ANNUAL POWER SYSTEM REVIEW

MARCH 2009

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Disclaimer

This review is based upon information received from participants in the Territory's electricity supply industry and agencies within government on a 'reasonable endeavours' basis. The information on which the review is based is current as at 19 March 2009.

The review contains certain predictions, estimates and statements that reflect various assumptions concerning load growth forecasts including accounting for major developments which may impact on the Territory's power system over the period to 2017-18. The Commission believes that the contents are accurate within the normal tolerance of economic forecasts and that the broad analyses are correct.

The purpose of this document is to review and report to the Minister in accordance with section 45 of the Electricity Reform Act 2000. It is not intended to be relied upon or 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 Commission and its officers accept no liability (including liability to any person by reason of negligence) for any use of the information in this document or for any loss, damage, cost or expense incurred or arising by reason of any error, negligent act, omission or misrepresentation in the information in this document or otherwise.

CHAPTER 1

INTRODUCTION

1.1 The Power System Review is published annually by the Commission in response to the requirements of section 45 of the *Electricity Reform Act 2000* ("the Reform Act").

1.2 Section 45 of the Reform Act requires the Commission 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;
- review and report to the Minister on the performance of the NT's power system;
- advise the Minister on matters relating to the future capacity and reliability of the NT's power system relative to forecast load;
- advise the Minister, either on its own initiative or at the request of the Minister, on other electricity supply industry and market policy matters; and
- submit to the Minister, and publish, an annual review of the prospective trends in the capacity and reliability of the NT's power system relative to projected load growth.

1.3 In 2005, the Commission broadened the scope of its Review to include an assessment of the arrangements under which power system planning and reliability is addressed in the NT, in addition to its regular examination of prospective demand and supply conditions for the generation sector.

Consultation with interested parties

1.4 The Commission has again consulted with various parties, including participants in the Territory's electricity supply industry and agencies within Government. This report has benefited significantly from the comments received from parties consulted by the Commission, although the views expressed in the report are those of the Commission alone and are not necessarily those of the parties consulted.

Inquiries

1.5 Inquiries regarding the Review should be directed in the first instance to:

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CHAPTER

2

SUMMARY OF KEY FINDINGS

2.1 This year's Power System Review addresses certain network planning and reliability issues and updates the Commission's assessment of the adequacy of generation capacity and gas supplies over the medium term to 2011-12, and the longer term to 2017-18.

Network planning and reliability

2.2 For the first time, the Commission has asked Power and Water to provide information on its network planning methods and asset capacity. The *Network Planning and Reliability Report* provided by Power and Water should support development of sound network management practices, leading to a more reliable and efficient power system. [1]

2.3 In its 2005 Power System Review, the Commission documented what it saw as a number of deficiencies in the approach taken in the Territory to addressing the key public policy interests inherent in the management of power system reliability. These deficiencies still apply. The policy framework within which Power and Water operates contains basic contradictions, with Power and Water structured as a commercial, return-oriented business entity but encumbered with implicit obligations to operate as if it were still a public authority responsible for deciding matters of public policy interest. Under good public policy, the point of separation should be explicit and transparent, and be capable of answering the key public interest questions, such as what level of reliability is considered to be satisfactory, how this is expressed in operational power system terms, and who is accountable and by what means.

2.4 The jurisdictions that make up the National Electricity Market (NEM) are faced with similar issues. In the Commission's view, while the issues that arise when commercial entities provide key infrastructure services are not at all fully resolved in the NEM, they are better managed compared with the NT by the requirements, checks and balances built into the NEM system of regulation.

2.5 Since 2005, the Commission has repeated its concerns in each of the subsequent Power System Reviews, but has noted that a broader review of regulatory arrangements was in process. As yet, no information has been released on the status of the Government's review. By itself, the continuing slow pace of policy development would be a sufficient cause for concern. However, the management of power system reliability has been given specific focus by the supply interruptions customers experienced in September and October 2008 as a result of events at the Casuarina substation, and the subsequent findings and conclusions of the Davies Report.

2.6 The Davies Report drew a number of largely negative conclusions regarding the past performance of Power and Water in managing the infrastructure assets that make up the Darwin region power supply network. In particular, procedures for

[1] Power and Water's *2009 Network Planning and Reliability Report* can be viewed or downloaded from the Commission's website.

monitoring and reporting the condition of key assets were considered to be deficient, and the resulting level of equipment maintenance was assessed as below the standard required to meet good industry practice. The Report also raised the concern that these problems may extend into other areas of the NT network.

2.7 The Davies Report has been accepted in full by Power and Water, and the Commission is advised that a strategic management approach is being taken in order to implement the recommendations as quickly and thoroughly as possible. While it is likely to take some time for the full implications to become apparent, Power and Water has advised that a high proportion of the assets so far assessed may require replacement. Significant increases in both capital and operating costs may therefore be in prospect.

2.8 The Davies Report has provided something in the way of a wake-up call. There is now good reason for the Government to finalise its assessment of the influence that the institutional and regulatory framework within which Power and Water operates has had on Power and Water's management practices and the service outcomes produced.

2.9 The Commission would be surprised if the absence of a technical code setting out the roles and responsibilities for achieving a reliable and efficient network, and the apparent conflict between Power and Water's *de facto* role in setting network reliability standards – essentially a matter of public policy interest – and its commercial 'self interest' as a corporatised entity, did not contribute in important ways to the situation revealed by the Davies Inquiry.

2.10 There is also the question of who – consumers or taxpayers – should bear the funding of additional spending yet to be decided in response to the findings and recommendations of the Davies Inquiry. Should it be passed through to consumers or borne by the Government (and so taxpayers)?

2.11 The Government has itself indicated that the issue of who pays may require a policy response, given statements in Parliament that power prices 'will not go up because of this power crisis'[2], and the recent announcement of an inquiry into Power and Water's overall financial position. On the other hand, Power and Water has flagged its intention to the Commission to seek pass-through of some if not all of the remedial costs involved.

2.12 How the funding of any remedial spending – in the form of both catching up on the maintenance backlog and rehabilitating assets overdue for replacement or renewal – is most appropriately shared between consumers and taxpayers is not a straight forward matter. The more that it can be shown that past deferrals of asset maintenance and renewal was the consequence of poor governance or regulatory frameworks and/or of internally-generated cash flow being diverted to dividend payments or being squeezed by the failure of the Government to fully fund community service obligations (CSOs), the greater is the case for the Government (and so taxpayers) bearing most of the associated costs. If, on the other hand, any increased spending can be sheeted home to Power and Water significantly increasing investment in its network and improving network security and reliability of supply in response to a public policy decision by the Government imposing service quality enhancements on Power and Water, the greater is the case for consumers bearing most of the associated costs.

2.13 These matters will be subject to closer scrutiny by the Commission over the next year as the nature and extent of the remedial task facing Power and Water becomes clearer and the Government moves to clarify its public policy position on any service quality enhancements required of Power and Water. Clause 71(c) of the NT Electricity Networks (Third Party Access) Code empowers the Commission to reset network prices during a regulatory period if it is satisfied there exist:

[2] *Daily Hansard: Parliamentary Record No.2*, 21 October 2008, Minister for Essential Services, Question: Power and Water Corporation - Cost of Backup Generators and Increases to Power Bills.

"…extraordinary developments with respect to any one of the key factors identified in clause 68 [of the Code] which, in the opinion of the regulator, were outside the network provider's control".

2.14 In the event there is a call for an intra-period increase in prices in response to the issues discussed above, the careful wording of this clause will require explicit judgments as to why consumers should carry an increased cost burden.

Generation capacity in the medium term

2.15 The Commission has updated its assessment of the 'adequacy' of generation capacity by comparing a baseline projection of capacity over the 2008-09 to 2011-12 period with its forecast of peak demand in each of the three regulated systems, Darwin-Katherine, Alice Springs and Tennant Creek.

Demand forecasts

2.16 Demand has been forecast primarily by considering economic and demographic conditions. Information on new projects that add significantly to demand has been included where the likelihood of commencement is high.

2.17 Following on from a period of high growth in recent years, the economic outlook for the NT is for solid growth in 2008-09, supported by mining, related investment, strong construction activity and firm jobs growth. However, the Territory is expected to experience an economic downturn over at least the next year or two in line with a global economic downturn.

2.18 The Commission has decided to include the impacts of the INPEX LNG project from 2010 in its medium term economic forecasts. Current indications are that the project is likely to proceed in Darwin (subject to the necessary approvals). If the project does proceed, it is likely to have a significant impact on population and employment in the Territory, which in turn will have a consequent impact on electricity demand and consumption.

2.19 For the Territory as a whole, output, employment and total population are forecast to record average growth rates of 1.6%, 1.8% and 2.2% respectively per annum.

2.20 It is important to recognise the importance of the INPEX project to this relatively buoyant medium term outlook. If the project does not proceed as currently anticipated, the outlook would be for significantly lower rates of employment and population growth over the next few years. Since the Commission's task is to review the capacity of the power system to meet prospective demand, it is reasonable to assume for the purposes of this review that the project will proceed as currently scheduled.

2.21 Electricity consumption and peak demand are forecast to increase by an average of 3.3% per annum (baseline growth, including the indirect impact of the INPEX project through the boost given to employment and population growth, but not including the direct impact of electricity required by the project itself) in the Darwin-Katherine system. The inclusion of demand expected from the INPEX project during its construction phase increases the forecast growth in demand and consumption to an average of 4.6% per annum.

2.22 In the absence of support from known planned projects, economic and demographic conditions are expected to record lower rates of growth in Alice Springs and Tennant Creek as these regions are affected by the difficult international conditions. Accordingly, electricity consumption and peak demand in these systems are forecast to grow at rates averaging 1% and 0.5% respectively.

Capacity projections

2.23 Baseline capacity has been projected by adjusting existing capacity for additions and retirements that are considered to be firm – either announced or scheduled for the near term. This is comparable with the approach taken by the National Electricity Market Management Company (NEMMCO) in developing its annual *Statement of Opportunities*. It has the advantage of avoiding assessments of the likelihood of uncommitted projects proceeding.

2.24 Given the current structure of the NT power market, it is likely that Power and Water is the only party actively planning to invest in new capacity. If the Commission were to include Power and Water's long term investment plans in the analysis it may inadvertently create the impression that additions to capacity are reserved for Power and Water.

2.25 This is not the case. The NT power market is open to investment from any source that meets the licence criteria. The Commission makes no assumption as to who will build the new capacity that its analysis indicates is required. The Commission's role is to provide information to all interested parties on the prospective supply-demand balance, to facilitate efficient investment from whatever source and to support the development of a competitive market.

