ANNUAL POWER SYSTEM REVIEW

OCTOBER 2001

UTILITIES COMMISSION

Level 9, 38 Cavenagh Street Darwin NT 0800

GPO Box 915, Darwin NT 0801

Email: utilities.commission@nt.gov.au

Disclaimer

The purpose of this document is to review and report to the Minister in accordance with section 45 of the *Electricity Reform Act 2000.*

The review is not intended to be relied upon and used for other purposes, such as making decisions to invest in further generation or network capacity. Any person proposing to use the information in this document for such other purposes should independently verify the accuracy, completeness, reliability and suitability of the information in this document, and the reports and other information relied upon by the Commission in preparing it.

The review is based upon information received from participants in the Territory's electricity supply industry, and agencies within government. The review also contains certain predictions, estimates and statements that reflect various assumptions concerning load growth forecasts including accounting for major industrial developments which *may* impact on the Territory's power system over the period to 2009-10. The Commission believes that the contents are accurate within the normal tolerance of economic forecasts and that the broad analyses are correct.

Inquiries

Any questions regarding the review should be directed in the first instance to:

The Executive Officer	Telephone:	(08) 8999 5480
Utilities Commission	Fax:	(08) 8999 6262
GPO Box 915	Email:	utilities.commission@nt.gov.au
DARWIN NT 0801		

Table of Contents

CHAPTER 1

INTRODUCTION

Legislative requirements

1.1 The purpose of this document is to review and report to the Minister on the matters required under section 45 of the *Electricity Reform Act 2000* ("the Act"). In particular, section 45(1)(e) of the Act requires the Commission to prepare and publish an annual review of prospective trends in the capacity and reliability of the Territory's power system relative to projected load growth.

1.2 Under section 45(1) of the Act, the Commission is also authorised to:

- develop forecasts of overall electricity load and generating capacity in consultation with participants in the electricity supply industry and report the forecasts to the Minister and electricity entities (sub-section (1)(a)); and
- advise the Minister on matters relating to the future capacity and reliability of the Territory's power system relative to forecast load (sub-section (1)(c)).

1.3 The Commission has also incorporated its activities in these respects in this its first annual review.

Focus of review

1.4 The Commission has chosen to limit the coverage of this first review in certain respects.

1.5 First, while section 45(1) of the Act refers to the future capacity *and reliability*[1] of the Territory's power system, this review limits its concern to those aspects of the reliability of the system arising from supply relative to demand and reserve margins.

1.6 Secondly, while the scope of section 45(1) covers the Territory's power system as a whole (and so both generation and network elements of the system), the focus of this review is on the future capacity of generation relative to forecast load. In the Commission's view, network capacity versus usage is not as pressing an issue, with Power and Water Authority (PAWA) Networks charged (as the sole network service provider) with responsibility for ensuring that capacity keeps pace with usage growth. It is in the generation area, following the introduction of competition, where there is potential for market failure when it comes to planning for increments in capacity and where the Commission has chosen to give initial priority.

1.7 Thirdly, coverage of the review is limited to the customers/load serviced by PAWA's regulated networks, in Darwin-Katherine, Tennant Creek and Alice Springs.

[1] Power system *reliability* measures the ability of a power system to transfer power from generation sources to load centres not only in the amount desired but also within acceptable degrees of continuity and quality.

The load outside this network coverage (e.g. Nhulunbuy, Jabiru, remote Aboriginal communities) is not included in the review.

1.8 Finally, the review has not undertaken any sophisticated modeling of power demand. Only when the supply-demand position becomes more finely balanced will such independent assessments of demand be justified. Instead, the Commission has developed its own forecasts based in the main on growth assumptions and methodology used by retailers (and generators). The Commission believes that, at the time of publishing this review, the forecasts provide an accurate assessment of growth prospects for the Territory's power system.

Consultation with interested parties

1.9 The review is based upon information received from participants in the Territory's electricity supply industry, and agencies within government.

1.10 On 9 August 2001, the Commission issued a draft review for comment to interested parties. Subsequently, a number of comments were received from Government agencies as well as private organisations. During the course of this consultation, Phillips deferred making a decision on the construction of the Bayu-Undan to Darwin gas pipeline, which increased uncertainty surrounding major developments which rely on this infrastructure and possibly cheaper gas supply. As a result of this recent development and comments received on the draft review, the Commission has undertaken a number of revisions to its electricity demand growth assumptions.

CHAPTER 2

SUMMARY OF KEY FINDINGS

Supply-demand balance

2.1 The Commission has developed forecasts of electricity load ("demand") in the Territory over the period to 2009-10, taking into account the views of participants and current economic indicators. Allowance has been made for possible onshore gas related and mining developments, and the likelihood that some of these developments will be accompanied by onsite generating capacity. The prospects for emerging capacity constraints in the generation sector of the Territory's power system have been assessed by comparing various demand forecasts with existing reserve capacity ("supply"), based upon available generation capacity assuming that the largest generation set is unavailable.

2.2 A supply-demand imbalance appears imminent only for the Alice Springs system, with demand projections exceeding existing reserve capacity from 2004-05.

2.3 As to the Darwin-Katherine system, and even after taking into account likely new developments, the generation capacity currently in place appears sufficient for the time being. While the net electricity import/export requirements of major developments are subject to considerable uncertainty at this stage, the Commission's modelling indicates that additional generation capacity by licensed generators would be necessary towards the end of this decade only were the new developments to exhibit in excess of a 20% net draw on offsite generation. Current indications are that the net draw of projects on the drawing board is not this high.

2.4 Existing generation capacity in the Tennant Creek system appears sufficient over the forecast period to 2009-10, even after allowing for the increased industrial activity associated with the Alice Springs to Darwin railway.

Recommendations

2.5 The Government should consider a combination of supply and demand measures to address the looming capacity constraint in Alice Springs:

- On the supply side, consideration could be given to a tendering for the right to build the next increment of generation capacity. This could facilitate the introduction of a new entrant into Alice Springs system as well as put in train the necessary additional generation capacity.
- On the demand side, tariff structures are required that encourage consumers to adopt certain demand management measures (including ice storage air-conditioning, production scheduling and other load control initiatives).

2.6 A watching brief over developments in the Darwin-Katherine power system is also recommended. While all scenarios involve projected peak demand falling short of reserve capacity over the forecast period to 2009-10, the situation could change as gas-related resource and industrial developments firm up.

CHAPTER 3

KEY FEATURES OF THE TERRITORY'S POWER SYSTEM

Introduction

3.1 The "power system" essentially involves two key processes: producing electricity (generation) and transporting electricity (transmission and distribution), which together are integral to the supply of electricity to end-use consumers.

3.2 Generation and transmission/distribution entities work together to supply electricity to consumers. Therefore, the decisions they make individually affecting the generation, transmission and distribution of power can have widespread effects on the delivery of power to consumers.

3.3 The Territory's regulated power system consists of three distinctly separate systems/regions – Darwin-Katherine, Tennant Creek and Alice Springs, with the Darwin and Katherine distribution networks being connected by a 132kV transmission line.

Unique aspects of the Territory's electricity supply industry

3.4 Technical difficulties associated with the great distances from other major centres in Australia mean that the Territory's power system, unlike those of the south-eastern States, is not interconnected with the national electricity market ("NEM") and operates in isolation from other markets.

3.5 In addition, the small size of the Territory market means that it is not possible to operate a wholesale pool like that now operating in the NEM. Instead, end-use consumers of electricity and or third-party retailers are obliged to have supply agreements in place directly with generators (termed bilateral contracting).

3.6 The dispatch and system control functions are essential to ensure that the power system as a whole (generators and networks together) produces and delivers the quantity of power required by all customers. The role of power system control is currently undertaken by PAWA in the interests of all participants in the market, in accordance with section 38 of the *Electricity Reform Act 2000*.

Generation

3.7 There are two licensed generators, PAWA and NT Power Generation Pty Ltd (NT Power), and a number of independent power producers (IPPs) producing electricity in the Territory. PAWA has generating assets throughout all major regions in the Territory whereas NT Power currently only operates in the Darwin-Katherine region.

3.8 Over 80% of all generation capacity supplying regulated networks in the Territory is installed in the Darwin-Katherine region with the remainder in the southern regions of Tennant Creek and Alice Springs. This corresponds with the level of residential and commercial/industrial activity and subsequently demand for electricity in these respective areas.

3.9 Generation plant in the Territory consists mainly of gas and liquid fuel driven turbines. The gas produced from the Palm Valley and Mereenie fields in the Amadeus Basin in central Australia is currently the primary source of fuel. Timor Sea gas supplies are eventually expected to replace the central Australia gas supply for most generators.

3.10 Gas from the Central Australian fields is transported to the Territory via a single gas pipeline, which has capacity constraints due to its size and length, connected to two gas fields, each of which have production capacity limits. To manage the risk of interruption to this supply, PAWA has installed and operates dual fuel generators (gas/distillate) in most sites as a safety net and commitment to ensure reliability of supply to customers.

Networks

3.11 PAWA is the sole owner of the regulated networks in the regions of Darwin-Katherine, Tennant Creek and Alice Springs. PAWA is therefore responsible for operating and maintaining power transmission and distribution in most cities, suburbs, townships and surrounding rural areas, including some remote Aboriginal communities.

Retailers

3.12 Currently, there are only two licensed retailers in the Territory's power system: PAWA and NT Power.

3.13 The major retailer in all regions is PAWA, a government statutory authority. PAWA is mandated to supply non-contestable customers in all regions (the franchise market). It also competes for the right to supply contestable customers in the regions.

3.14 The only other licensed retailer is NT Power. NT Power initially provided electricity to the gold mining operation at Mount Todd, which ceased operations in July 2000. More recently and since the commencement of competition in April 2000, NT Power has also supplied power to contestable customers in the Darwin-Katherine region.

CHAPTER 4

KEY FEATURES OF THE TERRITORY'S ECONOMY AND ENVIRONMENT

Introduction

4.1 The nature of the Northern Territory economy and environment determines the demand characteristics of the power system. This chapter provides an overview of the Territory and describes those factors impacting on the power system.

4.2 Broadly, the factors affecting demand in the Territory's power system are climate, population and economic and industrial activity.

Climate

4.3 Climate is one of the main factors contributing to the daily and seasonal fluctuations of electricity demand in the Territory.[2]

4.4 The Northern Territory has two distinct climate regions:

- the Top End and the Gulf District, which is characterised by rugged country and coastal floodplains with the occasional patch of rainforest; and
- Central Australia located in the south and characterised as arid.

4.5 The Top End has two main seasons – a wet season during November to April and a dry season from May to October. Throughout the year, temperatures are similar to Cairns, Bali and Singapore.

4.6 The wet season is characterised by high humidity, rainfalls, warm nights and thunderstorms with Darwin being one of the most lightning prone areas in the world. Typically, the region has an average maximum temperature in Darwin of 32.2˚C with an average overnight minimum of 24.8˚C. Inland, daytime temperatures are higher, reaching the high 30s to low 40s in November and December.

4.7 The dry season is characterised by low humidity, warm dry days, clear skies and cool nights, has an average maximum temperature in Darwin of 31.6˚C with an average overnight minimum of 21.7˚C. During June and July, it can be several degrees cooler. Temperatures vary more over the inland Top End, generally being warmer in the day and cooler at night.

