – Ergon	153	155	157	159	161	163	165	1.3%
Summer MD – MMA	33	35	36	38	40	41	43	4.3%
Summer MD – Ergon	33	34	35	36	36	37	38	2.5%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010.

Despite having similar sales and customer number forecasts, the Ergon Energy summer MD forecast for this zone is substantially less than the MMA MD forecast. It is not clear why this should be the case.

NIEIR has forecast according to regions rather than zones. This only allows comparisons on a combined East and West basis. The following Table compares the total numbers from NIEIR against the combined East and West zones.

Table 6-10 Comparison of forecasts, 2003/04 to 2009/10, East plus West

Ergon East plus West	2004	2005	2006	2007	2008	2009	2010	CAGR
Total sales, GWh – MMA	12575	12917	13302	13656	13835	14190	14630	2.8%
Total sales, GWh – Ergon	12761	13472	13872	14172	14473	15129	15434	3.3%
Total sales, GWh – NIEIR	11631	12076	12621	12960	13331	13634	14154	3.2%
Summer MD – MMA*	2168	2253	2346	2436	2494	2588	2697	4.2%
Summer MD – Ergon*	2118	2203	2311	2377	2449	2562	2632	3.9%
Summer MD – NIEIR*	2137	2279	2397	2469	2574	2632	2729	4.4%

Note the Compound Annual Growth Rate (CAGR) is from 2003 to 2010. * While the MMA maximum demand is simply the sum of that in the two zones, we understand that of Ergon Energy and NIEIR to allow for some non-coincidence of peak days in the two zones.

As was seen under the Ergon East assessment, while MMA and Ergon Energy have quite different sales forecasts, the MD forecasts for the two zones combined are very similar. Despite having a much lower starting point (presumably because of the different time of forecasting), NIEIR has forecast faster growth than MMA. The MMA forecasts for both sales and summer MD lie between those of Ergon Energy and NIEIR. All three parties have forecast similar summer MDs by 2010.

APPENDIX A APPLIANCE MODELLING

A.1 Average annual usage

Base Year Estimates

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 and we have used the 2002/03 appliance model estimates (refer to Figure 4-4 and Figure 4-5). These are very similar to linear trend estimates, which we believe represent reasonable approximations to weather normalised values. The base year estimates used are shown in Table A-1.

Table A-1 Base year (2002/03) residential usage per customer (kWh)

Energex	Ergon East	Ergon West*	Ergon Mt Isa*
6942	7408	8647	8703

- Note that these average usages may have been unduly influenced by assumptions about rural consumption. However, the overall impact on the forecasts is expected to be minimal.

A.2 Appliance model parameters

Appliance models with the structure described in Section 4.2.2 have been derived for Energex and the three zones of Ergon. Model parameters have been selected as below.

Initial appliance penetration

Initial values for off-peak water heating have been derived from company data. Initial values of all other appliances have been derived from ABS survey data, taking the March 2002 value and adding 9 months growth to get to mid 2002/03. Apart from air-conditioning, the Queensland average value was applied to each zone. For air-conditioning the average penetration of 41.93% is assumed to be a weighted average of 38.5% in Energex and 48.2% in Ergon (all zones combined).

Appliance penetration changes

With the exception of air-conditioning, changes are based on growth estimated from ABS survey data. For air-conditioning it is assumed that current high rates of growth moderate over the forecast period as penetration saturates (refer to section 4.2.2.1 for further discussion). Penetration growth of 3.25% pa is assumed for Energex and 3.75% is assumed in all Ergon zones.

Initial appliance usage

Initial usage (2002/03) has been estimated in the model derivation process. Starting with QEC values for 1992 we have estimated parameters for an aggregate model for the whole of Queensland from 1992 to 1998 (prior to creation of the individual companies), which produces usage estimates for 1997/98. These estimates are fed into individual company models for the period 1997/98 to 2002/03, which produce usage estimates for 2002/03.

For air-conditioning, the Queensland average usage (estimated at 1068 kWh pa in 2002/03) is assumed to be a weighted average of 876 kWh pa in Energex and 1350 kWh pa in Ergon (all zones combined). This ratio is based on the relative cooling degree days, approximately 1000 pa for Energex and 2000 pa for Ergon moderated by relative dwelling sizes and incomes.