Darwin-Katherine regulated system

2.26 The assessment of capacity adequacy for the Darwin-Katherine system over the medium term depends on the reserve standard that is applied.

2.27 At N-1, demand is met over the medium term period. However, based on the Commission's demand forecasts, additional capacity is required before 2010-11 in order to satisfy the N-2 reserve standard.

Alice Springs regulated system

2.28 Demand is met for the entire period at the N-1 standard. At N-2, capacity is below the reserve standard in 2008-09, but demand is met for the rest of the period.

2.29 This assessment is subject to the qualification that the first two sets at the Owen Springs Power Station will be as currently advised by Power and Water (10.9MW in 2009-10 and a further 10.9MW in 2010-11).

Tennant Creek regulated system

2.30 At both the N-1 and N-2 reserve standards, capacity in Tennant Creek remains adequate over the medium term period.

Generation capacity in the longer term

2.31 For the period 2012-13 to 2017-18, the Commission has assessed the requirement for new capacity by comparing its baseline capacity projection with high and low growth demand scenarios.

2.32 The high demand growth scenario assumes demand growth of 4% per annum in Darwin-Katherine, 3.5% in Alice Springs and 3% in Tennant Creek. The comparable rates in the low demand growth scenario are 2%, 1.5% and 0% respectively.

2.33 For each scenario, the additional capacity required to satisfy the N-1 and N-2 reserve standard has been calculated.

Darwin-Katherine regulated system

2.34 In the Darwin-Katherine system, under the high demand growth scenario, 83MW of additional capacity is required by 2017-18 to meet the N-1 standard and 131MW is required to meet the N-2 standard.

2.35 Under the low demand growth scenario, additional capacity of 42MW is required to meet the N-1 standard and 90MW is required to meet the N-2 standard by 2017-18.

2.36 The Commission recognises that Power and Water has identified the prospective shortfall in capacity for the Darwin-Katherine system in the longer term, and has flagged plans to commission a new power station in 2012-13 to address this shortfall. However, Power and Water's planned capacity additions relating to a new power station in the longer term have not been included in the Commission's analysis, consistent with the Commission's approach to include only those additions to capacity that are considered to be firm – either because they have been publicly announced as committed and proceeding or are clearly scheduled for near term action.

Alice Springs regulated system

2.37 In the Alice Springs system, under the high demand growth scenario, capacity is adequate at the N-1 reserve standard for the beginning of the period. However, the reserve margin is fully eroded by 2015-16, indicating that additional capacity of approximately 36MW is required prior to 2015-16 in order to satisfy the N-1 reserve standard. At the N-2 reserve standard, capacity is adequate but tight for the beginning of the period. However, additional capacity is required prior to 2014-15 in order to satisfy the N-2 reserve standard. By 2017-18, the shortfall totals 46MW.

2.38 Under the low demand growth scenario, capacity is adequate at both the N-1 and N-2 reserve standards for the beginning of the period. However, the margin is fully eroded by 2015-16 at N-1 and 2014-15 at N-2. Additional capacity required to meet the N-1 standard falls to 28MW and additional capacity required to meet the N-2 standard falls to 39MW over the period.

2.39 The Commission understands that the capacity retirements in Alice Springs nominated by Power and Water (and included in the Commission's analysis) are linked to planned additions to the Owen Springs Power Station in order to address the resultant shortfall. As new generating units are added to Owen Springs over time, Power and Water intends to progressively retire the remaining units at the Ron Goodin Power Station. However, where these planned capacity additions are not 'firm', they have been excluded from the Commission's analysis. The Commission recognises that, in practice, the timing of the capacity retirements will be influenced by the availability of replacement capacity.

Tennant Creek regulated system

2.40 In the Tennant Creek system, under the high demand growth scenario, the projected capacity is sufficient to meet both the N-1 and N-2 reserve standards for the period.

2.41 Under the low demand growth scenario, capacity is also adequate at both the N-1 and N-2 reserve standards for the period.

Adequacy of gas supplies

2.42 Existing contracts for the supply of gas from the Mereenie gas field (with the exception of the 'reasonable endeavours' component of the MSA4 contract) expire this year. Gas volumes permitting, the Palm Valley contract expires in 2012.

2.43 The first supply of gas from the Blacktip field was targeted to be available for electricity generation on 1 January 2009. However, delays have been encountered during the construction of the gas plant at Wadeye, and this has put the completion of the project behind schedule. The first supply of gas from the Blacktip field is now expected to be available around June 2009.

2.44 In 2006-07 and 2007-08, due to the expected decline in gas supply from the Mereenie and Palm Valley gas fields, Power and Water had to supplement gas supplies with diesel for electricity generation at the Channel Island Power Station. Gas supply shortfalls required Power and Water to consume 0.05PJ of diesel in 2006-07, and 0.8PJ of diesel in 2007-08. Similar shortfalls are expected to occur again during 2008-09, until the first supply of gas from Blacktip becomes available.

2.45 To eliminate its exposure to diesel consumption, during 2007-08 Power and Water entered into a contract with ConocoPhillips to receive supplementary gas from the Bayu-Udan gas field, via the Darwin LNG facilities at Wickham Point. Construction of a pipeline to transport the gas that will interconnect with the existing Amadeus Basin to Darwin gas pipeline commenced in September 2007, and is expected to be completed by May 2009.

Gas supply-demand in the medium term

2.46 For 2008-09, supplies under the existing gas contracts are unlikely to be adequate to meet Power and Water's gas supply requirement, and further use of diesel is likely to be necessary to meet intra-day peaks. This situation will improve when the contingency gas supply from ConocoPhillips becomes available, and if additional gas is made available on the 'reasonable endeavours' basis under the MSA4 contract.

2.47 For 2009-10, the contract quantities currently scheduled to be available under the Blacktip agreement should be adequate to meet gas supply requirements, provided supply matches contract quantities.

2.48 However, the Commission estimates that for 2010-11 and 2011-12 projected gas requirements could marginally exceed the contract quantities available under the Blacktip agreement.

Gas supply-demand in the longer term

2.49 In the longer term, the Commission estimates that projected gas requirements will marginally exceed the contract quantities available under the Blacktip agreement, under both the high and low growth scenarios. However, the Commission notes that the projected shortfall could be somewhat alleviated if Power and Water's average plant efficiency improves with the commencement of the new Weddell and Owen Springs power stations.

2.50 The Commission also notes that supplies of Blacktip gas in excess of contract quantities are likely to be available in the future. Eni is understood to be building reserve capacity into their facilities and have reported the existence of further probable Blacktip reserves for potential development in the future.

2.51 The Commission also considers Power and Water's contingency supply arrangements (the contract with ConocoPhillips to supply supplementary gas and its diesel fuel stocks) to be adequate to provide sufficient back up to cover any shortfalls under Power and Water's primary gas contracts.

CHAPTER 3

NETWORK PLANNING AND RELIABILITY

Reliability and the public interest

3.1 Like many essential services, the importance of electricity tends to be appreciated most when its availability is called into question. When the supply of electricity is interrupted, a wide range of activities in the home, in industry and across the community are affected.

3.2 The electrical power system from which customers take their supply has two main components – the generating units in which electricity is produced, and the transmission and distribution network over which electricity is transported to the locations at which it is finally consumed. The performance of each is critical to meeting the requirements of customers for a reliable and affordable supply of electricity.

3.3 In theory, it is possible to design and construct a power system to deliver 100% reliability. It would require the very best quality equipment, the best maintenance practices and enough spare capacity to cover all possible failures and contingencies. The problem is that such a system would be so expensive that very few customers would be able to afford the electricity produced.

3.4 Reliability, therefore, has a cost, and one of the primary determinants of the reliability of supply is the position the community takes on the economic problem of balancing risk (of loss of supply) against cost. The process by which the trade-off between cost and risk is translated into a set of technical parameters and performance standards for operating, maintaining and developing the power system is a key issue of public policy, for which governments are responsible.

3.5 Since the mid-1990s, Australian governments have outsourced the production and delivery of electricity to businesses, which may be privately or publicly owned. These businesses operate within a set of rules and regulations established by government to ensure that the supply of electricity meets society's requirements for safety, reliability, affordability, etc. The Territory moved to this form of organisation in 2002. Since then, the Power and Water Corporation has operated as a commercial business owned by the NT Government, within the system of regulation established by the Government.

Previous criticisms of the current regulatory framework

3.6 No system of regulation is perfect, but in its 2005 Power System Review the Commission documented what it saw as a number of deficiencies in the approach taken in the Territory to addressing the key public policy interests inherent in the management of power system reliability. The Commission concluded:

"…current arrangements in the Territory are distinctive in that:

- *the responsibilities, accountabilities and powers of the main participants – the System Controller, Power and Water Generation and Power and Water Networks and the Commission itself – are largely undefined; and*

- *there is limited recognition regarding the desirability of separating public interest responsibilities from commercial interests."* [3]

3.7 The Commission noted at the time that this is inconsistent with generally accepted industry practice. Among a number of disadvantages, it blurs the distinction between commercial interests and the public interest, makes the planning and investment process opaque and increases the risk that investment decisions may be sub-optimal from a power system perspective.

3.8 More detail on the Commission's views is provided in Appendix B.

3.9 In each subsequent Power System Review, the Commission has referred to its concerns, but noted that it was aware that a broader review of regulatory arrangements was in process. For example, in its 2007 Review, the Commission reported:

> *"The Government is currently considering the merits of joining the national energy regime established by the Australian Energy Market Agreement. NT Treasury has advised that it is in the process of undertaking targeted consultation with national energy market bodies and NT users, with a view to the Government making a final decision in the first half of 2008. In this context, the Commission has raised its concerns in regard to the management of power system planning and reliability in the Territory.*
>
> *The Commission must await the outcome of the Government's deliberations. However, while the Commission appreciates that the matters raised are under active review, it is disappointed by the slow pace evident in developing appropriate policy responses."*[4]

3.10 No further information has been released on the status of the Government's review. By itself, the continuing slow pace of policy development would be a sufficient cause for concern. However, the management of power system reliability has been given specific focus by the supply interruptions customers experienced in September and October 2008 as a result of events at the Casuarina substation, and the subsequent findings and conclusions of the Davies Inquiry.

