QUEENSLAND COMPETITION AUTHORITY

Electricity Demand Forecast

Report On

Demand Forecast for 2001 to 2011

February 2001

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Executive Summary

The Queensland Competition Authority (QCA) will assume the role of jurisdictional regulator for electricity distribution in Queensland from December 2000.

As part of the responsibility in relation to distribution service pricing, QCA require the electricity demand forecast for Queensland for the period 2001 to 2011.

GHD was engaged to undertake the consultancy to provide the demand forecast.[1]

GHD's methodology was based on validating the demand forecasts carried out by ENERGEX and Ergon Energy. The findings were in summary:

- ENERGEX and Ergon Energy demand forecasts are carried out using sound principles and are considered appropriate as indications of demand to 2011.
- ENERGEX have systems and data available to provide highly detailed levels of disaggregation of demand forecasts.
- Ergon Energy do not have systems or data available to provide detailed levels of disaggregation of demand forecasts.
- Ergon Energy, as a new entity, have yet to prove their recently produced planning criteria are appropriate.
- The average demand growths (compound) over the period for 2001 to 2011 are:

	2001-2006	2007-2011	2001 to 2011
ENERGEX	4.2%	4.0%	4.1%
Ergon Energy	3.0%	2.8%	2.9%

[1] Since GHD released its report in November 2000 additional information became available in relation to electricity demand forecasts. The November report has been revised to reflect this information. The key change is an increase in ENERGEX demand figures.

1. Introduction

GHD was engaged by the Queensland Competition Authority (QCA) to provide an electricity demand forecast for Queensland for the period 2001 to 2011.

QCA assume their role as jurisdictional regulator for the Queensland Electricity in December 2000. National Electricity Code (NEC) in Chapter 6, parts D and E outlines the objectives, principles and processes in relation to distribution service pricing. For ENERGEX and Ergon Energy, the Queensland electricity distribution businesses, QCA need to look at the expected demand growth to determine that the appropriate infrastructure is being put in place to service the demand.

GHD's methodology for undertaking the consultancy was briefly as follows:

- meet with ENERGEX and Ergon Energy planners to obtain their current data on demand forecast and background to planning model
- discussion with Powerlink to confirm the ENERGEX and Ergon Energy data
- contact Local Government Authorities to obtain their planning data
- compare forecasts from ENERGEX and Ergon Energy with the Local Government Authority data
- determine reasonable forecasts for 2001-2011 based on data obtained and extrapolated where necessary

2. Electricity Networks

2.1 National Electricity Code

The Code in Chapter 6 *Network Pricing for Transmission and Distribution Systems* requires the regulator, when setting a separate regulatory cap to be applied to each Network Owner, to take into account each Distribution Network Owner's revenue requirements during the regulatory period, having regard amongst other things to demand growth.

Clause 6.10.5.d (1) (2) and (4) further states:

(1) the demand growth which the *Distribution Network Owner* is expected to service using any appropriate measure including but not limited to:

- (i) energy consumption by categorisation of *Distribution Customers* or other relevant groups of persons who consume energy;
- (ii) demand by categorisation of *Distribution Customers* or other relevant groups of persons who consume energy;
- (iii) numbers of *Distribution Customers* or other relevant groups of persons who consume energy by categorisation of *Distribution Customers*; and
- (iv) length of the *distribution network*;

(2) the service standards applicable to the *Distribution Network Owner* under the Code and any other standards imposed on the *Distribution Network Owner* by any regulatory regime administered by the *Jurisdictional Regulator* and by agreement with the relevant *Network Users*;

(4) the *Jurisdictional Regulator's* reasonable judgement of the potential for efficiency gains to be realised by the *Network Owner* in expected operating, maintenance and capital costs, taking into account the expected demand growth and service standards referred to in clauses 6.10.5 (d) (1) and (2);

2.2 ENERGEX Network

ENERGEX retails electricity to more than 1 million customers. Its total geographic area is 24,830 square kilometres geographically located in the south east corner of Queensland. The area takes in Brisbane, Gold Coast and the Sunshine Coast and areas to the immediate west.

ENERGEX receive high voltage from Powerlink and transform that voltage to distribute to customers in their area. The power is received from Powerlink at bulk supply points at 132 kV, 110 kV and 33 kV. This is transformed at zone substations to 11 kV and subsequently to 415 V for distribution to customers. They also have high voltage customers connected directly to the zone substations. The bulk of ENERGEX distribution feeders would be classified as

CBD and urban with some short rural. The customer base consists of residential, commercial and industrial.