4.8 Rainfalls are markedly seasonal due to monsoonal influences. Most of the rain falls during the four months from December to March, which is also a period of high humidity. Thunderstorms and torrential rain occur during the transition from dry to wet, and wet to dry seasons.

[2] This review does not propose to analyse volatility due to the inherent unpredictability of the weather. A more detailed analysis may be warranted in future power system reviews.

4.9 South of Tennant Creek, the environment becomes semi-arid to arid and the distinction between seasons diminishes affecting temperatures and rainfall. Further inland the climate is generally drier. Autumn, from March to May, brings average temperatures in Alice Springs of 27.8˚C by day and 12.8˚C by night. Temperatures in winter, from June until August, average 20.6˚C during the day and 5.2˚C overnight. Spring, from September to November, brings warmer temperatures, with maximums reaching 30.5˚C and minimums reaching 14.3˚C. Between December and February, summer brings an average daytime temperature of 35.5˚C and 20.8˚C overnight.

Population

4.10 The Territory is sparsely populated, with a density of 0.1 persons per square kilometre, lower than any other State or Territory in Australia and well below the national level of 2.5 persons per square kilometre.

4.11 On 30 June 2000, it is estimated that just over 100,000 people live in and around Darwin, its satellite city of Palmerston and Litchfield, including a higher proportion of couple families with young children than any other population centre in Australia. A further 25,600 people live in Alice Springs, with a total of 17,500 people living in the regional centres of Katherine, Tennant Creek and Nhulunbuy. The remainder live in smaller communities, on pastoral properties and mining sites. Table 4.1 further illustrates the population distribution in the Territory.

Table 4.1 – Territory Population Distribution – 30 June 2000

	Population	% of Total	% Annual Change
Darwin	*68,802*	*35.2*	*0.6*
Palmerston	*21,209*	*10.9*	*8.0*
Litchfield	*15,584*	*8.0*	*1.2*
Darwin Region	105,595	54.0	2.1
Katherine	9,959	5.1	0.3
Nhulunbuy	3,586	1.8	-1.7
Tennant Creek	3,959	2.0	0.6
Alice Springs	25,576	13.1	0.2
Rest of Territory	31,204	16.0	1.2
Total	***195,463***	***100.0***	***1.4***

Source: ABS Cat. No. 3234.7

4.12 Over the five years to December 2000, the Territory's population grew at an annual average growth rate of 1.7%. This was equal with Queensland as the highest growth rate of all States and Territories in Australia and considerably higher than the 1.1% yearly average growth in Australia's population.[3] The primary reason for the Territory's high growth over this period was continued movement of the defence force units to the Territory.

4.13 The Territory's population growth rate is expected to continue to strengthen from 1.4% in 1999-00 to 1.7% in 2001-02. Further out, population growth is expected to rise to rates of around 2.0% and higher as construction activity related to onshore gas developments and the Darwin to Alice Springs railway drives growth in employment and boosts interstate migration.

[3] Budget Paper No.5, 2001-02, *Northern Territory Economy,* p.30.

Economy and industry

4.14 The Territory's Gross State Product (GSP) is forecast to grow by an average annual rate of 6.7% over the five years to 2005-06. Growth at this rate would be substantially higher than other States and Territories, and almost double the national rate.[4] This forecast economic growth relates to, among other things, the flow-on effects associated with construction of the Alice Springs to Darwin railway and construction work on several onshore gas-related projects. Excluding the effects of the onshore gas projects, Territory GSP growth could average around 4.0% per annum over the next five years, higher than forecasts for national growth over the same period.[5]

4.15 The mining and energy industry is by far the largest contributor to GSP, accounting for 17.7% of GSP in 1999-00.[6] In that year, the total value of mineral and energy production in the Territory increased by $1.3 billion to $2.9 billion due to an increase in oil and gas production from the Laminaria/Corallina project and an increase in oil prices. The value of energy production is expected to double to $3.2 billion in the near term, boosted by the first full year of oil production from Laminaria/Corallina. The outlook for energy developments in the Territory is positive. Oil production will dominate in the short to medium term, while gas extraction and gas-based manufacturing are expected to dominate in the medium to long term.

4.16 Exploration successes so far include the discovery of the Bayu-Undan, Greater Sunrise, Evans Shoal and Petrel/Tern gas fields, and the Laminaria/Corallina oil field which has been in production since November 1999. About $2.7 billion is planned to be spent on developing the first phase of the Bayu-Undan field, with production of condensate and liquefied natural gas (LNG) possibly beginning as early as 2004.

4.17 In recent months, there has been uncertainty surrounding offshore and onshore major developments mainly as a result of deferral of construction of the Bayu-Undan to Darwin gas pipeline. The decision follows the East Timor Interim Government's proposed changes to its taxation regime for petroleum developments in waters jointly managed by Australia and East Timor.[7] In the short term, the decision is a setback to Darwin's prospects of attracting gas-based manufacturing industries. Assuming onshore gas-related projects proceed as planned, providing the proposed LNG processing plants and the downstream syngas and methanol industries, at least a further $2 billion could be added to the Territory's GSP during the major construction and operational phases between 2004 and 2007.

4.18 If these projects proceed, delivery to Darwin of the first gas is expected around the middle of the decade. The development over the next decade of oil and gas fields in the Timor Sea, in conjunction with the piping of gas onshore for processing by manufacturing plants, could see Darwin transformed into a major regional manufacturing centre for various hydrocarbon products.

4.19 These developments would have economic flow-on benefits such as increasing industry investment, employment and increasing the Territory's tax base. Other benefits include the reduction of gas input costs in generating electricity thereby attracting more players in the generation market and providing greater stability in prices. This could ultimately lead to greater economic efficiency and lower prices to final consumers and could provide an improved standard of living for Territorians.

---

[4] Budget Paper No.5, 2001-02, *Northern Territory Economy,* p.21.

[5] Territory Economic Review, September 2001, p.3. Available from www.nt.gov.au/ntt.

[6] Budget Paper No.5, 2001-02, *Northern Territory Economy,* p.65.

[7] Territory Economic Review, September 2001, p.3. Available from www.nt.gov.au/ntt.

CHAPTER 5

DEMAND

Introduction

5.1 This chapter presents historical and forecast electricity demand in the Territory's power system for the years 1996-97 to 2009-10. In the main, the data has been provided by PAWA and NT Power and has been consolidated to give an overall picture of demand in the Territory's power system.

5.2 In developing the forecasts, the Commission has taken account of participants' views on future electricity demand, the continuing uncertainty surrounding the construction of the Bayu-Undan to Darwin gas pipeline and current economic indicators.

5.3 Generally, the Commission has taken a cautious approach to forecasting the impact of major developments that may rely on the gas pipeline. This involves factoring-in demand increases from the earliest point they could impact the system and at the same time assigning a high probability to associated developments taking place.

Composition of demand

5.4 Demand patterns depend upon those associated with the two main types of consumers: residential consumers and commercial/industrial consumers. Residential consumers include those in individual homes and apartments and are the biggest class of customers in terms of numbers. Commercial/industrial consumers are the largest consumers of electricity and include businesses such as stores, hospitals, office buildings, hotels, supermarkets, restaurants, mining sites, factories, refineries, and government departments.

5.5 Table 5.1 shows the extent of these two categories in each region's regulated network, in terms of energy usage (gigawatt-hours (GWh) per annum) and number of customers.

Table 5.1 – Consumer Categories – 1999-00

	Energy Use (GWh)	Energy Use (%)	Customer Numbers
Darwin-Katherine:			
Residential	331	27%	42,982
Commercial/Industrial:	907	73%	11,053
<750 MWh	415		10900
>750 MWh	492		153
Total	***1238***	***100%***	***54,035***
Tennant Creek:			
Residential	8	27%	1,455
Commercial/Industrial	22	73%	747
<750 MWh	13		742
>750 MWh	9		5
Total	***30***	***100%***	***2,202***
Alice Springs:			
Residential	75	35%	10,313
Commercial/Industrial	141	65%	3,263
<750 MWh	82		3238
>750 MWh	59		25
Total	***216***	***100%***	***13,576***
Territory Total:			
Residential	415	28%	54,750
Commercial/Industrial	1070	72%	15,063
<750 MWh	510		14880
>750 MWh	560		183
Territory Total	***1485***	***100%***	***69,813***

5.6 As shown in Table 5.1, commercial and industrial customers, while fewer in number, accounted for more than 72% of total energy consumption in 1999-00. This shows that the Territory's power demand is marginally more dependent upon commercial and industrial customers than residential customers than is typically the case in other States around Australia. On a national level, residential consumers accounted for 29.3% of electricity consumption while non-residential consumers accounted 70.7% for the year 2000-01.[8]

Forecasting approach

5.7 The overall demand forecasts have been undertaken in a two-stage process to illustrate the load growth *likely* to occur in the Territory over the period to 2009-10. The first stage is a 'baseline' demand forecast, showing the demand in the Territory based on a moderate to high economic growth scenario and excluding the impact of possible major developments. The second stage incorporates the forecast demand arising from gas-related and industrial projects, some of which are associated with the Timor Sea gas discoveries and the construction of the Bayu-Undan gas pipeline to Darwin. Together, these two stages provide an overall picture of prospective power demand in the Territory.

[8] Electricity Supply Association of Australia (ESAA), *Electricity Australia 2001*.

5.8 Electricity demand is essentially shown in two ways: as a maximum (peak) demand in mega-watts (MW) at a particular point in time (the generation required to meet the estimated likely load conditions), or as a consumption rate measured in giga-watt hours (GWh) per annum (the amount of electricity consumers use on average over a 12 month period).

5.9 IPPs contracted with power entities and connected to the regulated network have been included in the figures. Minor centres with their own independent generating capacity have been excluded.

Baseline demand forecast

5.10 Broadly consistent with the participants' views on load growth over the period to 2009-10, the Commission's baseline demand assumptions underlying the forecasts for each regulated system are:

- approximately 2% per annum growth in power demand in the Darwin-Katherine regulated system resulting from the increase in population;[9]
- approximately 1% per annum growth in power demand in the Alice Springs system resulting from the increase in population;[10] and
- 1% per annum constant growth in power demand per customer expected in each regulated system. This is the result of continuing growth in computing use and smart appliances.

5.11 In addition, Tennant Creek will experience significantly higher growth in years 2001-02 and 2002-03 resulting from industrial work associated with the construction of the AustralAsia Railway between Alice Springs and Darwin. With no further developments on the horizon, growth from 2003-04 is assumed to be negligible.

5.12 The baseline demand forecasts do not take into account the demand for the projects relating to proposed Timor Sea gas and associated industrial developments ("*direct demand*"). The demand flow-on effects provided by these developments such as the increase in population and commercial services ("*indirect demand*") are also excluded from the baseline forecast. These components of demand are considered later in this chapter.

5.13 The peak demand forecasts in the Darwin-Katherine system are based on the 2000-01 year, where a maximum of 218.4 MW occurred on 22 November 2000. The historical maximum demand associated with the Mount Todd mine, which ceased operating in July 2000, has been included in calculating a system maximum for years 1996-97 to 1999-00. The historical electricity consumption associated with the Mount Todd mine has also been included. The Commission has included these amounts to better represent historical electricity demand and enable comparisons between the base year and forecasted years.