The Casuarina substation event and the Davies Inquiry

3.11 The equipment failures at the substation and in the nearby network were clearly significant. Not only were there extensive and repeated supply interruptions to a large number of customers, but the security of supply also remained uncertain for a considerable period. Dangerous conditions within the substation added to the gravity of the situation by creating a safety risk for Power and Water employees.

3.12 In response to the significance of the event, the Government established the Davies Inquiry. The subsequent report, released early in February 2009, made findings about the causes of the equipment failures and the response of Power and Water in managing the impact on the network in the immediate aftermath.[5] These findings are largely of a technical nature. However, the report also draws a number of largely negative conclusions regarding the past performance of Power and Water in managing the equipment that makes up the Darwin region power supply network, and raises the concern that these problems may also extend into other areas of the NT network.

3.13 While noting the difficult circumstances under which Power and Water operates – the harsh climate, the small scale of its operations and the limitations this places on the organisation's technical capacity – the report is critical of key aspects of Power and Water's management of the network. In particular, its procedures for monitoring and reporting the condition of key assets were considered to be deficient, and the resulting level of equipment maintenance was assessed as below the standard required to meet good industry practice.

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[3] Utilities Commission, *Power System Review*, December 2005, p.28

[4] Utilities Commission, *Power System Review*, December 2007, p.7

[5] *Independent Enquiry into Casuarina Substation Events and Substation Maintenance Across Darwin: Final Report*, Chairman: Mervyn Davies, February 2009.

3.14 The scope of the investigations carried out by the Davies Inquiry limit the extent of the conclusions drawn. Nevertheless, the report raises the possibility that the problems that were identified in relation to the Darwin region network may apply more generally to Power and Water's operations across the NT power network. In other words, the problems may be systemic. This raises the possibility – and it is only a possibility – that the power system more widely may be subject to higher levels of reliability risk than the community may regard as acceptable.

3.15 Power and Water has responded to the Casuarina events with an evident sense of urgency. The Davies Report has been accepted in full and a strategic management approach taken in order to implement the recommendations as quickly and thoroughly as possible. Nevertheless, it is likely to take some time for the full implications to become apparent. Power and Water has advised that early indications from an initial selective review of asset condition suggest that a high proportion of the assets so far assessed may require replacement. Significant increases in both capital and operating costs may therefore be in prospect. If this eventuates, a decision will be required on how these costs are to be allocated between customers (via the network charges they pay) and taxpayers (via the return provided to the government as the owner of Power and Water).

3.16 The Commission would be surprised if the absence of a technical code setting out the roles and responsibilities for achieving a reliable and efficient network, and the apparent conflict between Power and Water's *de facto* role in setting network reliability standards – essentially a matter of public policy interest – and its commercial 'self interest' as a corporatised entity, did not contribute in important ways to the situation revealed by the Davies Inquiry.

3.17 There is also the question of who – consumers or taxpayers – should bear the funding of additional spending yet to be decided in response to the findings and recommendations of the Davies Inquiry. Should it be passed through to consumers or borne by the Government (and so taxpayers)?

3.18 The Government has itself indicated that the issue of who pays may require a policy response, given statements in Parliament that power prices 'will not go up because of this power crisis'[6], and the recent announcement of an inquiry into Power and Water's overall financial position. On the other hand, Power and Water has flagged its intention to the Commission to seek pass-through of some if not all of the remedial costs involved.

3.19 How the funding of any remedial spending – in the form of both catching up on the maintenance backlog and rehabilitating assets overdue for replacement or renewal – is most appropriately shared between consumers and taxpayers is not a straight forward matter. The more that it can be shown that past deferrals of asset maintenance and renewal was the consequence of poor governance or regulatory frameworks and/or of internally-generated cash flow being diverted to dividend payments or being squeezed by the failure of the Government to fully fund community service obligations (CSOs), the greater is the case for the Government (and so taxpayers) bearing most of the associated costs. If, on the other hand, any increased spending can be sheeted home to Power and Water significantly increasing investment in its network and improving network security and reliability of supply in response to a public policy decision by the Government imposing service quality enhancements on Power and Water, the greater is the case for consumers bearing most of the associated costs.

3.20 These matters will be subject to closer scrutiny by the Commission over the next year as the nature and extent of the remedial task facing Power and Water becomes clearer and the Government moves to clarify its public policy position on any service quality enhancements required of Power and Water. Clause 71(c) of the NT

[6] *Daily Hansard: Parliamentary Record No.2*, 21 October 2008, Minister for Essential Services, Question: Power and Water Corporation - Cost of Backup Generators and Increases to Power Bills.

Electricity Networks (Third Party Access) Code empowers the Commission to reset network prices during a regulatory period if it is satisfied there exist:

> *"…extraordinary developments with respect to any one of the key factors identified in clause 68 [of the Code] which, in the opinion of the regulator, were outside the network provider's control".*

3.21 In the event there is a call for an intra-period increase in prices in response to the issues discussed above, the careful wording of this clause will require explicit judgments as to why consumers should carry an increased cost burden.

Questions for the regulation of the power system

3.22 The picture that comes out of the Davies Inquiry is obviously less than ideal. While Power and Water carries primary operational responsibility for the concerns raised in the report, it is also necessary to stand back and look at the larger 'institutional' context. Power and Water is a commercial business operating in response to its corporate charter, the directions of its owner, and in accordance with the rules and regulations that govern its activities. Each of these factors will exert an influence on how the business operates.

3.23 The Commission is not in a position to comment on the relationship between Power and Water and its owner. However, as noted above, the Commission does have a direct interest in the effectiveness of the regulatory framework.

3.24 The deficiencies described in the 2005 Power System Review still apply. The policy framework within which Power and Water operates contains basic contradictions; Power and Water is structured as a commercial, return-oriented business entity, but has implicit obligations to operate as if it were still a public authority, responsible for deciding matters of public policy interest. While it is important to acknowledge that in practice it is impossible to fully separate commercial and public policy interests (it is more in the nature of a continuum), nevertheless, the point of separation should be explicit and transparent, and be capable of answering the key public interest questions, such as what level of reliability is considered to be satisfactory, how this is expressed in operational power system terms, and who is accountable and by what means.

3.25 The jurisdictions that make up the National Electricity Market (NEM) are faced with the same issues. In the Commission's view, compared with the NT, while the issues that arise when commercial entities provide key infrastructure services are not at all fully resolved in the NEM, they are better managed by the requirements, checks and balances built into the system of regulation.

3.26 The central question is – does the current institutional and regulatory environment within which Power and Water operates support and incentivise good management practices? In the Commission's view the answer is – not as well as it could.

3.27 Would a NEM-style system of regulation have prevented the Casuarina substation event, and the underlying operational problems, from occurring? While it is clearly not possible to be definitive, it is likely that the chances of such an outcome would, to some extent, be reduced. This is a qualified judgment – the system of regulation can influence operational practices, but it does not, and cannot, determine them. Regulation is not a cure-all, far from it. If the regulator, or some other agency looking over the shoulder of the network service provider, was the better manager of the network, then they should be given the responsibility and left to do the job. Intrusive regulation in these circumstances has a long history of abject failure.

3.28 Best practice NEM regulation applies a limited range of mechanisms:

- a clear separation of policy, regulatory and commercial functions;

- similar clarity and separation of accountabilities;
- transparency of information in key areas affecting service outcomes, such as planning methods, investment decision-making and the availability of capacity to meet demand;
- service outcomes performance monitoring combined with active, public peer group comparisons ('league tables');
- carefully designed financial incentives and penalties tied to agreed customer service outcomes; and
- procedures for investigating operational or technical concerns, such as independent audits or peer group reviews triggered by concerns regarding operating practices.

3.29 Of these mechanisms, only the last would possibly have prevented the Casuarina event from occurring, and then only if there had been sufficient information available on the condition of the asset or the standard of maintenance to trigger an independent external investigation. Nevertheless, the possibility of investigation, and the presence of financial incentives and penalties tied to customer service levels, and the reporting requirements, and awareness that service performance would be publicly compared with other service providers, may, in combination, have influenced management practices to the degree necessary to ensure that equipment maintenance and asset condition reporting received the priority it deserved, and that the Davies Inquiry concluded it did not get.

Casuarina and the Davies Report as an opportunity

3.30 The Davies Report has provided something in the way of a wake-up call. There is now good reason, supported by the views of an independent, highly respected and experienced senior power system manager, to take a thorough look at the influence that the institutional and regulatory framework within which Power and Water operates has on its management practices and the service outcomes produced.

3.31 The Commission is aware that NT Treasury has been looking at these and related issues for some time. Perhaps the Davies Report and the events at Casuarina will add a sense of urgency to this somewhat drawn-out process. The Commission wholeheartedly agrees, however, that it is better to be done right than done quickly.

3.32 In the meantime, the Commission has asked Power and Water to respond to a NEM-style request for information on its network planning methods and asset capacity. The requirement to provide this information in the NEM originates in the jurisdictional Network Codes developed by the relevant governments. While the NT lacks such a Network Code, Power and Water has responded positively to the Commission's request.

3.33 The Commission's information request is provided at Appendix C. Power and Water's response (*2009 Network Planning and Reliability Report*) is published in conjunction with this document, and can be viewed or downloaded from the Commission's website. In the short time available, and during a difficult period for its staff, Power and Water has made a highly creditable effort to meet the substance of the information request. It is to be hoped that this, and possibly other measures to be introduced in the future, will assist Power and Water's efforts by supporting the development of sound network management practices, leading to a more reliable and efficient power system.

CHAPTER 4

OUTLOOK FOR ELECTRICITY DEMAND

4.1 This chapter examines prospects for electricity demand in the Territory's regulated power systems.

4.2 The period under review extends to 2017-18. While a 10 year horizon allows longer term questions regarding the sequencing and size of capacity requirements to be explored, most interest is centered on the next few years. Medium term system adequacy assessment exercises, for example, generally examine system adequacy for a period up to two years ahead. Similarly, NEMMCO's horizon for its annual *Statement of Opportunities* provided to help market participants evaluate investment opportunities is 10 years, but in its role as reserve trader its horizon for assessing system adequacy is limited to two years.

4.3 Consistent with the approach taken in the previous two Power System Reviews, the approach taken in this Review is to look in some detail at the next four years (2008-09 to 2011-12) and then project forward another six years using broader brush demand scenarios.

Forecasting electricity demand

4.4 Electricity is consumed by individuals in households, by service organisations such as hospitals, schools and government administration, and by commercial entities in offices, shops, manufacturing, agriculture and mining. The quantity of electricity consumed is determined by the number and type of electricity-using appliances and the rate at which they are used. Since data at this level of detail is not generally available, the demand for electricity is usually assessed by focusing on its relationship with measures of economic activity and demographic change and movements in relative prices.