The asset quantities are approximately:

Asset Description	Quantity
110/132 kV overhead and underground	800 km
33 kV overhead and underground	2,300 km
11 kV overhead and underground	19,000 km
LV overhead and underground	18,000 km
Zone substations	approx 300

2.3 Ergon Energy Network

Ergon Energy retails electricity to over 550,000 customers.

It distributes electricity over an area of approximately 1 million square kilometres. The area covers 6 geographic areas being Far North Queensland centered around Cairns; North Queensland centred around Townsville; Mackay; Capricornia centred coastally around Rockhampton; Wide Bay centred around Maryborough and South West Queensland west of Toowoomba.

Ergon Energy receive high voltage from Powerlink and transform the voltage to distribute to customers. The majority of the power is received from Powerlink at bulk supply points at 132 kV, 66 kV and 33 kV. This is transformed at zone substations to 22 kV, 11 kV and SWER voltages (19.1 kV and 12.7 kV) and subsequently to 415 V for distribution to customers. They also have high voltage customers connected directly to their zone substations.

The bulk of Ergon Energy distribution feeders are classified as urban, short rural and long rural. Their customer base consists of residential, commercial and industrial.

The asset quantities are approximately:

Asset Description	Quantity
110/132 kV overhead and underground	2,400 km
66 kV overhead and underground	6,900 km
33 kV overhead and underground	4,600 km
11/22 kV overhead and underground	45,000 km
SWER lines	62,500 km

Asset Description	Quantity
LV overhead and underground	17,500 km
Zone substations	approx 325

2.4 Network Planning

Network service providers have obligations to ensure their networks can support the growth in electricity demand. As this expansion needs to be done economically and efficiently the network service provider needs to look at the long term. This will determine the need for augmentation or new construction. Network planners will determine the load forecasts by looking at a number of sources.

- historical load data from the network
- billing data
- population growths
- local knowledge
- local Council planning
- known loads to be connected in the future
- demand side management
- alternative energies

As the system needs to meet peak demand, the planners are usually concerned with the maximum loads rather than with energy usage.

Once a demand forecast is made, a number of other considerations need to be factored into planning the necessary augmentation or new construction:

- reliability - looking at the probability of a failure and the effect of the failure ie how long will supply be interrupted. These are often measured with indicators such as SAIDI, SAIFI and CAIDI
- quality of supply issues eg voltage regulation
- environmental issues such as location of substations or distribution lines
- legislation or community expectations eg. area requires underground power
- capability of existing plant to meet demand. This includes:
  - plant condition
  - plant fault ratings
  - plant thermal ratings

– plant utilisation

Before determining the works program required, an economic evaluation is undertaken to assess the commercial viability of the works. This will use a method such as net present value of future cash flows.

The solutions available to the network service provider will depend greatly on its network.

In Queensland where load growth is identified, system augmentation may be deferred in a densely populated urban area by rearranging loads from adjacent zone substations, whereas in a rural area the likely option is to increase capacity at the only substation feeding that area.

Rural area capital works are also likely to be driven by quality of supply issues rather than load growth. An increase in load may well be within the substation capacity but due to distance from the substation will require voltage regulators to be installed.

2.5 ENERGEX Planning

ENERGEX have a well established planning department and methodology. Improvements to refine the method are also ongoing.

ENERGEX have a number of inputs:

- historical rates of growth
- billing data that can allocate a customer to a zone substation based on locality. This gives energy use and indication of area growth
- maximum demand for each zone substation in real power (MW), apparent power (MVA) and electrical load (current)
- block loads where Councils or developers have definite projects
- residential house numbers in new estates from Councils.

As ENERGEX have significant historical data, the annual forecast is carried out as an adjustment rather than a new forecast. The last years actual load from the SCADA is checked against the prediction for that year carried out at the last annual forecast. If there has been a difference the forecast growth rate is adjusted accordingly.

The growth is split into residential, commercial and industrial where possible. It should be noted that with contestable customers and retail groups being ring fenced from network groups, network planners will find it becoming increasingly harder to obtain billing data, energy use, growth rates, customers numbers and types. Growth rate of customers is close to or parallels the growth rate of electricity demand.