Appliance efficiency trends

Australian Greenhouse Office (AGO) new appliance estimates have been converted to appliance stock estimates using a simple stock replacement model

Appliance utilisation trends

Housing floor area projections have been based on AGO projections for Queensland. Household size projections are estimated from population and customer projections for each zone.

Comfort factor estimates

Comfort factor estimates are derived from fitting the appliance models to data for the period 1997/98 to 2002/03. Other model parameters are estimated simultaneously, using the minimum least squares error method.

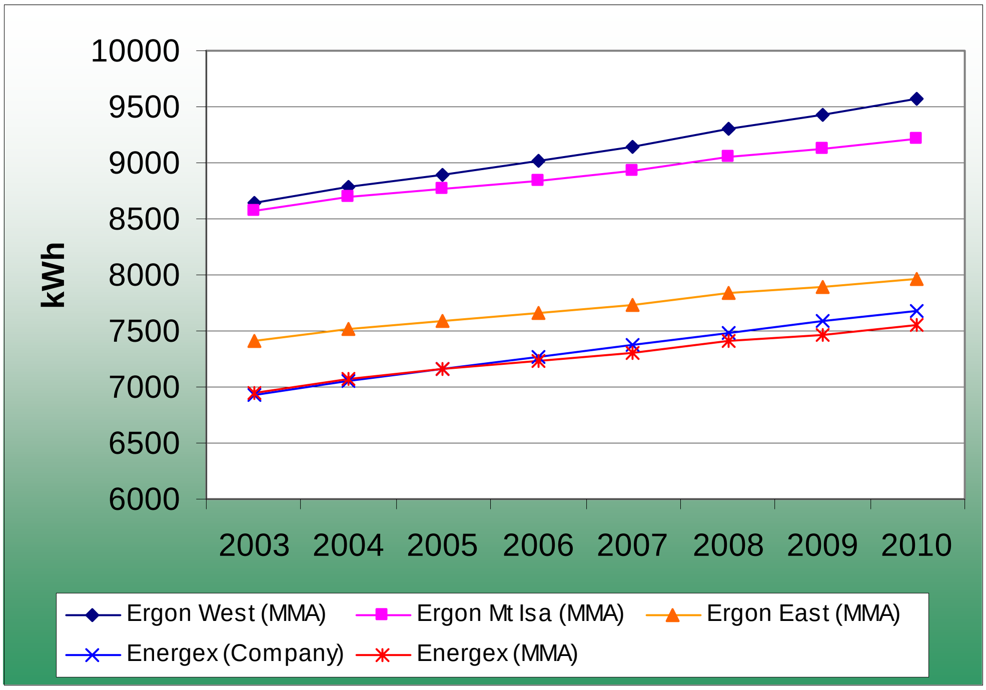
Conservation measures

Expected conservation measures have been modelled in accordance with Appendix C .

A.3 Forecasts

MMA's forecasts of average consumption are illustrated in Figure A-1. Energex's forecast is included for comparison but Ergon's are not because they include estimated rural use that we have excluded (refer to Section 3.3). While the resulting average usage estimates for Ergon West and Ergon Mount Isa appear high, this is unlikely to have a significant impact on the forecasts.

Figure A-1 Residential Average Consumption Projections



Note: All MMA projections apart from the Energex projection.

Growth rates projected by MMA and the DNSPs over the period 2003-2010 are compared in Table A-2.

Table A-2 Projected residential average usage growth rates

	MMA	DNSP
Energex	1.2%	1.5%
Ergon East	1.1%	1.6%
Ergon West	1.9%	2.0%
Ergon Mt Isa	0.5%	0.5%

APPENDIX B MAXIMUM (PEAK) DEMAND

B.1 Approach

Growth in summer peak demand is related to growth in annual load and changes in the summer load factors. The key issue for peak demand forecasting is the change in summer peak load factor due to increasing penetration of air conditioning. Our approach, therefore involves:

- Estimating base year residential and non-residential contributions to maximum demand
- Forecasting the MD contributions of the different markets separately, using the appliance model to determine the influence of air conditioning on residential MD
- Combining the results.