5.14 The 'baseline' peak demand and consumption forecasts through to 2009-10 in each regulated system are presented in Table 5.2 and Figures 5.1 to 5.4. The electricity consumption is determined on an annual 'sent-out energy' basis, which is defined as generation minus generator usage/losses, with no adjustment being made for network line losses. The transfers of standby generation between participants have also been included in the figures.

---

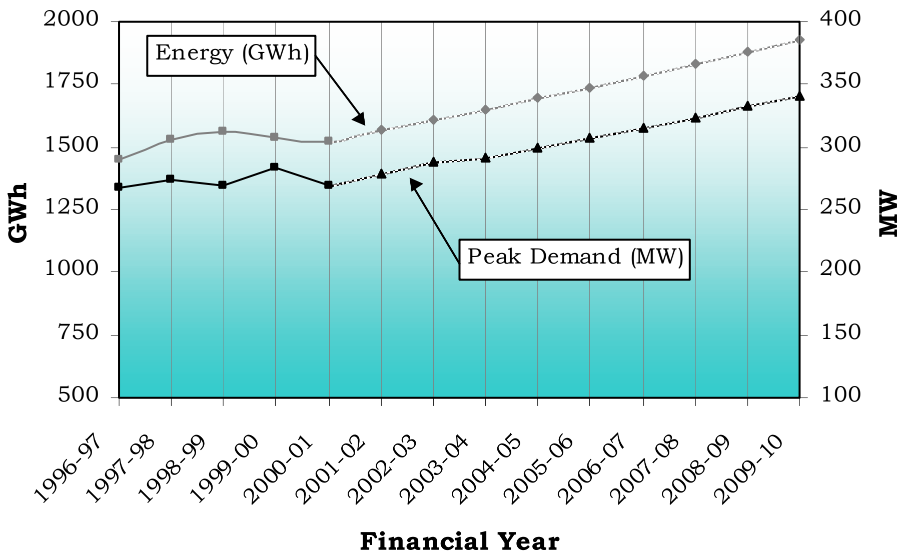
[9] This demand assumption is based on a population growth projection provided by ABS Catalogue 3222.7.

[10] The demand assumption is based on a population growth projection provided by ABS Catalogue 3222.7.

Table 5.2 – Peak Demand and Energy, Actuals and Forecast – Regulated Systems

	Darwin-Katherine		Alice Springs		Tennant Creek		Total	
Financial Year	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)
1996-97	217	1213	39	187	11	49	267	1449
1997-98	223	1283	41	199	10	50	274	1532
1998-99	218	1315	42	204	9	43	269	1562
1999-00	233	1299	43	207	7	30	284	1536
2000-01	218	1280	44	208	6	33	269	1520
2001-02	225	1319	45	210	9	37	279	1566
2002-03	232	1359	46	213	10	39	288	1612
2003-04	239	1399	47	218	7	33	292	1649
2004-05	245	1439	47	222	7	33	300	1694
2005-06	252	1479	48	227	7	33	308	1739
2006-07	260	1521	49	231	7	33	316	1785
2007-08	267	1563	50	236	7	33	324	1832
2008-09	274	1606	51	241	7	33	333	1880
2009-10	282	1650	53	246	7	33	341	1929

Figure 5.1 – Peak Demand and Energy – Total Regulated Systems

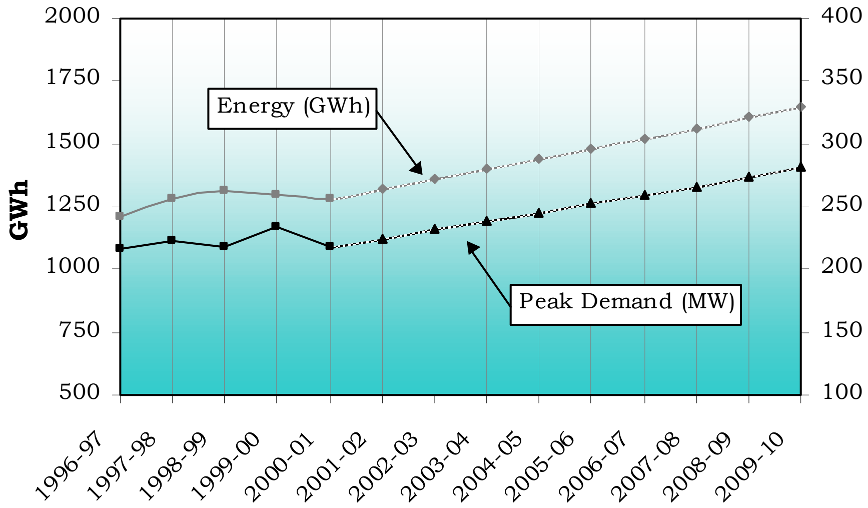


5.15 As seen from Figure 5.1, the peak demand (MW) curve follows, to a certain extent, the amount of energy (GWh) supplied into the Territory's overall regulated system. The growth assumptions applied to each demand indicator for the total regulated system are almost identical over the forecast period. The growth rate in total system demand under this baseline scenario averages 2.7% per annum through to 2009-10.

5.16 The overall representation of total energy and peak demand in Figure 5.1 is simply the consolidation of each regulated system in the Territory and includes Darwin-Katherine, Alice Springs and Tennant Creek regions. These regulated systems are not interconnected like that in the NEM, but are separated. Each regulated system is shown separately below in Figure 5.2 to Figure 5.4.

Darwin-Katherine regulated system

Figure 5.2 – Peak Demand and Energy – Darwin-Katherine



5.17 The Darwin-Katherine regulated system accounts for approximately 80% of all electricity demand in the Territory and is significantly influenced by mining and other commercial/industrial activity as well as by weather conditions varying from year to year.

5.18 As seen in Figure 5.2, there has been negligible growth in peak demand over the four years to 2000-01, though greater volatility in demand is evident in the same period. This is a combination of timing effects of the re-commencing and cessation of mining activity (for example, Mount Todd mine ceased operating in July 2000 thereby reducing peak demand), as well as weather conditions varying from year to year. Historically, over the 10 years to 2000-01, peak demand in the Darwin-Katherine system grew at an averaged annual compound rate of 3.9%, due mainly to mining developments being connected to the system. In terms of electricity consumption (GWh), a slight increase is evident over the four years to 2000-01 with an annual average compound growth of 1.4%.

5.19 The increases and fluctuations during the four years to 2000-01 are mainly explained by:

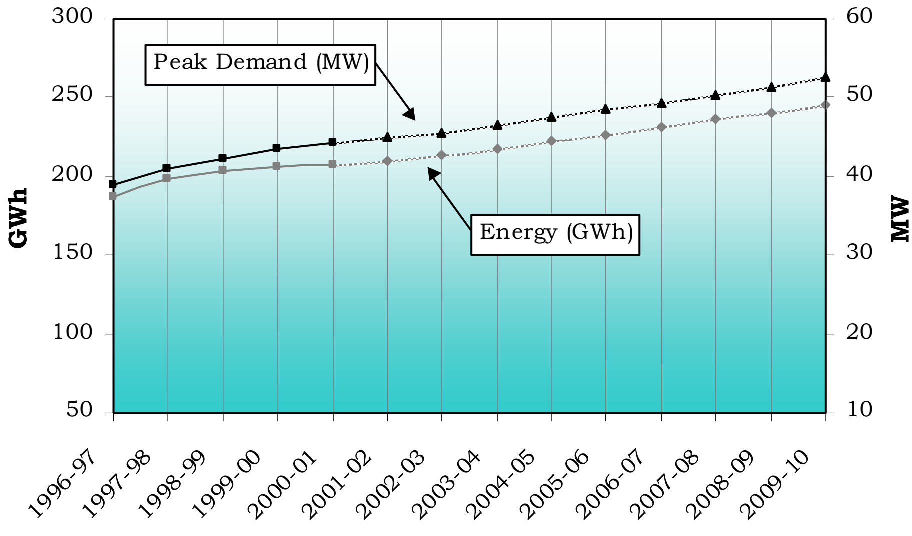
- 1996-97 to 1997-98: a 6% growth in electricity consumption due to expansion of the Union Reef mine;
- 1998-99 to 1999-00: a smaller increase due to a scaling down of the Mount Todd mine and the Woodcutters mine closure; and
- 1999-00 to 2000-01: a decrease due to the Mount Todd mine and Brocks Creek mine closures.

5.20 The peak demand and electricity consumption forecast for the Darwin-Katherine regulated system under the baseline scenario shows an average annual growth of 2.9% over the period to 2009-10. Demand arising out of population growth for the Darwin-Katherine region is based on a moderate economic growth scenario.[11] This baseline scenario produces a peak demand of 282 MW and energy consumption of 1650 GWh in 2009-10, an increase of approximately 30% from current levels.

[11] ABS Catalogue 3222.7.

Alice Springs regulated system

Figure 5.3 – Peak Demand and Energy – Alice Springs

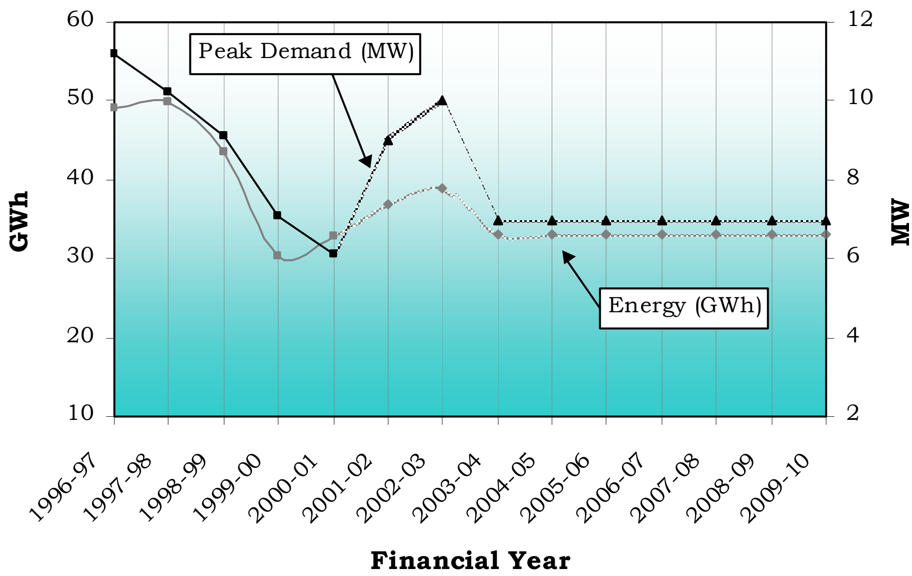


5.21 Alice Springs has seen an annual average growth in electricity consumption over the last four years of approximately 2.6% resulting from increased residential and commercial activity. However, growth in consumption has tailed off over the last couple of years with only 0.4% growth in 2000-01. The Commission expects a pickup in demand under the baseline scenario over the forecast horizon, with an average annual growth of approximately 2% accounting for the impact of the AustralAsia railway as well as the takeup of computers and smart appliances.[12] The growth over the forecast horizon assumes a high population growth scenario in Alice Springs. This growth allows for a rebound in electricity consumption on account of the railway and other commercial developments.

[12] Trends in many cities show growth in computing use and smart appliances is accelerating demand per customer and it is expected that the Territory will 'catch up' with the rest of Australia.