A forecast demand is projected for 10 years on a specialised computer program. The demand is increased at a zone substation level starting with the present maximum demand from the SCADA. The demand is looked at for the different peak periods, summer day and night and winter day and night. The growth rates applied depend on the historical growth, known information on areas and experience gained by the planners over many years. A mature area is likely to only grow at 1 or 2% per year whereas a new area will grow at 10% for 2 years and then level off. Any known block loads are added to the supplying zone substation in the year forecast. The block loads added are usually only committed developments. There are many developments foreshadowed but experiences shows that they do not usually happen at the time or place foreshadowed and as such would distort the projection of demand.

ENERGEX also independently carry out economic modelling on energy. This energy is converted back to demand using a load factor. The demand forecast is adjusted accordingly.

Once the forecast demands are completed, the planners look at the existing plant and check for the ability of the network to supply the loads. Where possible, loads are transferred to existing substations. Once this is complete augmentation or new capital works can be determined. Economic evaluation is undertaken for the options identified to determine the best option. A 7 year (5 years of works with 2 years lead time) budget is determined.

2.6 Ergon Energy Planning

Ergon Energy is the recent amalgamation of 6 distributors. Each of these distributors had planning groups which carried out demand forecasts and determined augmentations and capital works.

Since amalgamation, Ergon Energy has put considerable effort into being a single organisation. In the planning area network planning criteria which have recently been put in place for future planning have been developed.

Ergon Energy uses a most probable or median forecast to determine the timing of augmentation works. The forecast is based on historical data, local Council planning data, developers prospects, and is modified by any external load movements which can be either increases or decreases. The data available for loads on zone substations is limited. Some zone substations have SCADA or maximum demand indicators but the majority do not have this information or historic records available. Information is readily available at the bulk supply points as Powerlink have SCADA available at these points.

For Ergon Energy significant capital expenditure is driven by factors other rather than forecasting of demand. These drivers are:

- thermal rating of plant is exceeded as determined by load forecast
- voltage cannot be maintained within the Code limits
- system security is no longer adequate

- fault rating of plant will be exceeded
- age of plant becomes a safety issue
- the cost of operating and maintaining the plant is no longer economic
- system losses become excessive and can be reduced economically
- a major new customer needs to be connected.

In determining the necessary works Ergon Energy uses reliability assessment planning for the subtransmission network which is defined as the major supply feeders and zone substations. A n-1, 1% criteria is applied. This says the maximum load should be supplied by either a zone substation or subtransmission lines that will ensure that the remaining network load (after load transfers and the curtailment of switchable load) can be supplied for 99% of the time. It is also taken into account that some areas may not be able to have this n-1, 1% criteria applied eg a process which relies on continuity of supply and interruption to supply means significant economic losses.

Reliability assessment planning involves identifying the optimum timing of the works to augment the system.

In determining the augmentation and capital works program, an economic analysis is carried out. This is currently net present value but this process is under review to ensure the most appropriate methodology is used.

Ergon Energy has a number of embedded generators mainly in the sugar industry. However it should be noted that this does not currently assist Ergon Energy with demand management planning as the sugar mills do not generate all year round and even during generation periods they can have equipment failures which requires Ergon Energy to supply their load.

2.7 Comments

While the NEC calls for demand growth as one of the measures in relation to the distribution systems, Network Service Providers have a significant number of other measures besides demand growth that results in network augmentation.

ENERGEX and Ergon Energy have appropriate network planning procedures in place to determine the network augmentations. In relation to demand forecasting the existing network data Ergon Energy have available is limited. This is not necessarily seen as being a significant issue in network planning as their network expansion is mainly driven by other factors.

3. Published Documentation on Demand Forecast

While ENERGEX and Ergon Energy carry out their own load forecasting to determine the timing of their system augmentation works, a number of other sources provide data on demand and related energy usage forecast.

Some of the documents covering Queensland are briefly described below.

3.1 Profile of Australian Electricity Industry - ABARE (Research Report 2000.7)

The Australian Bureau of Agricultural and Resource Economies (ABARE) produced this report to enable industry participants to understand better the history and future prospects for the industry. Actual electricity consumption is given for the period from 1973 to 1997 and forecasts for the period 2009-10 and 2014-15.