Note that throughout this section summer peak demands are calculated on a financial year basis.

B.2 Base year maximum demand

Summer peak demands for each zone vary around the trend line due to variations in weather and other factors. The appropriate initial peak demand levels for forecasting are the 2002/03 weather normalised summer peak demands. 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 than a P50 value.

Because the DNSPs have not provided normalised historical peak demand data, we have used trend estimates as surrogates for P50 estimates. Since the trend in actual peak over time should approximate P50 over time, we believe this to be reasonable.

Figure B-1 and Figure B-2 illustrate actual and trend peak demands. As can be seen, the trend values used are close to the actual 2003 MDs for Energex, Ergon East and Mount Isa. Owing to the unusual shape of the Ergon West actuals we have used the actual 2003 value instead of the trend value for this zone.

Figure B-1 Energex and Ergon East summer peak demand – actual and trend

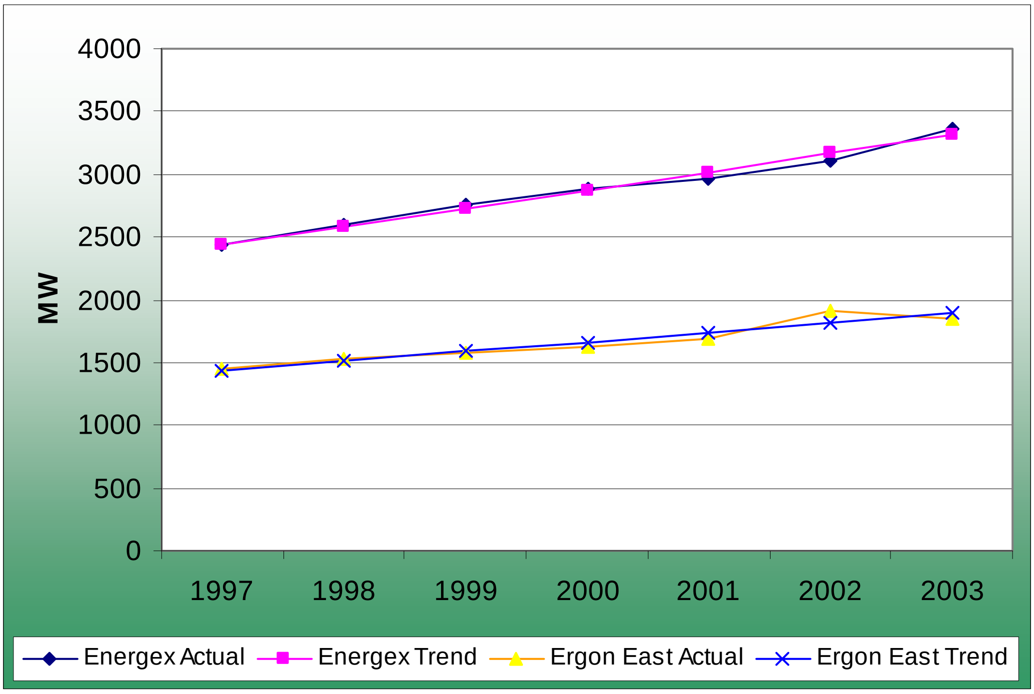


Figure B-2 Ergon West and Mt Isa summer peak demand – actual and trend

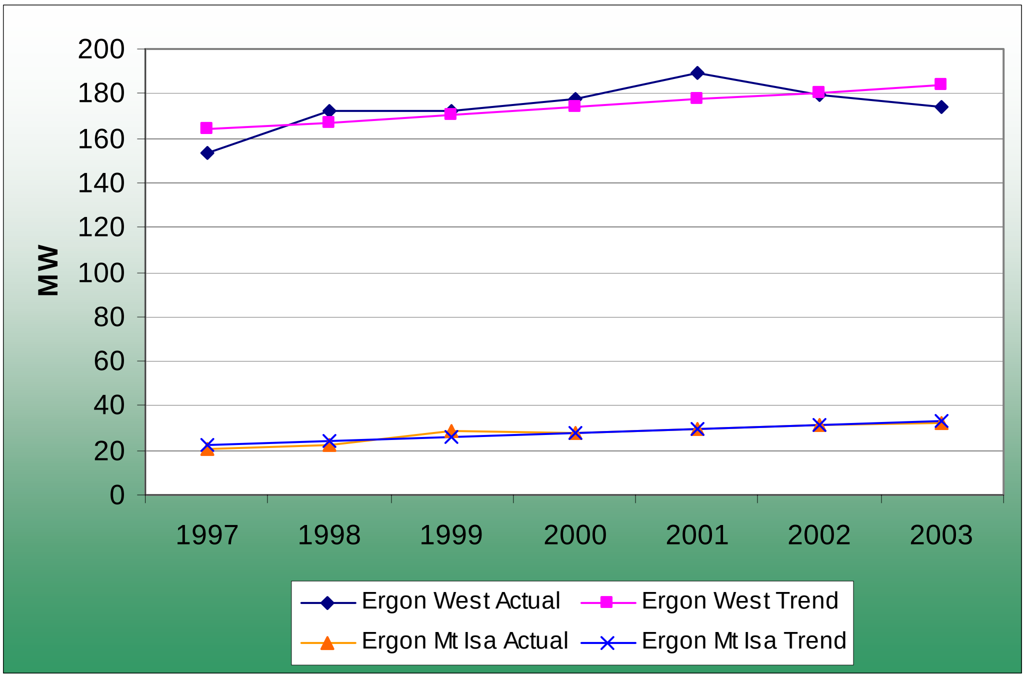


Table B-1 summarises the 2002/03 peak demands used in this forecast.

Table B-1 Estimated P50 peak demand in 2003 (MW)

Energex	Ergon East	Ergon West	Ergon Mt Isa
3,309	1,889	174	33

B.3 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. Assuming that the same load diversity applies in future, the total peak is then the sum of the sector peaks.

As no information relevant to peak demand contributions by sector has been provided by the DNSPs, MMA has relied upon a methodology based on the contributions estimated for distributors in New South Wales, NSW data suggests that the residential and non-residential sectors have summer load factors (average demand divided by peak demand) of 66% and 56% respectively. The estimated contributions presented in Table B-2 have been derived by finding the load factors closest to 66% and 56% which, when divided into the residential and non-residential average demand for 2003, equal the total MDs for each Queensland DNSP and zone in Table B-1.

Table B-2 MMA estimates of P50 peak demand contributions in 2003 (MW)

	Energex	Ergon East	Ergon West	Ergon Mt Isa
Residential	1,204	604	74	18
Non-Residential	2,105	1,285	100	15

B.4 Residential Forecast Methodology

The estimated P50 contributions to peak demand for an average residential customer, based on the estimated market contributions presented in Table B-2, are listed in Table B-3.

Table B-3 Estimated P50 average residential customer peak demand in 2003 (kW)