Tennant Creek regulated system

Figure 5.4 – Peak Demand and Energy – Tennant Creek



5.22 Tennant Creek has seen a 40% decrease in peak demand and energy consumption over the last five years. This is mainly a result of the progressive scaling down of Normandy's Warrego mine during 1998-99 and 2000-01.

5.23 In presenting the Tennant Creek forecasts, the Commission has relied on PAWA's view on demand and energy growth. As can be seen from Figure 5.4, growth in energy consumption is likely to increase significantly as a result of industrial activity associated with the upgrade of the Tarcoola to Alice Springs railway and the construction of the new railway to Darwin. Railway work is expected to be in full swing during 2001-02 and 2002-03, with annual increases of 13% and 5% respectively. With the expected completion of railway work in 2003-04 and no further major industrial activity on the horizon, Tennant Creek is expected to experience negligible growth. The Commission has assumed a 'no growth scenario' for the forecasting horizon beyond 2002-03.

Gas-related resource and industrial projects

5.24 This section outlines the *direct* and *indirect* electricity demand that might arise from developments relating to Timor Sea gas discoveries and other mining developments that could commence operational phases in the next 4-5 years.[13] In recent months, there has been uncertainty relating to the construction of the Timor Sea gas pipeline to Darwin, which has been deferred indefinitely by Phillips. As a result, doubts have been cast on downstream projects relying on gas and possibly cheaper electricity generation.

5.25 A number of projects may have on-site generation facilities and take advantage of relatively low cost gas to generate electricity, as may be the case when Timor Sea gas comes onshore. It is also possible that the power required for some

[13] As most projects have not been fully designed, their electricity requirements and impact on the power system are based upon initial specifications.

projects will be met by external network-sourced electricity, through power purchase agreements with a third-party generation supplier.[14]

5.26 The largest of the onshore gas developments, the Phillips LNG plant and the Methanex methanol plant, are based around the development of the Bayu-Undan and Greater Sunrise gas fields in the Timor Sea. The Bayu-Undan and part of Greater Sunrise gas fields are in an area covered by the Timor Gap Zone of Cooperation Treaty between Australia and East Timor. On 5 July 2001, Australia and East Timor formed the Timor Sea Framework Arrangement agreement on the sharing of oil and gas reserves in the Timor Sea. Although this progressed the situation, taxation arrangements proposed by East Timor have resulted in an indefinite deferral of construction of the pipeline to Darwin. In light of these current events, the Commission has chosen to illustrate the possible effects of gas-related resource and industrial projects by deferring downstream projects relying on the pipeline by up to 24 months. Brief details on the major developments considered in this review are described below.

Phillips Petroleum – LNG Plant

5.27 As part of Phillips Petroleum and Shell Woodside's cooperative development of the Bayu-Undan and Greater Sunrise gas resources in the Timor Sea, Phillips has proposed to build an LNG plant at Wickham Point near Darwin.

5.28 For illustrative purposes, the Commission has assumed that the proposed LNG plant will begin full commercial production in 2005. While the deferment of construction of the gas pipeline is significant in that it has unsettled major potential gas customers (El Paso and Methanex), this review assumes that outstanding matters will be resolved and that the project is likely to go ahead.

Methanex Corporation – Methanol Plant

5.29 In March 2000, Shell and Woodside announced a letter of intent with Methanex Corporation, a Canadian methanol producer. The letter of intent was to supply Greater Sunrise gas to a proposed large-scale synthesis gas (syngas) and methanol manufacturing facility near Darwin.

5.30 Methanex intends to build a methanol plant in Darwin to take gas from the Sunrise project and is expected to commence production in 2005. Methanex is also proposing another plant with the same specifications. However, the timing of the second plant is uncertain. Given the project's reliance on gas coming onshore from the Timor Sea, Methanex has been unable to finalise supply contracts with customers as was expected in 2001. While the project may have a relatively low probability of proceeding unless outstanding matters relating to the pipeline are resolved in the near future, this review still assumes the project is likely to go ahead.

Mt Grace Resources NL – Batchelor Magnesium Project

5.31 Mt Grace Resources NL is proposing to develop a project to mine magnesite from its Winchester deposit at Batchelor and produce magnesium via DC plasma arc furnace based technology. The mine is approximately 80 kilometres from Darwin.

5.32 Mt Grace proposes initial production in early 2003, with full production levels achieved in 2007. Mt Grace Resources envisages that a bankable feasibility study will be completed by the end of 2001.

[14] For forecasting and comparison purposes, the projects outlined here are assumed to be connected to the Darwin-Katherine power system, in which case additional infrastructure would be required in order to augment the existing network.

Compass Resources NL – Browns Mt Fitch Project

5.33 Compass Resources NL hold mineral leases over the Browns prospect in the surrounding Mount Fitch project area. The prospect is rated as a world's largest undeveloped polymetallic resource consisting of cobalt, copper, nickel and lead and is located seven kilometres from the township of Batchelor and approximately 80 kilometres from the new East Arm Port facility at Darwin.

5.34 First production from this mining project could come in 2003-04. The Browns project also has the potential to use any cheaper Timor Sea gas when it becomes available.

Demand – major developments

5.35 Other major proposals which are currently under investigation or negotiation are not included in the forecasts due to the lack of advancement or commitment by associated developers.

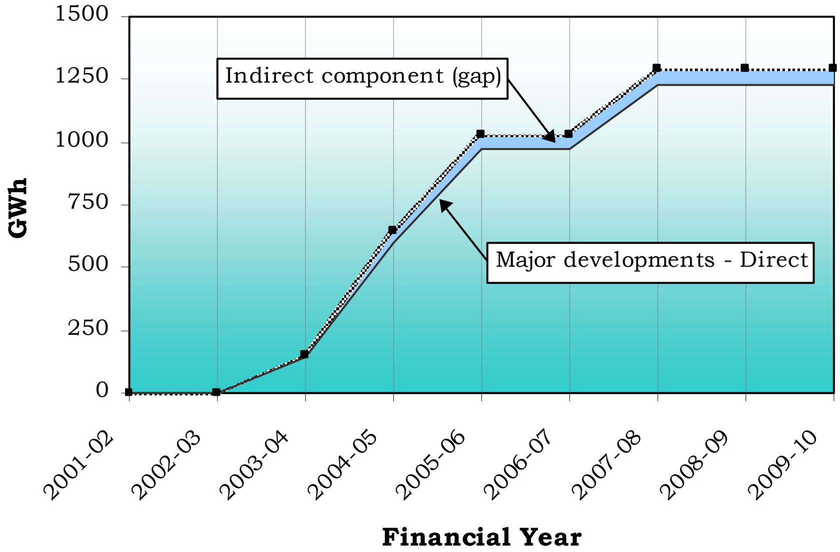
5.36 The forecasts presented in this section are based on upon currently available data on electricity demand and consumption of major developments. The forecasts illustrates the likely impact that major developments may have on the Territory's regulated power systems as a whole. Future reviews undertaken by the Commission will update the forecasts as more information comes to light on new developments, or revisions are made to existing developments.

5.37 The demand and energy impacts of major developments are two-fold: they will have a *direct* impact through the operational requirements of the projects themselves and an *indirect* impact relating to the residential and commercial flow-on effects associated with the projects. The Commission's forecasts assume the *indirect* demand component arising from proposed major developments will have a ripple-effect throughout the Territory – more so in the Darwin-Katherine system than in Alice Springs, with Tennant Creek having a negligible impact. A summary of these impacts is provided below at Table 5.3 and illustrated in Figure 5.5.

Table 5.3 – Peak Demand and Energy Forecast – Gas-Related and Industrial Projects

	Demand (MW)			Energy (GWh)		
Financial Year	**Direct**	**Indirect**	**Total**	**Direct**	**Indirect**	**Total**
2001-02	-	-	-	-	-	-
2002-03	-	-	-	-	-	-
2003-04	17	3	20	140	14	154
2004-05	72	8	80	600	43	643
2005-06	117	11	128	970	59	1029
2006-07	117	11	128	970	61	1031
2007-08	147	11	158	1230	63	1293
2008-09	147	11	158	1230	64	1294
2009-10	147	12	159	1230	66	1296

Figure 5.5 – Energy forecast – Gas-Related and Industrial Projects (GWh)



5.38 The above forecasts indicate a staged increase in the electricity demand for major developments corresponding to the planned levels of mining and industrial production. In early years between 2002-03 and 2004-05 as projects commence construction and operational phases, the electricity requirements and the *indirect* impact is not likely to be at full potential. When the projects are expected to be in full swing, the energy requirements and *indirect* consumption are forecast to increase by 60% in 2005-06 and again by 25% in 2007-08. The *indirect* component is expected to peak at 3.4% of total energy in Territory's regulated systems in 2005-06.

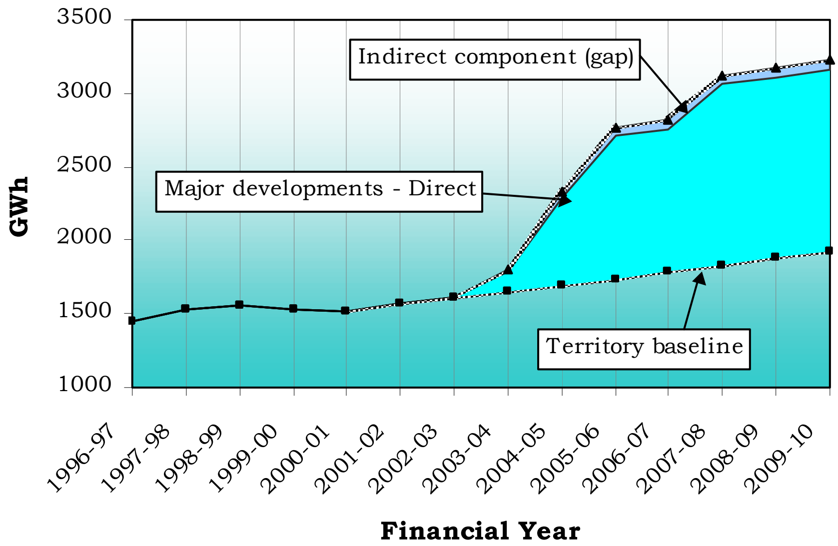
Overall demand – Territory baseline plus developments

5.39 The Commission has consolidated the baseline forecasts presented in Table 5.2 with the major developments forecasts (including the *indirect* component) presented in Table 5.3. The combined forecasts are provided in Table 5.4 and illustrated in Figure 5.6.

Table 5.4 – Peak Demand and Energy, Actuals and Forecast – Baseline plus Developments

	Territory baseline		Major developments		Total	
Financial Year	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)
1996-97	267	1449			267	1449
1997-98	274	1532			274	1532
1998-99	269	1562			269	1562
1999-00	284	1536			284	1536
2000-01	269	1520			269	1520
2001-02	279	1566	-	-	279	1566
2002-03	288	1612	-	-	288	1612
2003-04	292	1649	20	154	312	1804
2004-05	300	1694	80	643	379	2336
2005-06	308	1739	128	1029	435	2769
2006-07	316	1785	128	1031	444	2816
2007-08	324	1832	158	1293	482	3125
2008-09	333	1880	158	1294	491	3174
2009-10	341	1929	159	1296	500	3225

Figure 5.6 – Energy Actuals and Forecast – Baseline plus Developments (GWh)



5.40 Caution should be taken when interpreting this data due to the uncertain nature of electricity requirements for the projects considered and the ongoing uncertainty surrounding the projects themselves.