Some of the findings were:

- total Australian energy consumption grew at annual rate of 2.6% over the 25 years to 1997/98
- 80% of the total energy is used in electricity generation, transport and manufacturing sectors
- electricity generation sector grew the fastest at 4.2% a year
- there was a three fold increase in electricity consumption over the 25 years to 1997/98
- manufacturing sector is largest single user of electricity with a 34% share of consumption in 1997/98
- residential consumption share was 24% in 1997/98
- commercial consumption share was 19% in 1997/98
- electricity is projected to average 1.6% per year growth to 2014/15. This is almost half that experienced in the 25 years to 1997/98
- the electricity consumption growth rate per year to 2014/15 for the following sectors is projected to be:
  - manufacturing 1.4%
  - residential 0.8%
  - commercial 2.7%

For Queensland the key findings were:

- Queensland had the largest electricity consumption growth in Australia in the 25 year period to 1997/98. The average annual growth rate was 6.8% with the following sectors per annum growth rate:
  - manufacturing 7.8%
  - commercial 8.2%

  An annual growth rate of 8% is sufficient to double electricity consumption every ten years
- average electricity consumption growth rate per year to 2009/10 and 2014/15 is projected to be:

	2009/10	**2014/15**
Queensland total	2.6%	2.5%
Manufacturing	2.9%	2.3%
Commercial	3.8%	4.2%
Residential	1.6%	1.7%

3.2 Annual Planning Statement 2000 - Powerlink

Powerlink produce an annual planning statement. It is used as the input into NEMMCO's Statement of Opportunity document. The report includes a forecast of demand and energy for the next ten years. A difference occurred in this report compared with 1999 in that an allowance was made in 2000 forecasts for new embedded non-scheduled generation. This is expected as a response to the Australian Governments 2% mandatory renewables policy.

The demand and energy forecasts are presented based on a high, moderate and low growth scenarios. The moderate growth scenario is based on an increase in energy at an average rate of 2.9% (3.1% in summer) over the next ten years.

Powerlink obtains demand forecasts over a ten year horizon from ENERGEX, Ergon Energy and direct supplied Powerlink grid customers. Powerlink use the National Institute of Economic and Industry Research (NIEIR) to provide forecasts of economic activity. Powerlink reconcile between the data supplied by ENERGEX and Ergon Energy and the NIEIR forecasts. The report notes that the ENERGEX and Ergon Energy forecasts include for committed embedded cogeneration or renewable energy sources for the next two years, whereas NIEIR forecast includes proposals over the next 10 years. When the two forecasts were corrected for this difference there was very close agreement. The Powerlink forecast for maximum demand in the Queensland region on a moderate growth and 10% probability of exceedance weather basis is to grow from 6071 MW in 2000/01 to 7984 in 2009/10. This is an average increase of 3.2% per annum.

3.3 The Economic Outlooks for the NEM States to 2010 (October 1999) - NIEIR

The National Electricity Market Management Company (NEMMCO) requested NIEIR to prepare economic forecasts for the Australian States in the National Electricity Market (NEM).

For Queensland the report forecasts a gross domestic product (GDP) over the period 1999-2010 of 3.4% compound growth rate. The forecast percentage change in gross state product and population for each year is:

	GDP Growth % p.a.	Population Growth % p.a.
2000	4.1	1.6
2001	2.0	1.6
2002	2.8	1.6
2003	3.8	1.6
2004	3.5	1.6
2005	3.5	1.7
2006	4.1	-
2007	4.2	-
2008	3.3	-
2009	2.6	-
2010	2.8	-

3.4 Projections of Independent Power Production, Impacts of Greenhouse Policies and Estimates of Electricity Price Elasticities - (Jan 2000) NIEIR

NEMMCO requested NIEIR to prepare a report covering the work elements listed in the report title. The report looked at the States of Queensland, NSW, Victoria and South Australia which are the states in the National Electricity Market.

For Queensland the report states that the majority of current (1998) cogeneration capacity of 388 MW is sited at sugar mills. For the period 2000-2010 it forecasts an additional 600 MW of bagasse cogeneration and 100 MW of other biomass generation operating at a 50 per cent capacity factor.

The report also concludes that the 2% renewables is likely to have only minor impact on the Queensland fossil fuel expansion plans of the electricity supply industry and that the impact will probably show up in reduced capacity factors of the Queensland fossil fuel generating plants.

Capacity factor is defined as the percentage of a time interval (generally a year) that a generator produces electricity.