Energex	Ergon East	Ergon West	Ergon Mt Isa
1.175	1.197	1.540	1.826

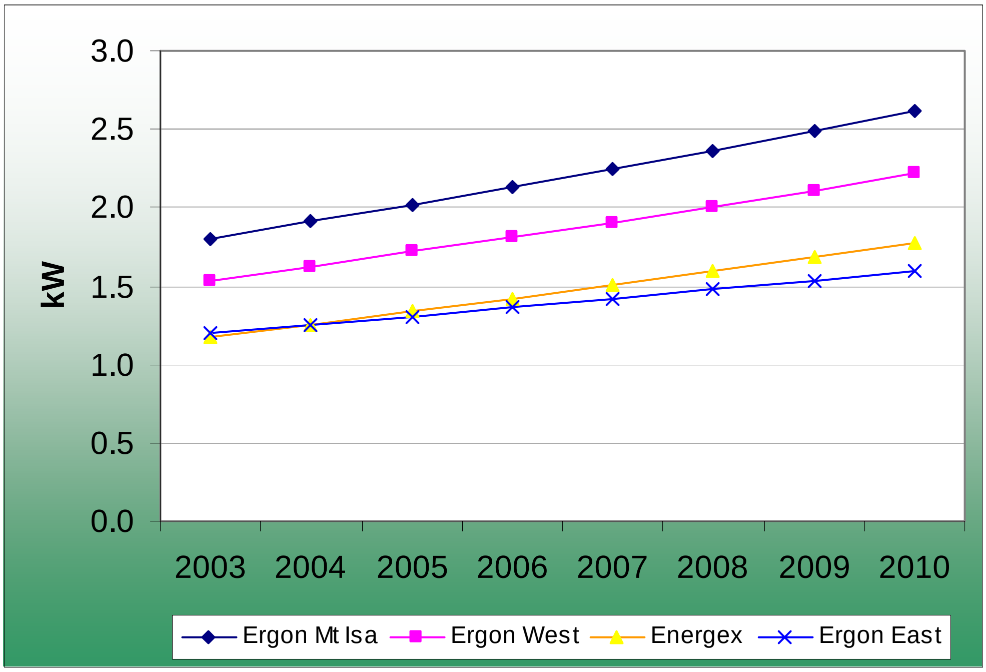
MMA has modelled the P50 peak demands using an extension of the appliance model in which the annual appliance usage is replaced by peak half hour usage, derived as follows:

- Off-peak appliances, heating, waterbeds and dryers – nil

- All other appliances other than air-conditioning – usage is determined by pro-rating annual consumption, bearing in mind that the peak is expected to be on a week-day afternoon.
- Air-conditioning usage is determined in order to fit the average in Table B-3.

The appliance model is used to forecast the trend in average residential customer contributions to peak demand (Figure B-3), using the same projections of appliance penetration and efficiency as for annual average consumption forecasts. Over the forecast period, estimated residential summer load factor declines from 67% to 49% for Energex, from 71% to 57% for Ergon East, from 64% to 49% for Ergon West and from 54% to 40% for Ergon Mt Isa.

Figure B-3 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.

B.5 Non-Residential Forecast Methodology

No definitive data has been provided from which trends in non-residential load factors could be estimated. In view of the high likelihood that the commercial air-conditioning market in Queensland is already saturated, a steady load-factor has been projected in each zone. Estimated load factors are: 59% for Energex, 66% for Ergon East, 58% for Ergon West and 44% for Ergon Mt Isa. Non-residential contributions to peak demand are set equal to projected average non-residential demand divided by load factor.

B.6 Peak Demand Forecasts

MMA's P50 peak demand forecasts for the DNSPs and zones, resulting from the above methodology, are presented in Table B-4.

Table B-4 MMA P50 peak demand forecasts (MW)

	2003	2004	2005	2006	2007	2008	2009	2010	% p.a.
Energex	3,366	3,541	3,747	3,971	4,191	4,388	4,619	4,887	5.50%
Ergon East	1,792	1,922	1,997	2,081	2,160	2,210	2,295	2,392	4.10%
Ergon West	174	183	192	201	210	217	227	237	4.50%
Ergon Mt Isa	32	33	35	36	38	40	41	43	4.30%

Table B-5 compares MMA's peak forecast growth with that of the DNSP's. MMA's peak forecast growth is slightly lower than Energex's and Ergon's for its east zone, equal for Ergon's west zone and higher than Ergon's Mt Isa zone forecast.

Table B-5 Comparison of MMA and DNSP forecast peak demand growth rates, (%p.a.), 2003 – 2010

	MMA	DNSPs
Energex	5.5%	6.5%
Ergon East	4.1%	4.3%
Ergon West	4.5%	4.5%
Ergon Mt Isa	4.3%	2.5%

B.7 Uncertainty

The above methodology does not facilitate estimating the level of uncertainty in the (MMA) projections, because it is not based on a thorough statistical analysis of MD patterns. MMA acknowledges that the methodology is not ideal but believes that it is superior to simple trend analysis that is not explicitly linked to annual load growth.