5.41 The forecasts illustrate the potential for a dramatic increase in peak demand and energy over the period to 2009-10. The forecasts show that the overall Territory system could have a peak demand of about 500 MW and energy consumption of approximately 3200 GWh, about double that of the existing system.

5.42 While these forecasts are speculative to an extent, they illustrate the scenario which the Government needs to plan for if system reliability is not to be jeopardised.

CHAPTER 6

SUPPLY

Introduction

6.1 This chapter outlines the generation capacity used in supplying electricity into the Territory's power system and identifies factors influencing supply in the short to medium term. A comparison of demand and supply forecasts is left to chapter 7.

6.2 Supply of regulated electricity in the Territory is predominantly provided by PAWA in all major regions. NT Power, the other licensed participant, currently only supplies into the Darwin-Katherine power system.

6.3 From a regional perspective, over 80% of all generation capacity in the Territory's regulated networks is installed in the Darwin-Katherine system. The remaining 20% of generation capacity is installed in the Alice Springs and Tennant Creek regulated systems.

Existing capacity

6.4 The Territory's generation facilities, consisting mainly of gas and liquid fuel driven turbines, are summarised in Table 6.1. Two indicators of 'supply capacity' are provided:

- total capacity (in MW); and
- N-1 capacity (in MW), which indicates the generation capacity excluding the largest generating set in a particular system.

Table 6.1 – Territory Generation Facilities as at 30 June 2001

Power Station/Region	Capacity (MW)	% of Total	Capacity at N-1
Darwin-Katherine regulated system:			
Channel Island (PAWA)	254.0		
Berrimah (PAWA)	28.0		
Katherine (PAWA)	19.5		
Mt Todd (NT Power)	37.0		
Pine Creek (IPP)	34.1		
Cosmo Howley (IPP)	7.5		
Total	***380.1***	***83%***	***342.1***
Tennant Creek regulated system:			
Tennant Creek (PAWA)	16.3		
Total	***16.3***	***4%***	***15.0***
Alice Springs regulated system:			
Ron Goodin (PAWA)	50.6		
Brewer (IPP)	8.5		
Total	***59.1***	***13%***	***47.4***
Overall Capacity	***456.1***	***100%***	

6.5 PAWA has a number of long-term power purchase agreements with IPPs. The capacity of these IPPs has been included in total system capacity. Approximately 50 MW of capacity is available to PAWA from IPPs at Pine Creek, Cosmo Howley and Brewer Estate power stations.

6.6 NT Power's Mount Todd generator was removed from service on 1 August 2001. NT Power is currently in the process of relocating its generation facilities to Channel Island. NT Power currently expects to have its new power station operating by June 2002.

6.7 PAWA is also responsible for the provision of power services to 85 remote Aboriginal communities and townships that are not connected to the power system. Some of these areas include Yulara, Borroloola, Timber Creek, Daly Waters, Newcastle Waters, Elliot, Ti-Tree and Kings Canyon. The generation capacity associated with these rural areas has not been included in system supply (for the purposes of this review) and is consistent with the treatment of associated demand in chapter 5.

New capacity

6.8 Broadly, the factors affecting supply in the Territory in the short to medium term are:

- the level of additional effective capacity introduced into the system. For example, additional capacity may accompany new onshore gas developments and other industrial projects assuming infrastructure is in place to facilitate connection to the network. This could significantly increase supply (along with demand) into the Darwin-Katherine power system. The average net export (if any) into the system from these major developments would contribute to available capacity for the Darwin-Katherine system. This possibility is considered in chapter 7;
- the economic life of existing generation assets;

- the implementation of more efficient or environmentally friendly generating systems or newer technologies which may increase capacity;
- the levels of supply risk that stakeholders such as consumers and generators are willing to bear (i.e. are those risks which are within acceptable degrees of reliability); and
- the risk for capacity to 'come and go' due to the small number of participants in the Territory market. For example, when the Mount Todd Power closed, 37 MW of capacity was lost. This follows two periods of activity at the mine which accounted for 35 and 25 MW demand for periods of time. However, as the market becomes more developed and the number of participants grows, the relative impact of loss in capacity will reduce.

CHAPTER 7

SUPPLY-DEMAND BALANCE

Introduction

7.1 Against the background of the forecasts of demand and existing generating capacity canvassed in the previous two chapters, this chapter examines the overall supply-demand position in the Territory's power system.

Indicators of generation reliability

7.2 Generation reliability depends fundamentally on the level of installed capacity measured against expected demand. The difference is known as the reserve margin, which is a margin that allows for both planned maintenance and forced outages (failures). If generation reliability is low then there is a greater chance of electricity supply interruption.

7.3 The Commission has chosen to focus on the "**N-1 reserve margin**", being the reserve generating capacity maintained above the peak demand for electricity after allowance is made for the unavailability of the largest generating plant (the so-called "N-1" rule). The N-1 reserve margin provides an indication of the risk of supply interruptions.

7.4 The Commission has undertaken its analysis on a region-by-region basis.

Darwin-Katherine regulated system

7.5 In this section, the prospective supply-demand balance in the Darwin-Katherine regulated system is presented under a number of scenarios over the forecasting horizon. Initially, a baseline scenario is shown, then the likely impacts of major developments are shown in alternative scenarios.

7.6 For the Darwin-Katherine regulated system the Commission has examined four scenarios:

- a baseline scenario where no allowance is made for any demand associated with gas-related and industrial developments;
- a no *direct* impact scenario by major developments (i.e. all *direct* demand arising from major developments is assumed to be met in its entirety by onsite generating capacity provided by major developments);
- a 20% net draw on offsite generation capacity by major developments; and
- a 10% net addition to generation capacity by major developments.

Baseline scenario

7.7 Table 7.1 and Figures 7.1 and 7.2 indicate the reserve margin implied by the Commission's baseline supply and demand forecasts for the Darwin-Katherine regulated system. This scenario ignores any impact on demand arising from major developments, whether *direct* or *indirect.*

7.8 The assumptions underlying the baseline forecasts were outlined in chapter 5. Additionally, the forecasted capacity is unchanged from the 2000-01 base level of 380.1 MW for the purposes of illustrating how demand would approach existing supply levels and diminishing reserve margins. This scenario includes NT Power contributing capacity of 37 MW over the forecast horizon, although this capacity is not presently in place. Also assumed over the forecast horizon to 2009-10 is that the largest generating set in the Darwin-Katherine system will remain at 44 MW.

Table 7.1 – Supply-Demand Balance Forecast – Darwin-Katherine Baseline (MW)

Financial Year	Demand	Capacity at N-1	Reserve margin N-1	Reserve %
1996-97	217			
1997-98	223			
1998-99	218			
1999-00	233			
2000-01	218	336	118	54%
2001-02	225	336	111	49%
2002-03	232	336	104	45%
2003-04	239	336	97	41%
2004-05	245	336	91	37%
2005-06	252	336	84	33%
2006-07	260	336	77	30%
2007-08	267	336	69	26%
2008-09	274	336	62	23%
2009-10	282	336	55	19%

Figure 7.1 – Supply-Demand Balance Forecast – Darwin-Katherine Baseline (MW)

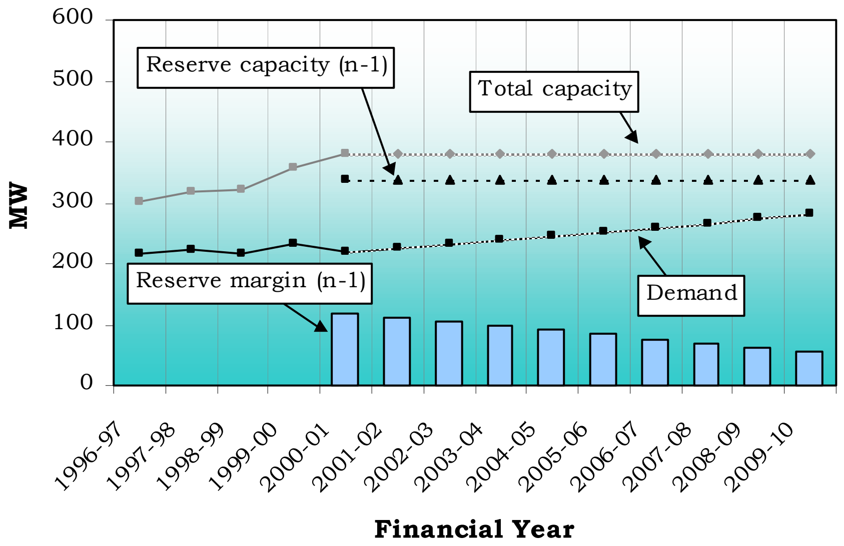
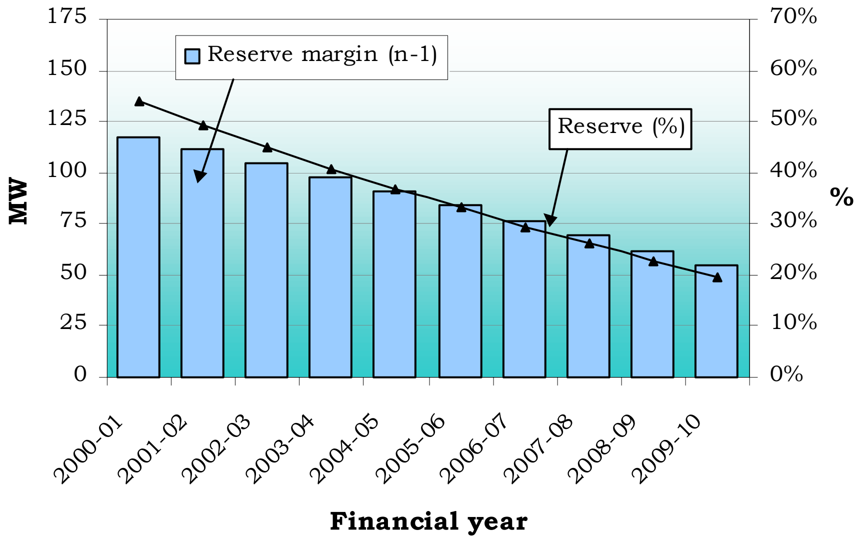


Figure 7.2 – N-1 Reserve Margins Forecast – Darwin-Katherine Baseline (MW)



7.9 Under the Commission's baseline scenario (where annual growth in demand over the forecast horizon is approximately 2.9%), reserve margins slowly decrease resulting in an N-1 reserve margin of 54 MW in 2009-10. This represents a decrease in the N-1 reserve margin of 35% from 2000-01 levels. Using the trigger level of N-1, no significant issues appear likely under the baseline scenario over the forecast horizon. However, other risk factors need to be considered such as generation performance and age of generation assets to determine whether reliability requirements would be satisfactorily met through to 2009-10.

Major developments equilibrium scenario

7.10 Table 7.2 and Figures 7.3 and 7.4 indicate the N-1 reserve margin implied by the Commission's supply and demand forecasts for the Darwin-Katherine system based on the assumption that the demand arising on account of the major developments is met in its entirety by onsite generation capacity provided as part of these developments.