4.5 By examining the relationship between overall electricity consumption and economic, demographic and relative price variables, 'top-down' forecasts of future electricity consumption can be developed based on assessments of expected economic and demographic conditions and price changes. If the data is available, top-down forecasts for broad customer groups – households, commercial offices and shops and other industrial, mining and agricultural activities for example – can also be developed.

4.6 Top-down forecasts in effect average out the actions of individual customers. However, where the market for electricity is fairly small, or there is a need to identify local impacts, as in network planning for example, a bottom-up approach that takes account of the expected consumption of large individual sources of demand, such as new mining projects for example, may also add value.

The Commission's approach

4.7 For this year's Review, the Commission once again sought assessments of medium and longer term conditions from agencies within the NT Government with the relevant responsibilities and expertise in economic and demographic forecasting.

However, with the exception of population forecasts provided through Northern Territory Treasury and available in the Northern Territory Population Projections (2009), no agency within the NT Government currently prepares and publishes economic forecasts for the Territory beyond the next financial year.

4.8 The Commission has used the Northern Territory Population Projections, in conjunction with Access Economics *Business Outlook* (December quarter 2008) and assessments of economic conditions made available by the major trading banks and other commentators, in the development of its electricity demand forecasts.

4.9 For the medium term 2008-09 to 2011-12, the Commission has identified a baseline rate of electricity consumption and peak demand growth. New projects that have a high likelihood of proceeding and a significant impact on electricity demand have been added to the baseline forecast.

4.10 For the longer term period from 2012-13 to 2017-18, the Commission has developed high and low growth scenarios. These focus on the aggregate growth in demand and energy. Due to the uncertainty involved, no attempt has been made to separately assess the impact of individual projects over this longer timeframe.

Economic and demographic conditions – medium term

4.11 Economic and demographic conditions are a primary driver of electricity demand. As economic activity increases and population levels rise, both the stock of electricity-using equipment and the rate of utilisation increase.

4.12 Conditions in the NT economy are principally influenced by three factors: global economic conditions and their link to resource development and the commodity price cycle, government spending on defence and infrastructure projects, and the performance of the tourism sector in attracting domestic and overseas visitors. If these sectors are doing well they provide a stimulus to employment, incomes and population growth more generally, which in turn flows through to the housing, retail and service sectors.

4.13 Access Economics' forecast for the Northern Territory presents a continuation of solid economic growth during 2008-09, due to the momentum developed during the resource, engineering and construction boom of recent years. However, this momentum may fall away quite rapidly due to the global recession, and in particular the slowdown materialising in large resource importing economies such as China. As a consequence, baseline NT growth rates are expected to slow over the medium term.

> *"The projects now underway – big and small – all have lead times attached, meaning that the Territory is running on the momentum developed when global conditions were very different to today. That is why little has changed so far. ...*
>
> *But that momentum will fade from here. As we said in the last issue of Business Outlook, "the Territory faces risks from more slowdown materialising in emerging economies. As is true of some other parts of Australia, the Territory is a leveraged bet on global growth".*
>
> *Well, the Northern Territory just lost that bet.*
>
> *That won't be evident for much of 2009, but ... output growth will soon ease, and demand growth could take a cold shower.*
>
> *That's not a disaster. It's a cycle. China's strength will return, as will other emerging economies, and the Top End's superb resources and strategic position should continue to serve it well for the longer term. However, the fuse of slowdown has been lit. This may be a slow burn, but the Territory's economy will be one of the larger losers from recent turmoil."* [7]

[7] Access Economics, *Business Outlook*, December 2008, pp.113-114

4.14 The forecasts in Table 4.1 illustrate this view:

Table 4.1 – Medium Term Economic and Demographic Variables
Northern Territory – Access Economics Forecasts
(percentage changes)

	2008-09	2009-10	2010-11	2011-12
Real gross state product	4.7	2.4	-0.4	-0.1
Real final demand	8.2	-0.8	2.6	1.8
Employment	2.6	1.1	0.7	1.1
Population	2.1	2.1	2.0	1.8

Source: Access Economics

4.15 The views of other economic analysts broadly align with this assessment. The consensus view is that, following on from a period of high growth in recent years, growth in the Territory will remain solid in 2008-09, supported by mining, related investment, strong construction activity and firm jobs growth. However, the Territory is expected to experience an economic downturn over the next three to four years in line with a global economic downturn.

4.16 The extent to which the Territory economy is affected by the global financial crisis will predominantly depend on the performance of its mining, engineering construction and tourism sectors. The Territory has recently benefited from a number of major projects, such as the Wickham Point LNG plant and the Alcan G3 expansion. But several large resource-related projects have recently been completed, are nearing completion, or have already experienced financial difficulties (the Compass Resources project, for example, which was included in last year's PSR as a major project, is now operating at a much reduced scale with the company under administration), and future investment is likely to be restrained.

4.17 An important exception to this trend is the planned INPEX LNG project in Darwin. This is expected to be a large project. As currently scheduled, during the construction phase INPEX is projected to significantly boost employment and population levels in the Darwin region, with flow-on effects for the local economy.

4.18 Access Economics notes that:

> *"…the Inpex Alpha LNG plant is now considering being based in Darwin rather than WA. Keep watching energy prices, because this $12 billion project is the subject of a feasibility study for a possible 2010 start, and would more than fill the NT's current mega-project hole."* [8]

4.19 NT Treasury provided two population growth scenarios to the Commission, available in the Northern Territory Draft Population Projections. These population growth scenarios are summarised by the Commission in Table 4.2:

- Population Scenario 1: NT Government projections using historical trends; and
- Population Scenario 2: Projections based on short term variable migration, and including the impact of INPEX from 2009-10.

Table 4.2 – Medium Term Demographic Variables
Northern Territory Population Projections (percentage changes)

	2008-09	2009-10	2010-11	2011-12
Population Scenario 1	1.4	1.4	1.4	1.4
Population Scenario 2 (including INPEX)	2.0	2.3	2.4	2.2

Source: Northern Territory Draft Population Projections 2009

[8] Access Economics, *Business Outlook*, December 2008, p.115

4.20 In considering whether or not to include the impact of the INPEX project in its medium term economic and demographic forecasts, the Commission has considered the likelihood of the project proceeding, and the likely impact of the project on the Territory's economy.

4.21 On 26 September 2008, INPEX announced that Middle Arm Peninsula in Darwin has been selected as the location for its proposed liquefied natural gas (LNG) processing facility.[9] The project involves three key elements:

- development of the Ichthys gas field 850 km southwest of Darwin;
- piping the gas onshore via a sub-sea pipeline; and
- processing gas and storing the LNG onshore for export.

4.22 A final investment decision on the project is expected by early 2010, subject to environmental approvals and engineering design study completion. The first LNG shipment from Darwin is planned for late 2014 or early 2015.

4.23 INPEX estimates that:

- more than US$20 billion in capital expenditure will be required to construct the onshore and offshore facilities needed for the project;
- 2000 employees will be required in Darwin during the peak of the four-year construction phase of the project from 2010; and
- a full-time workforce of approximately 300 will be needed in Darwin to maintain and operate the onshore facilities over the 40 year life of the project. [10]

4.24 The Commission therefore considers it prudent for the purposes of its electricity demand and supply analysis to include the impacts of the INPEX LNG project in its medium term economic forecasts. Current indications are that the project is likely to proceed (subject to the necessary approvals), and if the project does proceed, it is likely to have a significant impact on population and employment in the Territory, which in turn will have a consequent impact on electricity demand and consumption.

4.25 The Commission has considered the Northern Territory Draft Population Projections in conjunction with Access Economics' economic outlook in the development of its electricity demand forecasts. Table 4.3 summarises the economic outlook used by the Commission in preparing its forecasts of electricity demand for the medium term period from 2008-09 to 2011-12. This outlook includes the impact of the INPEX project on employment and population growth.

Table 4.3 – Indicative Medium Term Economic and Demographic Forecasts Northern Territory, 2008-09 to 2011-12 (average annual percentage changes)

Real gross state product	1.6
Real final demand	2.9
Employment	1.8
Population	2.2

Economic and demographic conditions - longer term

4.26 For the period 2012-13 to 2017-18, the Commission has again used a high growth and a low growth scenario to illustrate what might realistically be achievable for the Territory if the impetus to growth from resource development, tourism and other factors was to be either sustained or substantially reduced.

[9] INPEX media release, *INPEX Announces Northern Territory Location for Ichthys LNG Facility*, 26 September 2008.
[10] INPEX, *Final Ichthys Proposal Fact Sheet*, September 2008

4.27 Table 4.4 summarises the growth outlook used by the Commission in preparing its projections of electricity demand for the period 2012-13 to 2017-18.

Table 4.4 – Indicative Longer Term Economic and Demographic Projections Northern Territory, 2012-13 to 2017-18 (average annual percentage changes)

	Low Growth Scenario	High Growth Scenario
Real gross state product	2.0	4.5
Real final demand	2.0	3.5
Employment	1.0	3.0
Population	0.5	2.0

4.28 The purpose of using scenarios is to illustrate the realistic limits to growth, averaged over the longer term. Despite the many uncertainties present, not the least of which are the risks created by current international financial conditions and the possible response over the longer term to the threat posed by global warming, history continues to provide the most useful guide in this difficult task. As in previous Reviews, the approach taken by the Commission has been to set the high and low scenarios with reference to long term trends, and, in this process, not be unduly influenced by current conditions. On balance, the Commission has decided to hold the low and high growth longer term scenarios unchanged from last year's Review.

Other electricity demand influences

4.29 Electricity demand is also influenced by *energy intensity* (the rate at which electricity demand varies relative to the rate of general economic activity) and *relative prices* (the impact of changes in the price of electricity relative to the price of competing sources of energy and energy services).

4.30 Consistent with the approach taken in the last three Reviews, the Commission has made the assumption that both the intensity of electricity consumption and the intensity of peak demand will maintain a neutral influence on the growth in consumption and peak demand over the medium term. [11]

4.31 In relation to relative prices, the Commission has again made the assumption that price changes will exert a marginally negative influence on electricity consumption and demand over the medium term. [12]

Electricity forecasts 2008-09 to 2011-12

4.32 The picture that emerges from the Commission's medium term analysis is of an electricity market supported by a local economy with solid employment and population growth primarily driven by the INPEX project, no discernable trends suggesting a marked change in the intensity of electricity consumption or peak demand, but the prospect of price increases applying some negative pressure on consumption and demand at the margin.