3.5 Comments

The above reports indicate:

- ENERGEX and Ergon Energy demand forecasts are considered accurate by Powerlink. They have been confirmed by Powerlink by comparison with independent forecasts by NIEIR.
- The growth rate in electricity consumption in Queensland over the next 10-15 years is forecast to be at a slower rate than the last 25 years but will average 2.5%.
- The following sectors in Queensland will have the indicated per cent share of the total consumption:
  - manufacturing - 30%
  - commercial - 24%
  - residential - 18%
- The embedded generation in Queensland is expected to mostly come from sugar mill cogeneration. The expected capacity factor is 50%. On this basis is unlikely that the effect on maximum demand will be significant.
- The gas fired embedded generation if PNG or Timor Sea pipeline proceeds could be significant in its affect on demand forecasting. However at this stage neither project is definite and as such has not been included.

4. Forecast Methodology

4.1 Overview

The most logical starting point for a demand forecast is the actual demands on the network at the plant level. Where maximum demand is the driver for network augmentation, such as plant reaching thermal limits, it is analysed by planners at the affected plant.

For ENERGEX this is obtainable from their SCADA which records MW, MVA and MVAr at each zone substation.

For Ergon Energy the data is not as readily available as a significant number of zone substations do not have maximum demand recording devices. The available data is recorded at the Powerlink bulk supply points. Each bulk supply point supplies several Ergon Energy zone substations.

An aggregate of all of the demands for a network only gives an indication of demand growth if all the zone substations have their maximum demand at the same time. For a network this is not very likely as different consumer types have different load profiles which in turn can occur at different periods of time. Domestic consumer peak demands, for example, are most likely to occur in the morning and evening and the winter where cold weather dictates use of heating.

4.2 Terms of Reference

The QCA Terms of Reference requested a ten year electricity demand forecast through to 2011. The forecast was required to be highly detailed in its level of disaggregation eg:

- distributor
- zone substation type
- feeder type
- voltage type
- customer type (residential, commercial, industrial)

4.3 Methodology

GHD submitted a methodology based on verifying data available from the network providers rather than forecasting from a zero base.

The methodology employed to analyse the available data and provide a demand forecast was as follows:

- Meetings were held with each distributor to determine the data available and the forecasting and planning strategies of the distributors
- The data supplied by the distributors was reviewed
- Contact was made with each Local Government Authority (LGA) to obtain data on developments within the region that would be expected to have an impact on future demand. These expected developments were categorised where possible into:
  a) Residential
  b) Industrial
  c) Commercial
- Each substation and bulk supply point was categorised according to the LGA region in which it was located
- The forecast demand for each LGA was obtained by summing the peak demand forecasts of each substation and bulk supply point within the LGA region
- Population growth data for each LGA was obtained
- A comparison between the annual growth of the distributor forecast for each LGA region and the population growth for that region was made, taking into account the regions expected developments
- Regions where the distributors forecast load growth did not coincide with the expected population growth and regional developments were investigated.

4.4 Supplied Data

4.4.1 Data Supplied by ENERGEX

The following data was supplied by ENERGEX:

- Bulk supply point maximum demand forecast for each year up to and including 2009 for the following conditions:
  a) Demand at time of State summer peak
  b) Demand at time of State winter peak
  c) Demand at time of State peak
- Peak expected demand on each substation for each year up to and including 2004 for the following seasonal conditions:
  a) Summer Day
  b) Summer Night

c) Winter Day

d) Winter Night

- Maximum substation demand and seasonal condition in which the maximum occurs
- The type of load cycle applied to each zone substation eg domestic, commercial, domestic/commercial mix
- A list of planned load transfers and a list of planned block transfers according to the expected requirements of the system
- A list of all equipment expected to reach its rated limit under the expected load conditions

4.4.2 Ergon Energy

The following data was supplied by Ergon Energy:

- 5 year history of maximum demands at each bulk supply point
- Forecast demand at each bulk supply point for each year up to and including 2009
- List of feeders categorised by the former distributor region eg Capricornia
- List of substations categorised by the former distributor region
- Planning Criteria Document

Ergon Energy's load data is limited to the bulk supply points that each feed numerous zone substations. No data on individual substation loads is available.

4.4.3 Local Government Authorities

Each Queensland LGA was contacted and requested to provide information on residential, commercial and industrial developments forecast within the local region. Not all LGA's responded to this request.

The quality and detail of data supplied varied. It was also clear that there were individual proposed developments for which the developer had approached several Councils. Each Council reported this as a potential development in its area.