7.11 The technical assumptions underlying this scenario are:

- the % of MW drawn from the power system is the same across all major developments and is initially set to zero under this scenario to illustrate the overall effect on supply and demand by major developments as a whole;
- the % MW drawn from the system is the same across all years from the time the projects commence (expected to be between 2003-04 and 2004-05) to the end of the forecast horizon; and
- the forecasted baseline capacity does not change from the 2000-01 level of 380.1 MW and the largest generating set remains at 44 MW over the forecast horizon.

Table 7.2 – Supply-Demand Balance Forecast – Major Developments Equilibrium (MW)

Financial Year	Demand	Capacity at N-1	Reserve margin N-1	Reserve %
1996-97	217			
1997-98	223			
1998-99	218			
1999-00	233			
2000-01	218	336	118	54%
2001-02	225	336	111	49%
2002-03	232	336	104	45%
2003-04	258	353	95	37%
2004-05	324	408	84	26%
2005-06	379	453	74	20%
2006-07	386	453	67	17%
2007-08	423	483	60	14%
2008-09	431	483	52	12%
2009-10	439	483	44	10%

Figure 7.3 – Supply-Demand Balance Forecast – Major Developments Equilibrium (MW)

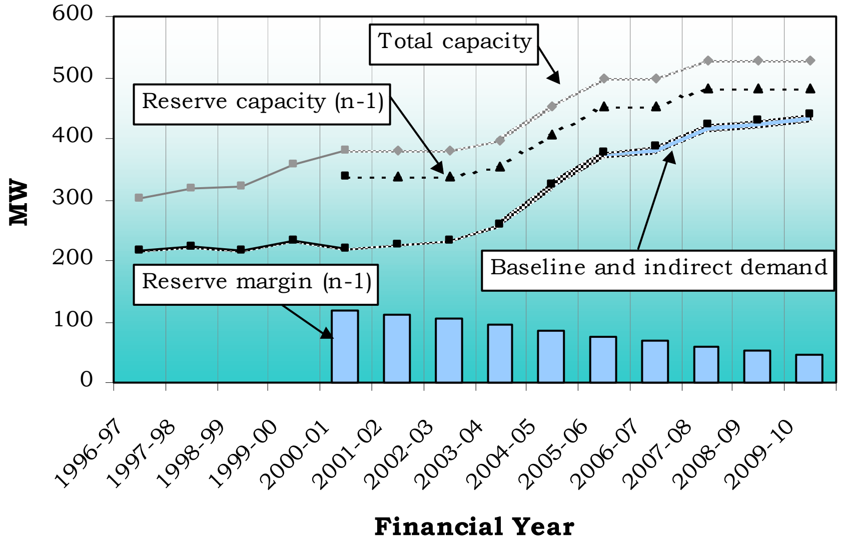
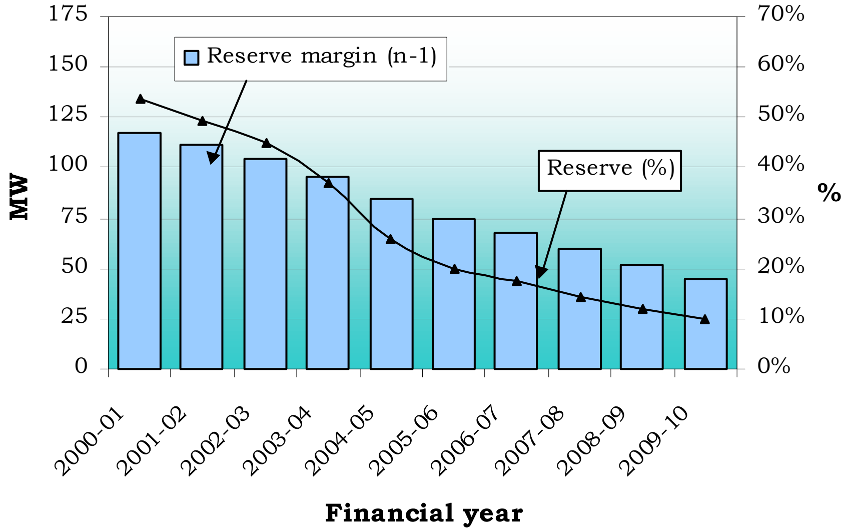


Figure 7.4 – N-1 Reserve Margins Forecast – Major Developments Equilibrium (MW)



7.12 Once major developments proceed, the Commission recognises that not only will there be a *direct* demand impact arising from the projects themselves, but also *indirect* demand associated with the flow-on effects rippling throughout the Territory. This has been shown in the demand projection in Figure 7.3 above.

7.13 Introducing the equilibrium supply-demand scenario of major developments into the Darwin-Katherine system sees the N-1 reserve margin reduced to 44 MW in 2009-10, an overall decrease of 44% from 2000-01. This additional decrease of reserve margins over the baseline scenario is simply a result of *indirect* demand, which could reach 2% in 2004-05. Overall demand increases in stages relating to the differing operational phases of major developments, with an increase of 48% from current levels expected in 2004-05. Ultimately, under this scenario, peak demand in the Darwin-Katherine regulated system is forecast to double to 439 MW over the forecast horizon, representing 8.1% average annual compound growth. On the other hand, supply will only increase to 527 MW in 2009-10, representing a 39% increase from current levels.

7.14 This scenario indicates that, provided all additional demand arising on account of the major developments were met by onsite generation capacity provided as part of these developments, the Darwin-Katherine system would have sufficient capacity to meet expected growth in demand over the forecast horizon. Even with no increase in current baseline capacity of 380 MW, the system on an N-1 basis could accommodate expected growth in *baseline* load including any additional *indirect* demand. Prospects for a supply-demand mismatch may only emerge towards the end of the forecasting period.

Impact of offsite power requirements by major developments

7.15 The above assessment is dependent upon the assumption made that the additional *direct* electricity demand arising from all major developments is met entirely from onsite generation.

7.16 To illustrate the effect were the major developments to draw energy from the remaining power system in order to meet their energy requirements, Table 7.3 and Figures 7.5 and 7.6 illustrate the effect of a 20% net draw on offsite generation capacity. The 20% figure is chosen because it is around the level that would see the need for increased generation capacity before the end of the forecasting period.

Table 7.3 – Supply-Demand Balance Forecast – Major Developments as Net Users (MW)

Financial Year	Demand	Capacity at N-1	Reserve margin N-1	Reserve %
1996-97	217			
1997-98	223			
1998-99	218			
1999-00	233			
2000-01	218	336	118	54%
2001-02	225	336	111	49%
2002-03	232	336	104	45%
2003-04	261	353	92	35%
2004-05	338	408	70	21%
2005-06	402	453	51	13%
2006-07	409	453	44	11%
2007-08	453	483	30	7%
2008-09	460	483	23	5%
2009-10	468	483	15	3%

Figure 7.5 – Supply-Demand Balance Forecast – Major Developments as Net Users (MW)

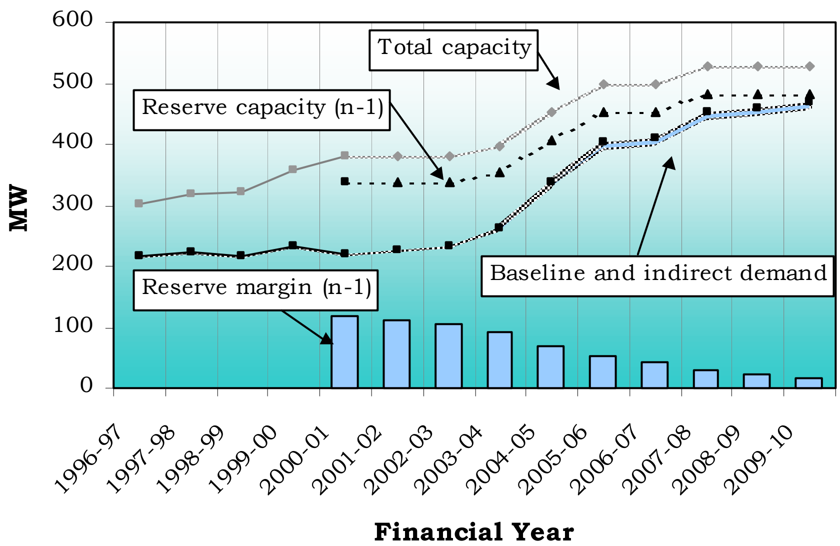
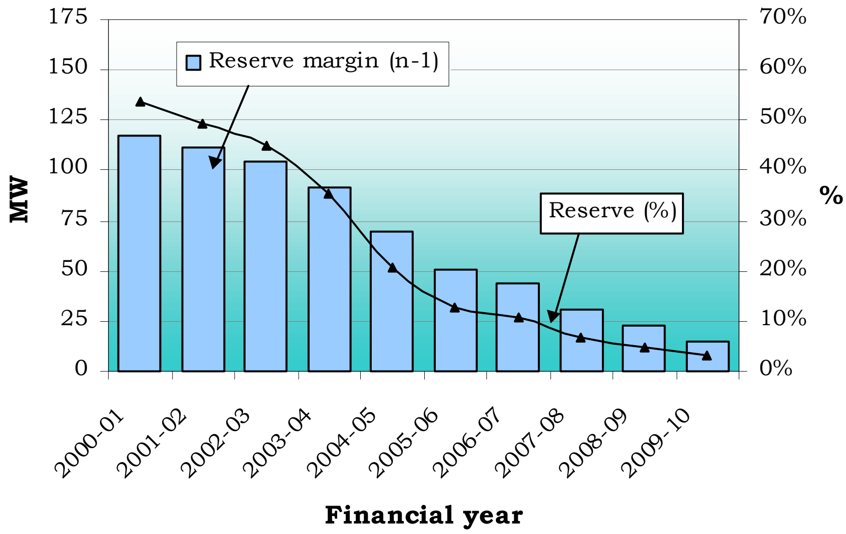


Figure 7.6 – N-1 Reserve Margins Forecast – Major Developments as Net Users (MW)



7.17 The Darwin-Katherine system supply capacity would need to be extended within the next 10 years, were at least 20% of the expected external demand from major developments to be met by offsite generation. Without additional capacity, under this scenario demand could come to within 7% of N-1 reserve capacity in 2007-08. Under this scenario, the additional net draw from major developments is forecast to be 30 MW (in terms of peak demand) in 2009-10. In such circumstances, any initiatives to correct the approaching imbalance would have to be implemented well before 2009-10.

Impact of a net addition to generation capacity by major developments

7.18 An alternative possibility is that onsite generation capacity associated with the major developments generates in excess of its own power requirements with the remainder being exported into the power system.

7.19 Table 7.4 and Figures 7.7 and 7.8 illustrate the effect of a 10% increase in supply from major developments on the power system. The 10% figure is chosen because it is sufficient to postpone any need to introduce additional external generating capacity (other than that expected to be provided by major developments) before the end of the forecasting period.