4.33 It is important to recognise the importance of the INPEX project to this relatively buoyant medium term outlook. If the project does not proceed as currently anticipated, the outlook would be for significantly lower rates of employment and population growth over the next few years. Since the Commission's task is to review the capacity of the power system to meet prospective demand, it is nevertheless reasonable

[11] For a more detailed discussion, see the Utilities Commission's *Power System Review*, December 2005, pp.39-40

[12] Utilities Commission, *Power System Review*, December 2005, pp.40-41

to assume for the purposes of this review that the project will proceed as currently scheduled.

4.34 This overall picture requires translating into forecasts of electricity consumption and peak demand for each of the three regulated networks – Darwin-Katherine, Alice Springs and Tennant Creek.

4.35 The Commission has updated the log regression analysis used in the 2005 Review to investigate the extent of the relationship between the selected economic and demographic variables and electricity consumption. The results again indicate that a fairly close relationship exists between both employment and population, and electricity consumption in the NT. Appendix D describes the Commission's methodology and results of the regression analysis in more detail.

4.36 In the absence of support from known planned projects, economic and demographic conditions are expected to record lower rates of growth in Alice Springs and Tennant Creek as these regions are affected by the difficult international conditions.

Baseline growth rate

4.37 Based on forecast output, employment and population growth averaging around 1.6%, 1.8% and 2.2% respectively, baseline growth in electricity consumption and peak demand in the Darwin-Katherine system are forecast to average 3.3% per annum. This forecast includes the indirect impact of the INPEX project, through the boost given to employment and population growth, but not the direct impact of electricity required by the project itself.

4.38 The regression analysis undertaken by the Commission identifies an implied "elasticity" of the growth in electricity consumption with regard to population growth and employment growth of approximately 2.0 and 1.3 respectively. In the context of 2.2% population growth and 1.8% employment growth, these elasticity measures give support to electricity demand baseline growth of 3.3%.

Major project additions to baseline forecast

4.39 In addition to the baseline forecast, the demand that arises from major projects also plays a role. In its submission, Power and Water advised the Commission that it considered that there were no major projects with a high likelihood of proceeding in the medium term that would have a significant impact on electricity demand in the Territory's regulated systems.

4.40 In last year's Review, two committed projects with a large demand impact were identified by the Commission for inclusion in the electricity consumption and peak demand forecasts: the Compass Browns Oxide Project and the BOC Helium Plant at Wickham Point (with an expected aggregate demand of approximately 10MW). Remaining projects identified by Power and Water were assumed by the Commission to be incorporated in the baseline demand, either because of their relatively small impact on demand or their uncertain status.

4.41 Subsequently, Compass Resources went into administration in January 2009, just three months after sending out its first shipments of copper sheeting from the Browns Oxide mine and processing plant near Batchelor, south of Darwin. The current metals price collapse and the global credit crisis have been cited as contributing factors.

4.42 Power and Water has advised the Commission that the prospective load reported previously for the BOC Helium Plant has become a low probability. Given the current uncertainty, the Commission has assumed that demand relating to the BOC Helium Plant is incorporated in the baseline demand.

4.43 INPEX has indicated to Power and Water and the NT Government requirements for a 10-15MW supply during the construction phase of the project. The Commission considers that this will have a significant impact on demand, and has therefore added INPEX's expected demand requirements to its forecasts. The Commission has assumed the following demand profile for the INPEX project during its construction phase for the purposes of its electricity demand and supply analysis:

- 0MW in 2008-09
- 7.5MW in 2009-10
- 15MW in 2010-11
- 15MW in 2011-12
- 15MW in 2012-13
- 15MW in 2013-14
- 7.5MW in 2014-15
- 0MW in 2015-16.

4.44 The Commission understands that 15MW is likely to be the maximum demand required for the project. In order to capture the potential impact on the requirement for generation capacity, the Commission has conservatively chosen to err on the high-side, and has therefore used the expected maximum demand of 15MW throughout the construction phase, with the exception of the start and end years of the project where demand is assumed to progressively build up and wind-down.

4.45 In summary, the Commission has projected growth in baseline demand of 3.3% for Darwin–Katherine, to which is added the expected (maximum) demand from the INPEX project during its construction phase, as identified above. This results in an average annual compound rate of growth of 4.6% in peak demand during the medium term. Again, it should be stressed that this is an upper estimate of likely demand, heavily reliant on the INPEX project proceeding as scheduled.

4.46 Economic and demographic conditions are expected to record lower rates of growth in Alice Springs and Tennant Creek. Accordingly, electricity consumption and peak demand in these systems are forecast to grow at rates averaging 1% and 0.5% respectively. No major projects have been identified that impact on the Alice Springs and Tennant Creek systems.

4.47 Table 4.5 summarises the Commission's medium term electricity consumption and peak demand growth rates.

Table 4.5 – Electricity Consumption and Peak Demand Growth Rates
Northern Territory, 2008-09 to 2011-12
(average annual percentage changes)

	Baseline growth rate (including indirect impact of INPEX)	Baseline demand plus INPEX direct (compound growth rate)[(a)]
Darwin-Katherine	3.3	4.6
Alice Springs	1.0	
Tennant Creek	0.5	

(a) Baseline growth rate including the indirect impact of the INPEX project, plus demand from INPEX during its construction phase.

4.48 Table 4.6 presents actual electricity consumption and demand from 2000-01, and the Commission's medium term forecasts of electricity consumption and demand to 2011-12.

Table 4.6 – Peak Demand and Energy
Actual and Forecast to 2011-12 – Regulated Systems

	Darwin-Katherine		Alice Springs		Tennant Creek	
Financial Year	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)
2000-01	218	1291	44	205	6	27
2001-02	223	1357	43	210	7	31
2002-03	233	1253	48	220	8	33
2003-04	227	1242	49	223	7	30
2004-05	234	1273	53	229	7	31
2005-06	236	1289	53	236	7	29
2006-07	256	1362	54	236	7	29
2007-08	261	1416	54	229	7	30
2008-09	270	1463	55	232	7	30
2009-10	286	1553	55	234	7	30
2010-11	303	1644	56	236	7	30
2011-12	312	1696	57	239	7	30

Longer term demand scenarios

4.49 For the remaining six years of the period under review the Commission has applied high and low growth demand scenarios.

4.50 A broad analysis by the Commission of consumption in the Darwin-Katherine region indicates a longer term average annual growth rate of approximately 3% (over the period from 1990-91 to 2007-08). The Commission used this average to develop its high and low growth scenarios for Darwin-Katherine. The higher demand growth scenario assumes average annual growth in peak demand and energy use of 4% for the period 2012-13 to 2017-18. The lower growth scenario assumes average annual growth in peak demand and energy use of 2%.

4.51 For Alice Springs and Tennant Creek, the higher growth demand scenario assumes average annual growth in peak demand and energy use for the period 2012-13 to 2017-18 of 3.5% and 3% respectively. For the low growth demand scenario, the Commission has adopted annual rates of growth of 1.5% for Alice Springs and 0% for Tennant Creek.

4.52 The statistical relationships between electricity consumption, population and employment referred to earlier can be used as a cross-check. Applying the derived elasticities to the high and low projections for population and employment reported in Table 4.4 suggests growth in electricity consumption of approximately 4% and 1% in the high and low scenarios respectively.

4.53 Table 4.7 summarises the Commission's longer term electricity consumption and peak demand growth rates under both the high and low growth scenarios.

Table 4.7 – Longer Term Electricity Consumption and Peak Demand Growth Rates
2012-13 to 2017-18 (average annual percentage changes)

	Low Growth Scenario	High Growth Scenario
Darwin-Katherine	2.0	4.0
Alice Springs	1.5	3.5
Tennant Creek	0.0	3.0

4.54 Table 4.8 presents the resulting longer term forecasts of electricity consumption and demand under the Commission's high growth scenario.

Table 4.8 – Peak Demand and Energy Consumption
High Growth Scenario – Regulated Systems

	Darwin-Katherine		Alice Springs		Tennant Creek	
Financial Year	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)
2000-01	218	1291	44	205	6	27
2001-02	223	1357	43	210	7	31
2002-03	233	1253	48	220	8	33
2003-04	227	1242	49	223	7	30
2004-05	234	1273	53	229	7	31
2005-06	236	1289	53	236	7	29
2006-07	256	1362	54	236	7	29
2007-08	261	1416	54	229	7	30
2008-09	270	1463	55	232	7	30
2009-10	286	1553	55	234	7	30
2010-11	303	1644	56	236	7	30
2011-12	312	1696	57	239	7	30
2012-13	324	1761	59	247	7	31
2013-14	337	1828	61	256	7	32
2014-15	342	1857	63	265	8	33
2015-16	348	1889	65	274	8	34
2016-17	362	1965	67	284	8	35
2017-18	376	2044	70	293	8	36

4.55 Table 4.9 presents the resulting longer term forecasts of electricity consumption and demand under the Commission's low growth scenario.

Table 4.9 – Peak Demand and Energy Consumption
Low Growth Scenario – Regulated Systems

	Darwin-Katherine		Alice Springs		Tennant Creek	
Financial Year	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)	Demand (MW)	Energy (GWh)
2000-01	218	1291	44	205	6	27
2001-02	223	1357	43	210	7	31
2002-03	233	1253	48	220	8	33
2003-04	227	1242	49	223	7	30
2004-05	234	1273	53	229	7	31
2005-06	236	1289	53	236	7	29
2006-07	256	1362	54	236	7	29
2007-08	261	1416	54	229	7	30
2008-09	270	1463	55	232	7	30
2009-10	286	1553	55	234	7	30
2010-11	303	1644	56	236	7	30
2011-12	312	1696	57	239	7	30
2012-13	318	1729	57	242	7	30
2013-14	324	1762	58	246	7	30
2014-15	323	1755	59	250	7	30
2015-16	322	1748	60	253	7	30
2016-17	328	1783	61	257	7	30
2017-18	335	1819	62	261	7	30

CHAPTER

5

ADEQUACY OF GENERATION CAPACITY

5.1 This chapter first outlines the generation capacity available in the Territory's regulated power systems. The prospective supply-demand position in the Territory's power system is then examined against the background of the demand forecasts canvassed in the previous chapter.