5. Results

5.1 Overview

In reviewing the results and the level of disaggregation, the following points should be taken into account.

Distributor

The geographic area covered by the distributors is very large. The different regions have different consumer types and growth. Powerlink in its Annual Planning Statement 2000, breaks its forecasts into zones which are largely dictated by their sections of 275 kV transmission grid which has been developed to supply the demand. The zones are:

- Far North Queensland
- Ross - North of Proserpine
- North Queensland
- Central Queensland
- Wide Bay
- Moreton North
- Moreton South
- South West Queensland
- Gold Coast/Tweed Heads

Powerlink notes that each zone normally experiences its own zone peak demand which is often at a time other than at the time of the Queensland region coincident maximum demand.

Zone Substation Type

For ENERGEX the zone substations are relatively easily classified into CBD and Urban. There are some rural substations.

For Ergon Energy it is more difficult to classify zone substations as many zone substations have a mix of urban and rural feeders.

Feeder Type

Using feeders as a measure of demand is not considered suitable as Network Providers in urban areas run their feeder networks in open rings. This flexibility means that load transfers are relatively easily carried out by changing the open points, thus the demand on a feeder can and does change on a regular basis.

For rural or remote areas, while the feeders are radial and demand can be measured, if recording equipment is installed on the feeder, it is more often built for voltage regulation rather than demand reasons.

ENERGEX can from their SCADA system provide feeder demands. They use this information in short term 1-2 year planning to look at thermal ratings. Voltage regulation is another key driver in this planning.

Ergon Energy do not appear to have feeder demand data.

Voltage Type

Both ENERGEX and Ergon Energy have details on their zone substation voltage levels. Subtransmission generally is 33 kV, 66 kV, 110 kV and 132 kV. This subtransmission voltage is transformed to 11 kV and 22 kV for distribution. Ergon Energy also have significant SWER distribution of 12.7 kV and 19.1 kV.

Customer Type

With the development of contestability in the National Electricity Market, customers connected to a Network Provider are contracted for supply of energy from a retailer. This is a completely different business from the network provider. Previously the distribution company would supply energy to all the consumers connected to their network which meant data on customer numbers, type, energy consumption was readily available.

This type of data is becoming increasingly difficult to obtain as there are numerous retailers and they treat their data as confidential.

5.2 Forecast Demand

The demand forecasts have been split into two five year periods 2001-2006 and 2007-2011. The 2001-2006 period has a higher degree of certainty as unknown factors such as embedded generation could affect the results after this period.

5.2.1 ENERGEX

The bulk supply point and zone substation demand forecasts for the years 2000-2009 was supplied by ENERGEX. For years 2010-2011 the average of the annual growth over the preceding two year period of supplied data has been used to estimate the following years total demand.

The maximum demand at each zone substation is not necessarily at the same time. ENERGEX have data for summer day and night and winter day and night peaks, however the data given is the worst case demand which occurs at each substation irrespective of time. Accurate data was only available to 2004/5.

The zone substation data indicates the type of load supplied eg domestic, industrial, mix of commercial/industrial, as well as reactive plant installation.

5.2.2 *Ergon Energy*

The bulk supply point demand forecasts were supplied by Ergon Energy. For the years 2010-2011 the average of the annual growth over the preceding 3 year period of supplied data has been used to estimate the following years total demand.

The maximum demand at each bulk supply point takes into account capacitors installed on the system for power factor correction and is the transformed load.

5.3 Forecast Demand - Validation of Supplied Data

To check validity of the forecast demands supplied by the network service providers, a check was carried out by comparison with local government population growth rates. The demand for electricity is consistent with growth rate.

The ENERGEX zone substations located in a LGA area were grouped and their maximum demands summated. While the summated demand is not diversified and as such overstates the actual demand it was considered suitable for trending of demand growth for comparison with population growth. Ergon Energy bulk supply points were grouped in LGA areas. Where the demand and population growth rates varied by more than 2.5% further investigation was carried out.

ENERGEX were able to provide a map locating their zone substations and the LGA area they are in.

To enable comparisons of demand and growth it was assumed that the zone substation or bulk supply point supplies all electricity in the LGA area in which it is located. This is not entirely valid as some of the zone substations and bulk supply points feed into adjacent LGA areas, however for trending it is considered valid.