A more robust approach which would give greater understanding of the uncertainty in MD growth would be to develop detailed models of load sensitivity to MD drivers such as temperature. This would enable load to be split into temperature sensitive and insensitive (base) load, from which load at any temperature can be estimated, together with its uncertainty. Using normalised temperatures, this model would generate accurate estimates of normalised MDs and, provided the annual load forecasts can be reliably split into temperature sensitive and base components, would provide superior MD forecasts. We strongly recommend that the DNSPs develop such an approach for use in planning and price reviews.

APPENDIX C CONSERVATION MEASURES

C.1 Specification

The conservation measures taken into account in the residential forecasts have the following characteristics:

- They apply only to new homes
- They mandate improved thermal efficiency (lower heating/cooling requirements), reduced water usage and installation of solar-electric or other less CO2 intensive water heaters than electric off-peak or day-rate

We have modelled measures that require 25% reductions in heating, cooling and hot water usage, which can be achieved at relatively low cost.

C.2 Reduced Service Requirements

For any measure that has the effect of reducing a household's end use requirements for a particular service, such as cooling or hot water, to x% of current levels, the following calculations are applied. We assume that existing customers remain at 100% and ignore home demolitions (so new homes equal net customer growth), and the average requirement after n years is:

Ave Req $= (100\% * C_0 + x\% * (C_n - C_0))/C_n$ where $C_n =$ customer numbers in year n

$= 100\% / (1+g)^n + x\% (1 - 1/(1+g)^n)$ where g is the customer growth rate

$= 100\% * (1-ng) + x\% * (1-(1-ng))$ approximately

$= 100\% - ng * (100-x)\%$

This is equivalent to the average efficiency improving by g *(100-x)% each year. We have modelled this as though it is independent of other efficiency trends, which seems a reasonable assumption as it is not related to appliances.

For heating/cooling, using a typical customer growth rate of 2%, the average annual efficiency improvement would be 0.02*(1-0.75) = 0.5%.

C.3 Requirement for an Efficient Hot Water System

It is assumed that all new homes use an electric boosted solar water heater. This reduces the water heating requirement by a factor of approximately 68% based on relative power consumption estimates[24]. The impact is calculated as for the lower service requirements,

[24] Reducing Greenhouse Emissions from Water Heating. Australian Gas Association Research Paper #16, Nov 2002.

with x=32%. This will affect other trends because it changes the appliance type but this has been ignored as it is unclear what the effect is.

C.4 Water heating Requirement

A reduction in hot water use of approximately 25% is modelled as for service requirements generally but compounds the efficiency gains due to the switch to solar boosted water heating. The compound x factor is given by:

x = (1-0.68)*(1-0.25) = 24%

For water heating, using a typical customer growth rate of 2%, the average annual efficiency improvement would be 0.02*(1-0.24) = 1.5%. Based on their respective forecast growth rates, the water heating efficiency improvement rates for Energex and Ergon are 1.7% and 1.1%. The magnitude of the resulting energy savings are presented in Table C-1.

Table C-1 Water Heating Energy Savings

	Energex	**Ergon**
2003 Average usage (kWh)	6942	7535
2003 Water heating usage per customer (kWh)	2261	2145
Annual savings (kWh)	38	23
Annual savings as % of Average usage	0.5%	0.3%

The savings in water heating are the dominant effect of the conservation measures.

APPENDIX D REVIEW METHODOLOGY

MMA analysed the historical information obtained from the DNSPs and conducted a number of telephone discussions and follow-up meetings with staff of the DNSPs to clarify information supplied through the information request submissions and to verify the methodology used in producing their forecasts.

D.1 Energex Forecasting Methodology

Residential

Energex employ a number of approaches to develop their customer and energy sales forecasts. A "Middle Approach" is applied for the residential sector. It involves the use of population and household data to predict customer numbers and energy sales.

Customer Numbers

Energex methodology uses customer numbers as of 30th June of each year.

Customer numbers forecasts are produced by applying a regression equation with time being the independent variable, based on determining a polynomial relationship between the ratio of customer numbers to QLD population and time.

Energy Sales

Energy sales forecasts are produced by applying a regression equation with time being the independent variable.