Existing capacity

5.2 Supply of electricity in the NT's regulated power systems is provided by Power and Water, either from its own sources or under the terms of power purchase agreements it has with a number of Independent Power Producers (IPPs). At the regional level, 80% of all generation capacity in the Territory's regulated networks is installed in the Darwin-Katherine system, with the bulk of this capacity located at the Channel Island Power Station. The remaining 20% of generation capacity is installed in the Alice Springs and Tennant Creek regulated systems.

5.3 The Territory's generation facilities, consisting mainly of gas and liquid fuel driven turbines, are summarised in Table 5.1. Three indicators of 'supply capacity' are provided:

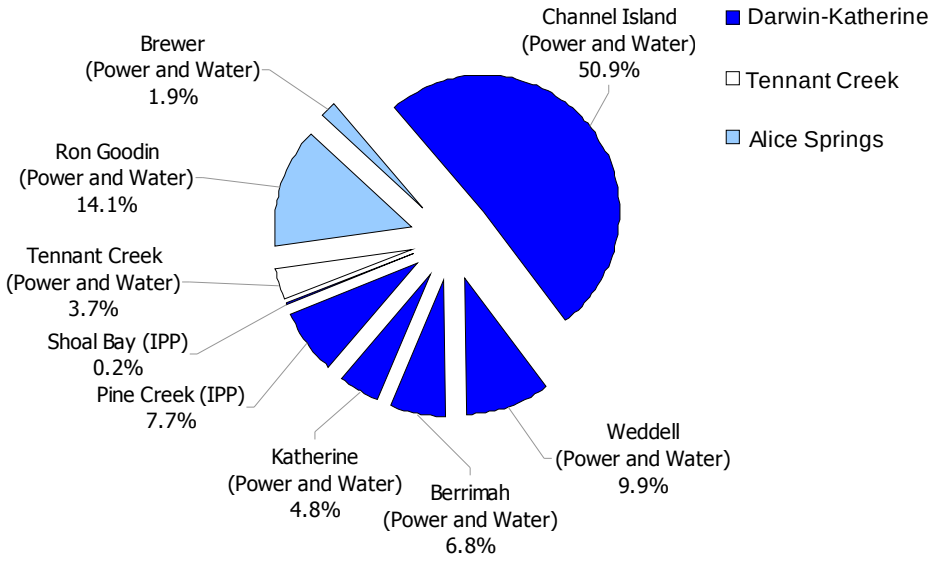
- total capacity (in MW);
- N-1 capacity (in MW), which indicates the generation capacity excluding the largest generating set in a particular system; and
- N-2 capacity (in MW), which indicates the generation capacity excluding the two largest generating sets in a particular system.

Table 5.1 – Power Facilities in Regulated Systems
30 June 2008

Region / Power station	Operator	Capacity (MW)	% of Total	Capacity at N-1	Capacity at N-2
Darwin-Katherine Regulated System:					
Channel Island	PWC	226.0			
Weddell	PWC	44.0			
Berrimah	PWC	30.0			
Katherine	PWC	21.3			
Pine Creek	IPP	34.1			
LMS Shoal Bay	IPP	1.1			
Total		**356.5**	**80%**	**308.5**	**260.5**
Tennant Creek Regulated System:					
Tennant Creek	PWC	16.4			
Total		**16.4**	**4%**	**12.5**	**11.0**
Alice Springs Regulated System:					
Ron Goodin	PWC	62.6			
Brewer	IPP	8.5			
Total		**71.1**	**16%**	**59.4**	**49.3**
Total Capacity in Regulated Systems		**444.0**	**100%**		

5.4 Power and Water has power purchase agreements with three IPPs that operate in regulated systems: Energy Developments Ltd (Pine Creek A operated by its subsidiary NGD (NT) Pty Ltd and Pine Creek B operated by its subsidiary Cosmo Power Pty Ltd); LMS Generation Pty Ltd (Shoal Bay); and Central Energy Power Pty Ltd (Brewer Power Station). Overall, about 44MW of capacity is currently available from these IPPs.

Chart 5.1 – Regulated System Power Station Capacities



5.5 Power and Water is also responsible for the provision of power services to remote indigenous communities and townships that are not connected to the regulated power system. Some of these areas include Yulara, Borroloola, Timber Creek, Daly Waters, Elliot, Ti-Tree and Kings Canyon. The generation capacity associated with these remote 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 4.

Changes to capacity during 2007-08

5.6 Construction of Power and Water's new power station in the Darwin-Katherine region was completed in 2007-08, including the commissioning and installation of the first generating set. This has increased the capacity of the Darwin-Katherine system by 44MW. The new Weddell Power Station is located close to the Channel Island Power Station to utilise existing gas pipeline and water infrastructure.

5.7 Power and Water has amended the total capacity of the Channel Island Power Station. In previous Reviews, the capacity of the Channel Island Power Station has been reported as 253.7MW, which included approximately 20MW made available by the power station's ice cooling capabilities.[13] Power and Water has now advised the Commission that ice cooling is no longer employed, as there is evidence that this style of operation has caused problems with generator rotor integrity. The capacity of the Channel Island Power Station is now considered to be 226MW.

5.8 Total capacity at Tennant Creek reduced from 16.7MW in 2006-07 to 16.4MW in 2007-08. This 0.3MW reduction was the net result of the retirement of a 2MW generating set, the installation of a 1.5MW generating set, and minor increases and reductions following modifications made to existing sets and site operating experience.

[13] Gas turbine output is significantly affected by changes in climatic conditions. An increase in inlet air temperature results in an output drop of the turbine. To counteract this, Power and Water employed a system that cools the inlet air to the turbines at the Channel Island Power Station.

Baseline capacity projections

5.9 In developing its baseline capacity projections, the Commission has taken the approach of including only those additions to capacity that are considered to be firm – either because they have been publicly announced as committed and proceeding or are clearly scheduled for near term action. Retirements included in the baseline capacity projections are as advised by Power and Water.

5.10 This method is comparable with the approach taken by NEMMCO in developing its annual *Statement of Opportunities*. It has the advantage of avoiding assessments of the likelihood of uncommitted projects proceeding.

5.11 Given the current structure of the NT power market, it is likely that Power and Water is the only party actively planning to invest in new capacity. If the Commission were to include Power and Water's long term plans in the analysis, it may inadvertently create the impression that additions to capacity are reserved for Power and Water.

5.12 This is not the case. The NT power market is open to investment from any source that meets the licence criteria. The Commission makes no assumption as to who will build the required new capacity indicated by its analysis. The Commission's role is to provide information to all interested parties on the prospective supply-demand balance, to facilitate efficient investment from whatever source and to support the development of a competitive market.

5.13 In some cases, in the years that Power and Water has nominated capacity retirements, these are linked to planned capacity additions to address the resultant shortfall. However, where these planned capacity additions are not 'firm', they have been excluded from the Commission's analysis. The Commission recognises that, in practice, the timing of the capacity retirements will be influenced by the availability of replacement capacity. [14]

5.14 Table 5.2 contains the Commission's baseline capacity projection for the Darwin-Katherine regulated system.

Table 5.2 – Darwin-Katherine Baseline Capacity Projection (MW)

Financial Year	Retire-ments	New Capacity	Total Capacity	N-1	N-2
2008-09	(22.5)	39.0	373.0	325.0	277.0
2009-10		10.0	383.0	335.0	287.0
2010-11			383.0	335.0	287.0
2011-12	(15.0)		368.0	320.0	272.0
2012-13			368.0	320.0	272.0
2013-14			368.0	320.0	272.0
2014-15			368.0	320.0	272.0
2015-16			368.0	320.0	272.0
2016-17	(26.6)		341.4	293.4	245.4
2017-18			341.4	293.4	245.4

[14] Power and Water takes a different view to the Commission on this matter: *"The Commission's comparison of its own long term demand forecasts with its own baseline projections of capacity is potentially misleading as the comparison, as acknowledged by the Commission, does not reflect the actual supply-demand balance that is expected to develop as we move closer to the years in question. ... Power and Water does not agree that its active planning curtails competition or that including its long term plans in the Commission's analysis creates the impression that additions to capacity are reserved for Power and Water. ... Further, it could be inferred that a market which is not of significant size, does not appear to be appropriately structured or have an adequate framework in place may deter potential market entrants from investigating investment opportunities."* (Power and Water email, 19 March 2009)

5.15 In 2008-09, overall capacity in Darwin-Katherine increases by 16.5MW. The Commission has included Power and Water's second planned capacity addition to the Weddell Power Station in its analysis, as the commissioning of the second unit is near completion. As a consequence, capacity increases by 39MW in 2008-09. This is off-set by a reduction in capacity of 15MW due to the decommissioning of set 1 at Berrimah, and by 7.5MW due to the expiry of the Pine Creek B power purchase agreement.

5.16 In 2009-10, capacity increases by 10MW due to a new set being commissioned for the Katherine Power Station. The Commission has included this planned capacity addition as tenders for this generating set are currently being assessed by Power and Water, with construction due to commence this financial year.

5.17 In 2011-12, capacity decreases by 15MW as the last generating set at Berrimah is decommissioned. Capacity reduces by a further 27MW in 2016-17 due to the expiry of the Pine Creek A power purchase agreement.[15] Power and Water has indicated that planning is underway for a third unit at Weddell for 2011-12, and that construction tenders may be issued in the months ahead. However, this is not shown as new capacity in Table 5.2, in line with the Commission's approach of only including 'firm' capacity additions.

5.18 Table 5.3 contains the Commission's baseline capacity projection for Alice Springs.

Table 5.3 – Alice Springs Baseline Capacity Projection (MW)

Financial Year	Retire-ments	New Capacity	Total Capacity	N-1	N-2
2008-09			71.1	59.4	49.3
2009-10	(4.0)	10.9	78.0	66.3	56.2
2010-11		10.9	88.9	77.2	67.1
2011-12			88.9	77.2	67.1
2012-13	(4.2)		84.7	73.0	62.9
2013-14			84.7	73.0	62.9
2014-15	(4.2)		80.5	68.8	58.7
2015-16	(12.7)		67.8	56.1	46.0
2016-17	(17.2)		50.6	38.9	28.8
2017-18	(5.5)		45.1	33.4	23.3

5.19 In February 2007, Power and Water announced its plans for the development of a new power station for Alice Springs, and construction of the Owen Springs Power Station located at Brewer Estate commenced in late 2008. As the construction contract includes the supply, installation and commissioning of the first two generating sets, the Commission has included them in its analysis. As a consequence, Alice Springs capacity increases by 10.9MW in 2009-10 and a further 10.9MW in 2010-11.