Table 7.4 – Supply-Demand Balance Forecast – Major Developments as Net Generators (MW)

Year	Demand	Capacity at N-1	Reserve margin N-1	Reserve %
1996-97	217			
1997-98	223			
1998-99	218			
1999-00	233			
2000-01	218	336	118	54%
2001-02	225	336	111	49%
2002-03	232	336	104	45%
2003-04	258	355	97	38%
2004-05	324	415	91	28%
2005-06	379	465	86	23%
2006-07	386	465	79	20%
2007-08	423	498	75	18%
2008-09	431	498	67	16%
2009-10	439	498	59	13%

Figure 7.7 – Supply-Demand Balance Forecast – Major Developments as Net Generators (MW)

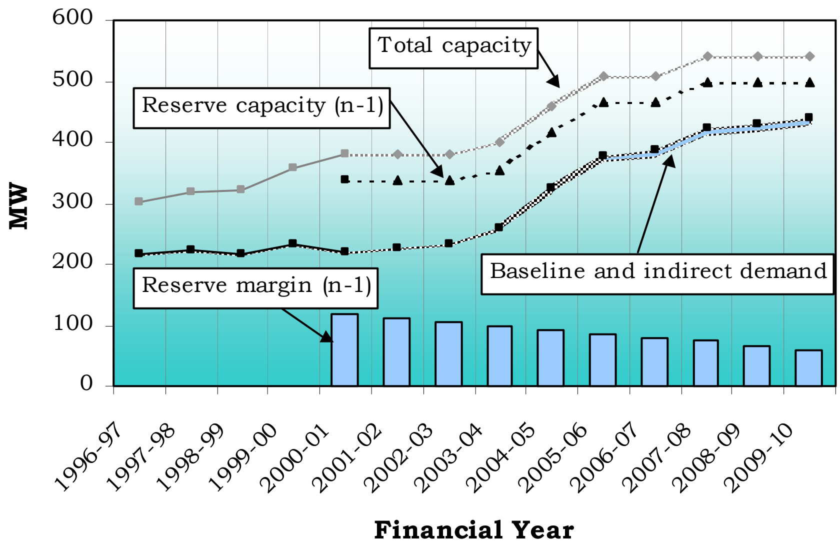
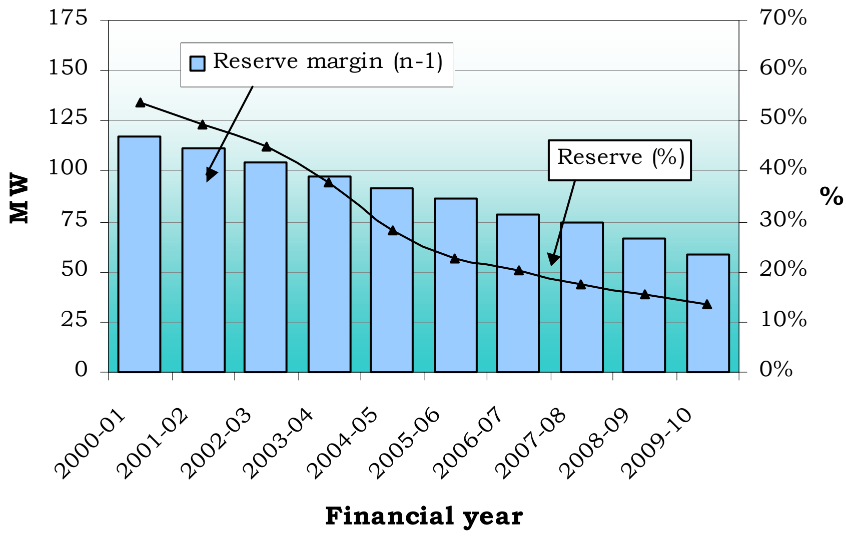


Figure 7.8 – N-1 Reserve Margins Forecast – Major Developments as Net Generators (MW)



7.20 With an increase in supply of 10% from major developments, the Darwin-Katherine system could be well placed to satisfy forecast demand through to at least 2009-10. Under this scenario, capacity increases overall by 21% in 2004-05 and 43% in 2009-10 from current levels. In 2009-10, total capacity would reach 540 MW and include 15 MW exported by major developments.

7.21 The levels of reserve margins are comparable to those indicated by the baseline scenario. In 2009-10, an N-1 reserve margin of 59 MW would be expected, a decrease of 40% from current levels.

Summary

7.22 The future supply-demand balance situation in the Darwin-Katherine regulated system may fall somewhere between the major development scenarios presented above. For example, in initial years (including during construction), additional power may be drawn from the system to satisfy the demand of major developments and, in later years, major developments may build up spare additional capacity that they would like to export into the system.

Alice Springs regulated system

7.23 The Commission has not undertaken alternative scenarios for the regions outside the Darwin-Katherine region, such as Alice Springs.

7.24 Table 7.5 and Figures 7.9 and 7.10 indicate the supply-demand balance and N-1 reserve margins implied by the Commission's forecasts for the Alice Springs regulated system. This includes some additional *indirect* demand associated with the flow-on effects arising from the impact of major developments as well as the AustralAsia Railway.

Table 7.5 – Supply-Demand Balance Forecast – Alice Springs (MW)

Financial Year	Demand	Capacity at N-1	Reserve margin N-1	Reserve (%)
1996-97	39			
1997-98	41			
1998-99	42			
1999-00	43			
2000-01	44	47	3	6%
2001-02	45	47	2	5%
2002-03	46	47	1	3%
2003-04	47	47	1	1%
2004-05	47	47	0	-1%
2005-06	48	47	-1	-3%
2006-07	49	47	-2	-5%
2007-08	50	47	-3	-7%
2008-09	51	47	-4	-9%
2009-10	53	47	-5	-10%

Figure 7.9 – Supply-Demand Balance Forecast – Alice Springs (MW)

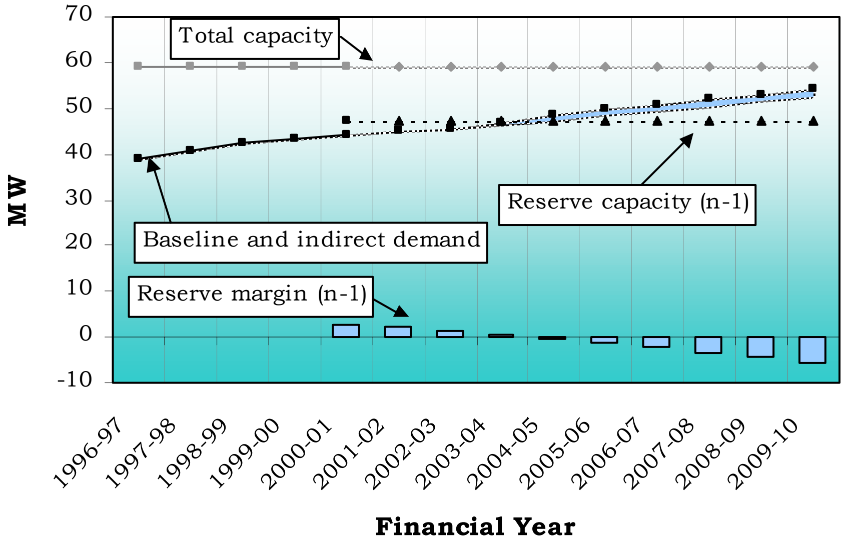
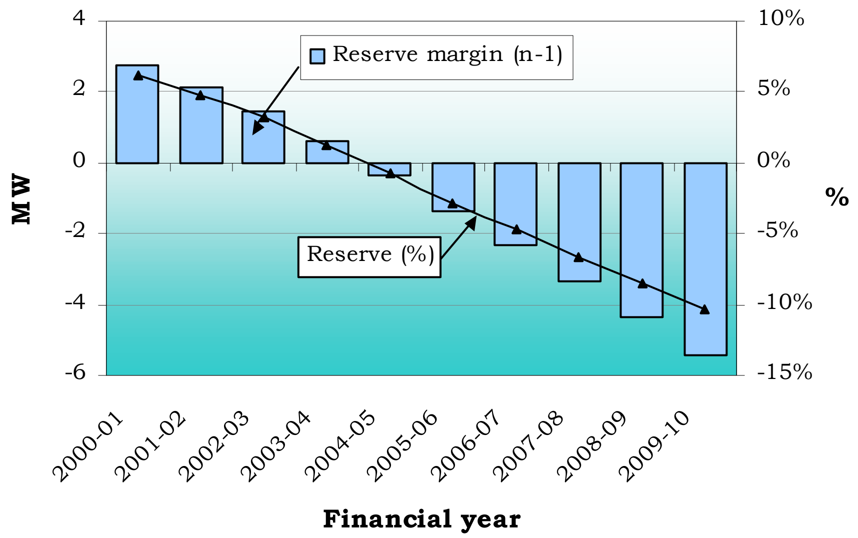


Figure 7.10 – N-1 Reserve Margins Forecast – Alice Springs (MW)



7.25 The forecast demand and supply in the Alice Springs regulated system clearly indicates a tight supply situation approaching by 2004-05. At this time, reserve capacity is expected to be completely exhausted. There is a pressing need for additional generating capacity and/or implementation of demand management programs (see Chapter 8).

Tennant Creek regulated system

7.26 Table 7.6 and Figures 7.11 and 7.12 indicate the supply-demand balance and reserve margins implied by the Commission's forecasts for the Tennant Creek regulated system.

Table 7.5 – Supply-Demand Balance Forecast – Tennant Creek (MW)

Financial Year	Demand	Capacity at N-1	Reserve margin N-1	Reserve %
1996-97	11			
1997-98	10			
1998-99	9			
1999-00	7			
2000-01	6	15	9	145%
2001-02	9	15	6	67%
2002-03	10	15	5	50%
2003-04	7	15	8	114%
2004-05	7	15	8	114%
2005-06	7	15	8	114%
2006-07	7	15	8	114%
2007-08	7	15	8	114%
2008-09	7	15	8	114%
2009-10	7	15	8	114%

Figure 7.11 – Supply-Demand Balance Forecast – Tennant Creek (MW)

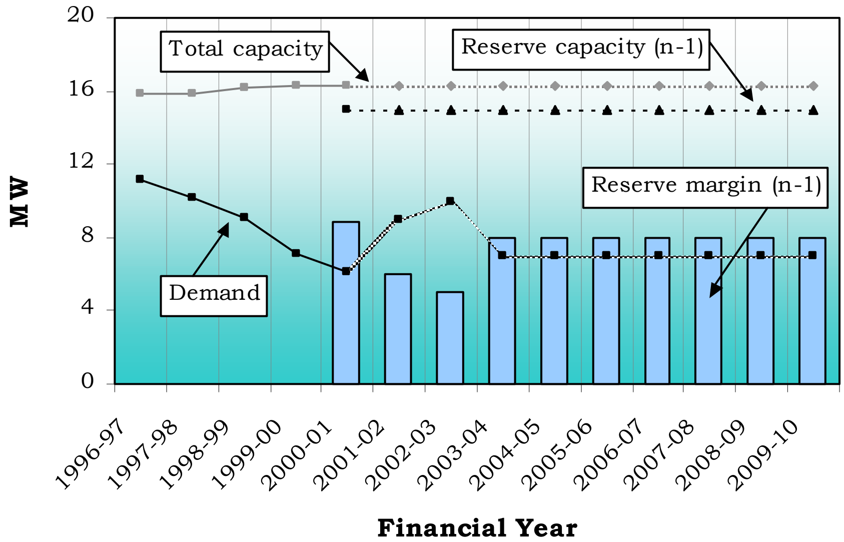
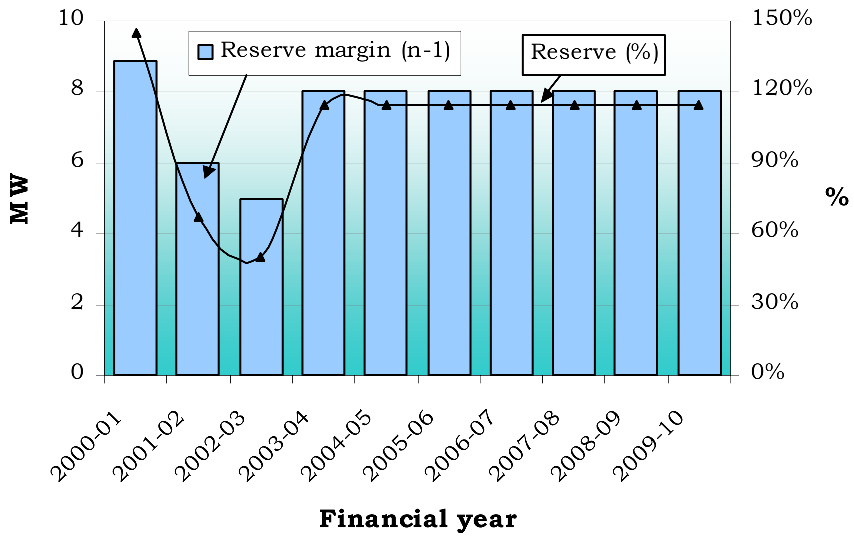