Commercial & Industrial

Energex methodology for forecasting C&I energy sales is iterative, and involves reconciliation of projections from two forecasts: market segment forecasts and total Energex energy sales forecasts.

It is MMA's understanding that customer numbers and average consumption for the Commercial and Industrial market segments are forecast separately, having consideration for population growth and QLD GSP. For very large contestable customers energy consumption is forecast individually based on an estimated growth rate.

In addition to these market segment forecasts, Energex forecasts total system Energy purchases by aggregating Connection Point forecasts that have been derived using linear trends and knowledge of future developments. Both sets of forecasts are then adjusted if considered necessary to ensure consistency between forecasts (after accounting for distribution losses).

Therefore, the final C&I energy sales forecasts are not strictly derived from any econometric regression equation, although they do attempt to account for some of the key drivers of energy sales.

Maximum Demand

Energex utilises a combination of top-down and bottom-up approaches in determining their maximum demand forecasts.

The top-down approach uses the last 4 years of maximum demand. These 4 years are weather normalised using an experience-based approach and forecasts are created using regression models where the variables include population and GSP. This effectively determines the overall system maximum demand for its network area. This forecast incorporates views on future air-conditioning up-take and is finalised after discussions with Powerlink.

The bottom-up approach involves determining a maximum demand forecast for a combination of zone sub-station and bulk supply points.

These forecasts are usually developed by applying trends based on the last 3 years of data. Prior to this analysis the data is 'cleaned' by correcting for switching and transfers. The forecast is then adjusted for predicted block loads and transfer loads. The forecast may also be adjusted downwards if an area is a well established one and growth is not expected to continue at previous rates.

The top-down and bottom-up approaches are reconciled using coincidence factors for each Bulk Supply Point. Differences between the two sets of forecasts are normally attributed to:

- Losses (historically around 5.4%)
- The bottom-up approach includes adjustments for block and transfer loads which the top-down forecast does not.
- The top-down forecast includes a higher factoring of air-conditioning penetration which is not really taken into account in the bottom-up forecast.

These differences are considered before a final forecast is developed by applying a trim factor to the top-down forecasts (encapsulating losses, differences due to air-conditioning and differences due to factoring in block and transfer loads), which is typically around 3-4%.

D.2 Ergon Forecasting Methodology

Ergon Energy distribution network covers a large geographic area and there are marked differences between the zones. Of the three zones, East is considerably larger than either West or Mt Isa both in terms of energy sales and maximum demand. Almost 90% of

Ergon's customers, demand and load are located in the East zone, while only around 8% and 2% are in the West and Mt Isa zones, respectively.

Residential

Residential and rural information were combined as Ergon Energy could not disaggregate the data for the two sectors. Ergon Energy based its energy sales and customer numbers forecast on information from the last 2 years, as availability of historical data was limited due to industry reorganisation and structural/IT issues.

Customer Numbers

Customer numbers were obtained by looking at trends in population based on 2 years of historical data and general "local knowledge". Ergon Energy compared their customer numbers forecasts with a recent study by NIEIR for consistency.

Energy Sales

Historical sales data were limited and were derived to 1998 from input energy (energy measured at Bulk Supply Points) into the Ergon Energy network area after applying assumed loss factors. A regression model was applied using a "top down" approach which was compared with NIEIR's "bottom-up" approach.

MMA understands that Ergon Energy's customer numbers and energy sales forecasts were produced using a different set of data to the final data delivered to MMA.

Commercial & Industrial

Ergon Energy current energy sales forecasts are based on regression analysis of demands and energy limited by 2 years of historical data. While adjustments are made for known events and external factors (including "unusual" weather), the process assumes that the climate essentially is consistent over time.

The limited diversity of Ergon Energy's industrial and agricultural load base results in a disproportionate sensitivity to changed economic circumstances in particular sectors (eg in the coal mining or sugar industries).

Maximum Demand

A Bottom-up approach is applied to forecasting peak demands.

- Historical bulk supply point MDs are "cleaned" to remove switching.
- Forecasts are then derived for each Bulk Supply Point (BSP) using linear regression, with time being the predictor variable. Data for some stations dates

back as far as 1985, whereas obviously newer stations do not have as much data as this.