The average demand growth rates over the ten year period 2000-2010 have also been compared with Powerlink demand forecasts and ABARE electricity consumption growth predictions for Queensland. While consumption cannot be directly compared with demand it does give an order of magnitude comparison. The demand growth will be higher than consumption growth due to the consumption not taking into account that peak demands occur to supply that electricity. The 3.5% residential and 4.2% commercial/industrial electricity demand growth and overall higher growth rate for ENERGEX is considered indicative of the growth activity in their area of Queensland. The ABARE figure of 1.6% is an average for all of Queensland. The comparisons show the ENERGEX and Ergon Energy forecasts are reasonable.

	ENERGEX (demand) 2000-2010	Ergon Energy (demand) 2000-2010	Powerlink (demand) 2000-2010	ABARE (consumption) 1998/99-2009/10
Residential	3.5[2]	-	-	1.6
Commercial/Industrial	4.2[3]	-	-	3.4
TOTAL	4.1	2.9	3.2	2.6

5.4 Summary Demand Forecast

Tables 5.1 and 5.2 summarise the forecast demand (MVA) for each distributor. The MVA figures for ENERGEX have been derived from the MW figures using an overall power factor of 0.86, which is the average of the power factors of all the bulk supply points. For comparison purposes Table 5.3 includes Powerlink diversified maximum demand (MW) figures for moderate growth, 10% probability of exceedance weather are also included.

Year	ENERGEX (MVA)	Annual Growth %	Ergon Energy (MVA)	Annual Growth %
2001	3642	4.1	2757	3.0
2002	3792	4.1	2854	3.5
2003	3956	4.3	2920	2.3
2004	4128	4.4	3010	3.1
2005	4293	4.0	3100	3.0
2006	4464	4.0	3198	3.2
Average of annual growths	-	4.1	-	3.0
Average annual growth (compound)	-	4.2	-	3.0

Table 5.1 ENERGEX and Ergon Energy Demand for 2001-2006

[2] Average is for 2000-2004
[3] Average is for 2000-2004

Year	ENERGEX (MVA)	Annual Growth %	Ergon Energy (MVA)	Annual Growth %
2007	4638	3.9	3293	3.0
2008	4828	4.1	3387	2.9
2009	5027	4.1	3476	2.6
2010	5230	4.0	3572	2.8
2011	5441	4.0	3670	2.8
Average of annual growths	-	4.0	-	2.8
Average annual growth (compound)	-	4.1	-	2.8

Table 5.2 ENERGEX and Ergon Energy Demand for 2007-2011

Year	Total ENERGEX and Ergon Energy(MVA) (Note 1)	Yearly Growth %	Powerlink Demand (MW) (Note 2)	Powerlink Early Growth %
2001	6399	3.6	6071	-
2002	6646	3.9	6270	3.3
2003	6876	3.5	6426	2.5
2004	7138	3.8	6571	2.3
2005	7393	3.6	6737	2.5
2006	7662	3.6	7044	4.6
2007	7931	3.5	7305	3.7
2008	8215	3.6	7551	3.4
2009	8503	3.5	7712	2.1
2010	8802	3.5	7984	3.5
2011	9111	3.5		

Table 5.3 - Comparison of Demand with Powerlink

Notes:

1. The figures are the total of the ENERGEX and Ergon Energy bulk supply points demands. ENERGEX MVA is derived from supplied MW data.
2. It is understood that Powerlink figures from their Annual Planning document are diversified demands and include direct customers as well as ENERGEX and Ergon Energy.

6. Conclusions

The forecast of electrical demand carried out by both ENERGEX and Ergon Energy is done on sound principles. Where demand is a driver for network augmentation the demand data used to determine timing of the works is considered sound.

ENERGEX have data systems in place that can give detailed disaggregation of demand for zone substations, for a 10 year period with good confidence in the 5-7 year period.

Feeder data is also available however it is useful for short term planning only due to the operational requirements of a network.

Ergon Energy have only just introduced their planning criteria. The criteria are based on good methods carried out by the previous organisations that formed Ergon Energy. It will take 1-2 years before the effectiveness of their new planning criteria can be fully gauged. The difficulty in determining demand data for Ergon Energy is the lack of recording of the information at zone substation level.

While this presents a problem in obtaining disaggregated data, an economic evaluation would need to be carried out to see if there are any benefits in installing the equipment to obtain the data. Ergon Energy have a number of drivers when it comes to system augmentation and demand is only one of their inputs.