Figure 7.11 – N-1 Reserve Margins Forecast – Tennant Creek (MW)



7.27 Current generation capacity in Tennant Creek of 17 MW appears sufficient to accommodate the expected demand over the next 10 years, even after taking into account the N-1 safety margin. This is the case notwithstanding additional pressure on the system between 2001-02 and 2002-03 as a result of expected increased industrial activity associated with the Alice Springs to Darwin railway.

CHAPTER 8

ADDRESSING SUPPLY-DEMAND IMBALANCES

Introduction

8.1 This chapter canvasses options and provides recommendations on courses of action available to the Government in order to counteract the projected imbalances (in chapter 7) in the Territory's regulated power systems over the forecast period to 2009-10.

8.2 In order to assess the supply-demand balance situation, consideration must be given to the range of risk factors inherent in a particular power system. Once this is done, stakeholders can implement programs to evaluate and monitor risks and strategies can then be devised and decisions made about addressing future supply-demand imbalances. Ultimately, resolving the questions of how, when, where and by whom should these strategies be implemented are matters for the Government.

Risks of supply

8.3 Generally, the following factors must be considered when evaluating the risk of supply in a power system:

- the relative growth in demand compared to supply which is illustrated by the reserve margin measure. Growth in demand in the short to medium term will be of importance;
- the lead times involved in installing new generating capacity or implementing demand management programs. The usual lead-time in installing a generator is approximately 18 months;
- existing supply-demand management programs and the effectiveness of such programs;
- proposed new plant developments and decommissions. Currently, there are no new plant developments proposed for the Darwin-Katherine or Tennant Creek regulated systems. In Alice Springs, PAWA has proposed that an additional 8 MW generator be installed in 2004;
- existing and future generation/network reliability, taking into account the size of the power system and technical constraints; and
- fuel supply reliability and the effectiveness of any initiatives to ensure continued supply of electricity.

8.4 The Commission has not provided a detailed analysis of the risk factors associated with each regulated system, although it may consider these in future reviews. Instead, the Commission has evaluated risk and the reliability of supply on an N-1 basis. In other words, the review limits its concern to those aspects of reliability of the system arising from supply relative to demand and reserve margins.

General assessment

Alice Springs regulated system

8.5 The most pressing supply situation in prospect is in the Alice Springs system, where an N-1 reserve margin may disappear by 2004-05. Further out to 2009-10, N-1 reserve margins becomes –10%, although it is not expected that all capacity (59 MW) will be exhausted at this time. In any case, a comfort zone, like that existing today with N-1 reserve margin of 6%, would be appropriate.

Darwin-Katherine regulated system

8.6 The situation in the Darwin-Katherine system appears manageable for the moment with N-1 reserve capacity in excess of projected peak demand in all of the scenarios presented over the forecast period (see chapter 7). According to the Commission's calculations, peak demand from major developments presented in this review would need to be an additional 30% before all reserve capacity is exhausted in 2009-10, representing 44 MW (in terms of peak demand).

8.7 Nevertheless, the Darwin-Katherine supply-demand balance will need to be kept under watch as gas-related resource and industrial developments firm up and a clearer picture of their impact is evident.

Tennant Creek regulated system

8.8 The Tennant Creek system with capacity of 16 MW appears manageable, even with projected increases in demand in 2001-02 and 2002-03 associated with industrial work on the Alice Springs to Darwin railway. Consideration will need to be given to other risk factors, particularly the age of existing generation assets and performance.

8.9 Currently, capacity in the Tennant Creek system is more than double the existing demand and is due to the progressive scaling down of Warrego mine over the last three years reducing demand by 40%.

8.10 Supply deficiencies would only be in prospect in the Tennant Creek system with the commencement of major new mining and industrial developments requiring power from the system. No such developments are in prospect at the moment.

Options

8.11 Generally, there are two options available to address supply-demand imbalances in a power system: increasing generating capacity and/or implementing demand-side response initiatives. The options available for the Alice Springs system are canvassed below, but also apply in principle to other regulated systems in the Territory where appropriate.

Supply responses

Installation by PAWA of an additional 8 MW generator in 2004

8.12 PAWA could be encouraged by the Government to continue with its plans to install additional generating capacity required in Alice Springs.

Third-party supply of additional generation capacity

8.13 Alternatively, the Government could facilitate the introduction of a new entrant in the Alice Springs system to supply additional generation capacity. This could be achieved via some sort of tendering process for the right to build the next increment of generation capacity in Alice Springs.

8.14 The existing IPPs could be one source, although they may prefer to stick to their core business and not get involved in the retailing of electricity to contestable customers. The new generation entrant (or expansion by an existing IPP) could avoid becoming a retailer only by establishing a power supply agreement with a licensed retailer.

Co-generation

8.15 Co-generation involves the capture of exhaust heat from an engine and using it for heating purposes (such as required by absorption chillers in air-conditioning plants). Customers with high steam, heating and cooling requirements (e.g. hospitals) may find co-generation an attractive alternative to grid supply within the Alice Springs market. A 1 MW co-generation at the hospital has been mentioned as one possibility.

Alternative Energy Solutions

8.16 Alice Springs is blessed with an abundant supply of solar energy, which is rarely disturbed by cloud. The installation of solar hot water systems could play a role. Grid connected photovoltaics by individual customers to supply into the grid could also be possible.

Demand-side responses

8.17 Demand-side management refers to initiatives that focus on influencing the demand for electricity, with the objective of reducing peak load and the need for additional generating capacity at such times.

Interruptible Contracts

8.18 Retailers could be encouraged, for example, to negotiate *interruptible contracts* with large customers where appropriate. Contracts such as these allow the retailer to initiate a price driven load response in the market.

Water Pumping Scheduling

8.19 A number of strategies can be implemented involving additional water pumping scheduling measures, including:

- arrangements to carry out pumping schedules at critical times of the day/year to fill the town storage tanks during the lower demand periods at night. In 1995, the pumping of water accounted for 6% of the energy consumption in Alice Springs. It represented 5% of the demand for electricity on a summer's afternoon. In critical demand situations, 1.5 - 2 MW could be shifted from water pumping;
- increasing the size of water storage capacity, which is under periodic review; and
- installing variable speed drives on bore pumps to reduce consumption at critical times without stopping the bore pumps.

Ice Storage Air-conditioning

8.20 By encouraging the investment of ice-storage in businesses air-conditioning plants, electrical energy can be produced more cheaply at night and used to produce ice. The ice is slowly melted during the next day to provide cooling in air-conditioning systems, which in turn lessens the electricity demand of businesses during the day. In Alice Springs, there has been no successful ice storage implementation to date. However, this is under periodic review and the take-up rate could be enhanced by appropriate tariff structures and levels.

Production Scheduling

8.21 Some major customers may be able to operate in a cooperative mode with the power supplier in order to relieve tight periods of maximum demand. Adjusting working hours and/or using their standby plant could achieve this.

Load control

8.22 Similar to production scheduling, this is aimed at households who can operate pool pumps and electric hot water systems during low demand periods.

Commission's recommendations

8.23 The Government needs to consider encouraging a combination of demand and supply measures in Alice Springs.

8.24 Demand initiatives could be urged on the existing retailer/generator (PAWA) by Government as shareholder. In addition, as PAWA is the sole licensed retailer/generator, the Commission could also encourage such approaches by approving default tariff structures that encourage consumers to adopt demand management measures.

8.25 In the interests of fostering generation and retail competition in Alice Springs, the Government should give consideration to tendering out the right to supply the next increment of generation capacity. This could be achieved by a combination of shareholder pressure on PAWA and actions by the Commission which limit PAWA's generation licence to existing generation capacity.

APPENDIX A

GLOSSARY

Capacity – The maximum output that a generating unit can provide under specific conditions for a given time period without exceeding temperature and stress limits.

Co-Generation Generator – An electric generating unit in which electricity is produced as well as another useful form of energy for industrial or commercial uses.

Contestable Customer – A customer that is eligible to buy its electricity from a retailer of its choice.

Demand – The amount of electricity being consumed by customers at any given time.

Demand Side Management – The management of demand for electricity with the goal of reducing the peak load and the need for generating capacity at such times.

Forced Outage – The shutdown of a generating unit, transmission line or other asset for either emergency reasons or unexpected breakdown.

Generator – A machine that converts mechanical energy into electrical energy.

Giga – A prefix used to denote 1,000,000,000 (one billion) units (10^9).

Gigawatt (GW) – One gigawatt equals 1 billion watts, 1 million kilowatts or 1 thousand megawatts.

Gigawatt-hour (GWh) – One gigawatt-hour equals one billion watt-hours.

Interruptible Load – Load which is able to be disconnected, either manually or automatically, which is provided for the restoration or control of the power system frequency.

Load – The amount of electricity needed to meet demand at any given time.

Mega – A prefix used to denote 1,000,000 (one million) units (10^6).

Megawatt (MW) – One megawatt equals one million watts.

Megawatt-hour (MWh) – One megawatt-hour equals one million watt-hours. One MWh of electricity can power ten thousand 100-watt light bulbs for one hour.

Network – The apparatus, equipment, plant and buildings used to convey, and control the conveyance of, electricity to customers (whether wholesale or retail) excluding any connection assets. In relation to a Network Service Provider, a network owned, operated or controlled by that Network Service Provider.

Non-contestable Customer – A customer who obtains electricity from the local host electricity distributor/retailer. The customer does not have a choice of supplier.

Off-Peak – A time span of lower electricity usage, which would normally include public holidays, weekends and 9pm to 7am on weekdays.

Peak – A time span of higher electricity usage, which would normally involve 7am to 9pm on weekdays.

Reserve Margin – Reserve generating capacity maintained above the peak demand for electricity so as provide a level of operating flexibility and reliability within the system.

Sent-Out Energy – The amount of electricity supplied by a generator to the transmission or distribution network at its connection point.

Watt-hour – The total amount of energy used in one hour by a device that uses one watt of power for continuous operation. Electric energy is commonly sold by the kilowatt-hour.