- Periods where major load entry has created discontinuity in the historical time series are excluded.
- BSP forecasts are then adjusted to account for known new block loads assigned a probability of eventuating
- Historical coincidence factors are calculated for each BSP to get region total demand forecasts. Coincident factors change with temperature, so the average of the last 3 years' coincidence factors are used.
- From this region total demand, the zone demand for Mt Isa, and a combined East-West zone can be fairly easily derived.
- To separate the East and West zones, the West half hour demand profile is determined first, since it is much smaller, has fewer supply points, and hence is likely to have fewer errors. The East zone is then the difference between the total combined half hour demand profile and the West half hour demand profile.
- To validate its forecast Ergon Energy also retains NIEIR on an annual basis to undertake an independent Maximum Demand forecast at Bulk Supply Point level, based on econometric methods.

D.3 Summary of DNSP methodologies

Summary of DNSPs Methodology and Key Drivers

Residential Sales and Customers	Non-residential Sales and Customers	Maximum Demand
Energex		
• Customer numbers – based on determining a polynomial relationship between the ratio of customer numbers to QLD population against time • Energy – application of observed trends over time.	• Customer numbers – application of observed trends over time • Energy – application of observed trends over time • Energy – Large customers examined individually • Energy – Block loads incorporated in forecasts • Rural energy forecast using a polynomial trend	Bottom up and Top down approaches with reconciliation Top down approach: • Weather adjust last 4 years of MD using an intuitive approach. • Regress data against population and GSP, estimate impact of air conditioning uptake Bottom-up approach: • Determine trend forecast by zone substation / bulk supply point

Residential Sales and Customers	Non-residential Sales and Customers	Maximum Demand
		• For each forecast, adjust for predicted block & transfer loads and expected local growth. Reconciliation: • Allow for known differences between forecast approaches and come to some middle ground (may be subjective)

Residential Sales and Customers	Commercial & Industrial Sales and Customers	Maximum Demand
Ergon Energy (East, West & Mt Isa)		
• Customer numbers – trend analysis based on two years of historical data of connection numbers, looking at trends in population, and local knowledge of future developments • Energy - trend analysis based on two years of historical data and local knowledge of future developments	• Forecasts are based on last two years of historical data and local knowledge of future developments • 19 out of 20 large customers are in East zone • Prospective projects are assigned probabilities to commence	"Bottom up" approach. • Determine trend forecast by Bulk Supply Point. • Adjust individual forecasts for block loads. • Combine individual bulk supply point forecasts using coincidence factors based on the average of the last 3 years. (Coincidence factors describe the relative contribution of one bulk supply point to the total demand on the peak day.)

Recommendations for Energex and Ergon

Energex

Energex provided a set of consistent historical data for the residential, rural and non-residential markets. However, Energex could not provide data disaggregation into industrial and commercial and could not provide any appliance penetration or average use modelling to assess changes to important trends, especially air conditioning uptake.

MMA recommends that Energex should in future consider:

- Collecting data on appliance penetration and usage, in particular air-conditioning
- Collecting disaggregated sales data for the residential, commercial, industrial, large industrial and rural categories
- Developing an appliance model to better explain the effect of appliances on demand
- Correcting demand for weather effect using robust statistical techniques.

Ergon Energy

Ergon Energy could provide only a very short time series of consistent historical data by pricing zones and had problems in responding to the data requests for this review. We recommend that Ergon Energy improve its quality of data for the next review by:

- Extracting (and checking for consistency) data from its legacy systems from at least 1998 for each zone:
    - customer numbers
    - energy sales

by zone and the following customer types:

- residential (separated into general and controlled load)
- rural
- C&I
- Other

- Collecting in future disaggregated sales data for the residential, commercial, industrial, large industrial and rural categories
- Collecting data on appliance penetration and usage, in particular air-conditioning
- Develop an appliance model to better explain the effect of appliances on demand
- Developing an approach to measure and correct for the weather sensitivity of the residential, rural and C&I markets.