5.20 Alice Springs capacity is also reduced by 4MW in 2009-10, due to the decommissioning of two 2MW generating sets at the Ron Goodin Power Station. As new units are added to Owen Springs over time, Power and Water intends to progressively retire the remaining generating units at Ron Goodin. These retirements are currently planned for 2012-13, 2014-15, 2015-16, 2016-17 and 2017-18. Capacity decreases by a further 8.5MW in 2015-16 due to the expiry of the Brewer power purchase agreement.

5.21 Table 5.4 contains the Commission's baseline capacity projection for Tennant Creek. Power and Water has advised the Commission that at this stage, based on

[15] Power and Water has advised the Commission that there is a provision to extend the Pine Creek A power purchase agreement, should it be required.

current peak demand and consumption patterns, there are no planned additions to capacity or retirements from capacity for the Tennant Creek regulated system for the period 2008-09 to 2017-18.

Table 5.4 – Tennant Creek Baseline Capacity Projection (MW)

Financial Year	Retire-ments	New Capacity	Total Capacity	N-1	N-2
2008-09			16.4	12.5	11.0
2009-10			16.4	12.5	11.0
2010-11			16.4	12.5	11.0
2011-12			16.4	12.5	11.0
2012-13			16.4	12.5	11.0
2013-14			16.4	12.5	11.0
2014-15			16.4	12.5	11.0
2015-16			16.4	12.5	11.0
2016-17			16.4	12.5	11.0
2017-18			16.4	12.5	11.0

Indicators of system adequacy

5.22 Regrettably, as noted in previous Reviews, the Commission is still awaiting the outcome of NT Treasury's review of current electricity sector arrangements before further considering its 2005 Review conclusion that reliability criteria for the NT system should be made explicit on the advice of an appropriately constituted expert advisory body, and that these criteria should be used in future reviews of system adequacy. Accordingly, in the absence of any outcome from the Treasury review, the Commission has again reported against both the N-1 and N-2 standard.

5.23 The N-1 standard allows for the loss of the largest single unit of capacity. The N-2 standard is more stringent as it allows for the loss of the two largest units of capacity.

Supply-demand balance in the medium term

5.24 In the following sections, supply-demand conditions are examined for each of the regulated systems for the period 2008-09 to 2011-12.

Darwin-Katherine regulated system

5.25 Table 5.5 indicates the reserve position of the Darwin-Katherine system at the N-1 and N-2 standard, based on the Commission's medium term forecast of demand and its baseline capacity projection.

Table 5.5 – Medium Term Supply-Demand Balance Forecast Darwin-Katherine (MW)

Financial Year	Total Capacity	N-1	N-2	Peak Demand	Reserve Margin over N-1	Reserve Margin over N-2
2008-09	373.0	325.0	277.0	269.5	55	7
2009-10	383.0	335.0	287.0	286.0	49	1
2010-11	383.0	335.0	287.0	302.8	32	-16
2011-12	368.0	320.0	272.0	312.5	8	-40

5.26 For the Darwin-Katherine regulated system, demand is met for the entire period at the N-1 standard, with each year's reserve margin over N-1 by at least 8MW.

5.27 At the N-2 standard, reserve conditions are adequate through to 2009-10. Based on the Commission's demand forecasts, additional capacity is required before 2010-11 in order to satisfy the N-2 reserve standard.

Alice Springs regulated system

5.28 Table 5.6 indicates the reserve position of the Alice Springs system at N-1 and N-2.

Table 5.6 – Medium Term Supply-Demand Balance Forecast Alice Springs (MW)

Financial Year	Total Capacity	N-1	N-2	Peak Demand	Reserve Margin over N-1	Reserve Margin over N-2
2008-09	71.1	59.4	49.3	54.9	4	-6
2009-10	78.0	66.3	56.2	55.5	11	1
2010-11	88.9	77.2	67.1	56.0	21	11
2011-12	88.9	77.2	67.1	56.6	21	11

5.29 For the Alice Springs regulated system, reserve conditions are adequate at the N-1 standard for the entire period. At N-2, capacity is below the reserve standard in 2008-09, but demand is met for the rest of the period.

5.30 This assessment is subject to the qualification that the first two sets at the Owen Springs Power Station will be as currently advised by Power and Water (10.9MW in 2009-10 and a further 10.9MW in 2010-11).

Tennant Creek regulated system

5.31 Table 5.7 indicates the reserve position in Tennant Creek at N-1 and N-2.

Table 5.7 – Medium Term Supply-Demand Balance Forecast Tennant Creek (MW)

Financial Year	Total Capacity	N-1	N-2	Peak Demand	Reserve Margin over N-1	Reserve Margin over N-2
2008-09	16.4	12.5	11.0	6.9	6	4
2009-10	16.4	12.5	11.0	7.0	6	4
2010-11	16.4	12.5	11.0	7.0	6	4
2011-12	16.4	12.5	11.0	7.0	5	4

5.32 At both the N-1 and N-2 reserve standards, capacity in Tennant Creek remains adequate over the medium term period.

Supply-demand balance in the longer term

5.33 Comparisons of longer term demand forecasts with baseline capacity projections allow estimates to be made of the total additions to capacity that will be required for the period in question. Because the baseline capacity projections do not include assumptions regarding future capacity investments that may be expected to occur, the comparison does not reflect the actual supply-demand balance that is expected to develop as we move closer to the years in question.

5.34 For each of the three regions, the Commission has compared high and low growth demand scenarios for the period 2012-13 to 2017-18 with its baseline projections of capacity.

Darwin-Katherine regulated system

5.35 Table 5.8 indicates that, if demand increased at an average rate of 4% per annum over 2012-13 to 2017-18, 83MW of additional capacity is required by 2017-18 to meet the N-1 reserve standard, and 131MW of additional capacity is required to meet the N-2 reserve standard.

Table 5.8 – Longer Term Supply-Demand Balance
Darwin-Katherine High Growth Scenario
(MW)

Financial Year	Total Capacity	N-1	N-2	Peak Demand	Reserve Margin over N-1	Reserve Margin over N-2
2012-13	368.0	320.0	272.0	324.4	-4	-52
2013-14	368.0	320.0	272.0	336.7	-17	-65
2014-15	368.0	320.0	272.0	342.1	-22	-70
2015-16	368.0	320.0	272.0	348.0	-28	-76
2016-17	341.4	293.4	245.4	361.9	-68	-116
2017-18	341.4	293.4	245.4	376.4	-83	-131

5.36 Alternatively, as indicated by Table 5.9, if demand increased by an average of only 2% per annum, the requirement falls to 42MW and 90MW respectively to meet the N-1 and N-2 reserve standards.

Table 5.9 – Longer Term Supply-Demand Balance
Darwin-Katherine Low Growth Scenario
(MW)

Financial Year	Total Capacity	N-1	N-2	Peak Demand	Reserve Margin over N-1	Reserve Margin over N-2
2012-13	368.0	320.0	272.0	318.4	2	-46
2013-14	368.0	320.0	272.0	324.5	-4	-52
2014-15	368.0	320.0	272.0	323.2	-3	-51
2015-16	368.0	320.0	272.0	322.0	-2	-50
2016-17	341.4	293.4	245.4	328.4	-35	-83
2017-18	341.4	293.4	245.4	335.0	-42	-90

5.37 The Commission recognises that Power and Water has identified the prospective shortfall in capacity for the Darwin-Katherine system in the longer term, and has flagged plans to commission a new power station in 2012-13 to address this shortfall. Power and Water's planned capacity additions relating to a new power station in the longer term have not been included in the Commission's analysis, consistent with the Commission's approach to include only those additions to capacity that are considered to be firm – either because they have been publicly announced as committed and proceeding or are clearly scheduled for near term action. [16]

Alice Springs regulated system

5.38 Tables 5.10 and 5.11 present the comparable analysis for the Alice Springs system.

[16] Refer to the Baseline Capacity Projections discussion earlier in this chapter.

5.39 If demand increased at an average rate of 3.5% per annum over 2012-13 to 2017-18, capacity is adequate at the N-1 standard for the beginning of the period. However, the reserve margin is fully eroded by 2015-16, indicating that additional capacity is required prior to 2015-16 of approximately 36MW in order to satisfy the N-1 standard over the period. Capacity is adequate but tight at the N-2 standard for the beginning of the period. However, the margin is fully eroded by 2014-15, indicating that additional capacity is required prior to 2014-15 in order to satisfy the N-2 reserve standard. By 2017-18, the shortfall totals 46MW.

Table 5.10 – Longer Term Supply-Demand Balance
Alice Springs High Growth Scenario
(MW)

Financial Year	Total Capacity	N-1	N-2	Peak Demand	Reserve Margin over N-1	Reserve Margin over N-2
2012-13	84.7	73.0	62.9	58.6	14	4
2013-14	84.7	73.0	62.9	60.6	12	2
2014-15	80.5	68.8	58.7	62.7	6	-4
2015-16	67.8	56.1	46.0	64.9	-9	-19
2016-17	50.6	38.9	28.8	67.2	-28	-38
2017-18	45.1	33.4	23.3	69.5	-36	-46

5.40 Alternatively, as indicated by Table 5.11, if demand growth averages only 1.5% per annum, reserve conditions are adequate at both the N-1 and N-2 reserve standards for the beginning of the period. However, the reserve margins are fully eroded by 2015-16 at N-1 and 2014-15 at N-2. Additional capacity required to meet the N-1 standard falls to 28MW and additional capacity required to meet the N-2 standard falls to 39MW over the period under the low growth scenario.

Table 5.11 – Longer Term Supply-Demand Balance
Alice Springs Low Growth Scenario
(MW)

Financial Year	Total Capacity	N-1	N-2	Peak Demand	Reserve Margin over N-1	Reserve Margin over N-2
2012-13	84.7	73.0	62.9	57.4	16	5
2013-14	84.7	73.0	62.9	58.3	15	5
2014-15	80.5	68.8	58.7	59.2	10	0
2015-16	67.8	56.1	46.0	60.0	-4	-14
2016-17	50.6	38.9	28.8	60.9	-22	-32
2017-18	45.1	33.4	23.3	61.9	-28	-39

5.41 The Commission understands that the capacity retirements in Alice Springs nominated by Power and Water (and included in the Commission's analysis) are linked to planned additions to the Owen Springs Power Station in order to address the resultant shortfall. As new generating units are added to Owen Springs over time, Power and Water intends to progressively retire the remaining units at the Ron Goodin Power Station. However, where these planned capacity additions are not 'firm', they have been excluded from the Commission's analysis. The Commission recognises that, in practice, the timing of the capacity retirements will be influenced by the availability of replacement capacity. [17]

Tennant Creek regulated system

5.42 Tables 5.12 and 5.13 present the comparable analysis for Tennant Creek.

[17] Refer to the Baseline Capacity Projections discussion earlier in this chapter.

5.43 Under the high demand growth scenario, the projected capacity is sufficient to meet both the N-1 and N-2 reserve standards for the period.

Table 5.12 – Longer Term Supply-Demand Balance
Tennant Creek High Growth Scenario
(MW)

Financial Year	Total Capacity	N-1	N-2	Peak Demand	Reserve Margin over N-1	Reserve Margin over N-2
2012-13	16.4	12.5	11.0	7.3	5	4
2013-14	16.4	12.5	11.0	7.5	5	4
2014-15	16.4	12.5	11.0	7.7	5	3
2015-16	16.4	12.5	11.0	7.9	5	3
2016-17	16.4	12.5	11.0	8.2	4	3
2017-18	16.4	12.5	11.0	8.4	4	3

5.44 Under the low demand growth scenario, capacity is also adequate at both the N-1 and N-2 reserve standards for the period.

Table 5.13 – Longer Term Supply-Demand Balance
Tennant Creek Low Growth Scenario
(MW)

Financial Year	Total Capacity	N-1	N-2	Peak Demand	Reserve Margin over N-1	Reserve Margin over N-2
2012-13	16.4	12.5	11.0	7.0	5	4
2013-14	16.4	12.5	11.0	7.0	5	4
2014-15	16.4	12.5	11.0	7.0	5	4
2015-16	16.4	12.5	11.0	7.0	5	4
2016-17	16.4	12.5	11.0	7.0	5	4
2017-18	16.4	12.5	11.0	7.0	5	4

CHAPTER

6

ADEQUACY OF GAS SUPPLIES

6.1 In the Territory context, system *adequacy* concerns can also arise if there is insufficient gas available to generate the expected level of electricity required. This chapter addresses this issue.

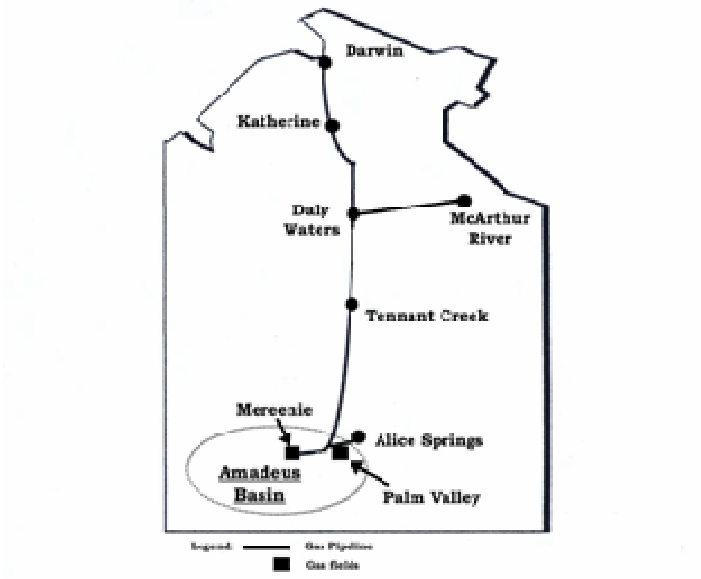
Natural gas supply

Amadeus Basin gas fields

6.2 Over 99% of electricity in the Territory's regulated system is generated from natural gas-fuelled plant through direct powering of gas turbines and reciprocating engines and the production of steam through the recovery of waste heat from the gas turbines.

6.3 Currently, these plants are serviced by two gas fields in the Amadeus Basin: the Palm Valley field operated by Magellan Petroleum Australia Ltd and the Mereenie field operated by Santos Ltd. Each operator has significant interest in both fields. The location of these gas fields is shown in Chart 6.1.

Chart 6.1 – Location of Amadeus Basin Gas Fields



6.4 In 1983, Power and Water entered into an agreement with the operator of the Palm Valley field to supply gas to Alice Springs primarily for electricity generation.

6.5 In 1985, the Power and Water subsidiary Gasgo contracted to purchase gas totalling 200 petajoules (PJ) over the period to 2012 from the Palm Valley field to fuel

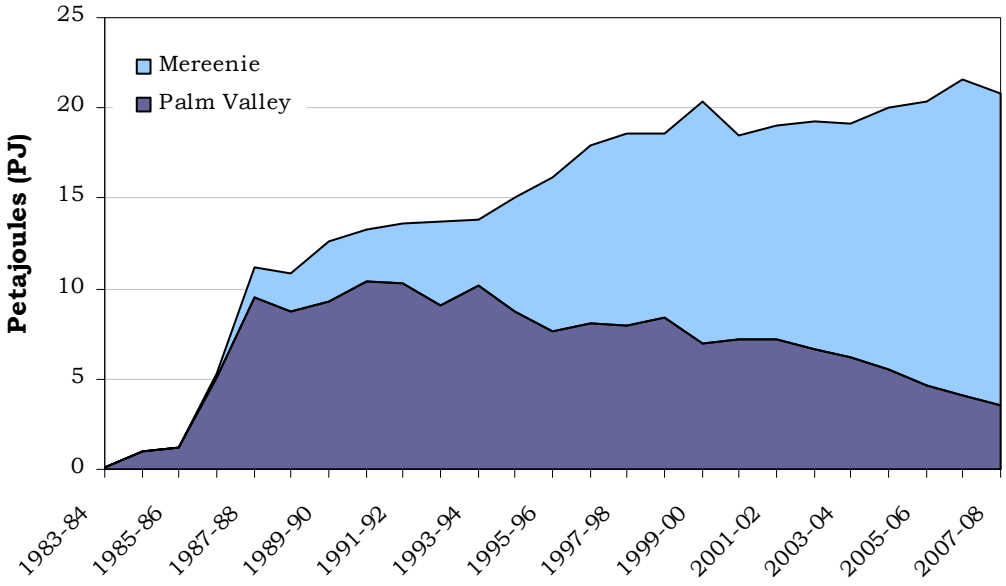
electricity generation in the Darwin-Katherine region. In the same year, Gasgo also entered into a gas purchase agreement with the operator of the Mereenie field for the supply of 66PJ over the period to 2009. Since that time, natural gas has been the major fuel source for electricity generation in the Territory.

6.6 The Palm Valley field has not met original expectations and, although Gasgo has funded substantial development work as required by the gas purchase agreement, the operator downgraded the resource (including forecast cumulative production) to approximately 50% of the original reserves figure.

6.7 The poor performance of the Palm Valley field and greater than expected energy demand resulted in two other contracts being established for the purchase of 113PJ of Mereenie gas over the period to 2009. In 2005-06, an additional contract with Mereenie producers (MSA4) was entered into for the supply of a minimum of 5.2PJ of gas from March 2006 to December 2008 and for the supply of additional gas from January 2008 to December 2010, if required, on a 'reasonable endeavours' basis. Further attempts by Power and Water to broker an agreement with the Mereenie producers to increase gas production have been unsuccessful.

6.8 Chart 6.2 illustrates the declining production of the Palm Valley field and the increasing reliance upon the Mereenie field over recent years.

Chart 6.2 – Gas Sales
1983-84 to 2007-08



6.9 The Gasgo contracts for the supply of gas from Mereenie (with the exception of the 'reasonable endeavours' component of the MSA4 contract) expire in 2009. Gas volumes permitting, the Palm Valley contract expires in 2012.

Blacktip gas field

6.10 On 30 June 2006, Power and Water executed an agreement with Eni Australia B.V. (Eni) for the supply of 740PJ of gas from the Blacktip field. Power and Water expects that this arrangement will meet its forecast gas demand for the next 25 years.

6.11 Eni will extract the gas from the Blacktip gas field, which is located 100km to the west of Wadeye in the Bonaparte Basin. The gas will come onshore to a processing plant near Wadeye, and will then be transported via a new gas pipeline from Wadeye that connects to the existing Amadeus Basin to Darwin Pipeline (ABDP). The location of the Blacktip gas field is shown in Chart 6.3.

Chart 6.3 – Location of Blacktip Gas Field

Source: Power and Water Media Release, 30 June 2006

6.12 The first supply of gas from the Blacktip field was targeted to be available for electricity generation on 1 January 2009.

6.13 The gas pipeline from the processing plant at Wadeye and connecting to the existing ABDP has been completed and capable of accepting Blacktip gas from 1 January 2009. However, delays have been encountered during the construction of the gas plant at Wadeye, and this has put the completion of the project behind schedule.

6.14 The first supply of gas from the Blacktip field is now expected to be available around June 2009.

Adequacy of contingency supply arrangements

6.15 In 2006-07 and 2007-08, due to the expected decline in gas supply from the Mereenie and Palm Valley gas fields, Power and Water had to supplement gas supplies with diesel for electricity generation at the Channel Island Power Station. Gas supply shortfalls required Power and Water to consume 0.05PJ of diesel in 2006-07, and 0.8PJ of diesel in 2007-08. Power and Water expects similar shortfalls to occur again during 2008-09, until the first supply of gas from Blacktip becomes available.

6.16 Power and Water's main generating units are dual-fuel, and capable of operating on liquid fuel if gas supply is unavailable. Intra-day peak electricity demand can cause gas supply shortfalls requiring the consumption of diesel to prevent interruption to the electricity supply. Gas supply shortfalls are most likely to occur periodically in the Darwin-Katherine region during the "build-up" months of September to December, and also in March (with the end of the wet season rains), as these are periods during which the system's peak demand occurs.

6.17 The use of diesel is costly, and introduces another set of supply chain logistics, reliability issues and risks. To eliminate its exposure to diesel consumption, during 2007-08 Power and Water entered into a contract with ConocoPhillips to receive supplementary gas from the Bayu-Udan gas field, via the Darwin LNG facilities at Wickham Point. During 2007-08, Power and Water also entered into an agreement with the APA Group to transport the gas via a pipeline that will interconnect with the existing ABDP. Construction of the Wickham Point Interconnect pipeline commenced in September 2007, and is expected to be completed by May 2009. Additional, but uncertain, supplies may also be available under the Mereenie (MSA4) contract, to be provided on a 'reasonable endeavours' basis.

6.18 Depending on the availability of MSA4 gas, Power and Water will continue to be exposed to diesel use during 2008-09 until the Wickham Point Interconnect pipeline is completed.

6.19 The Commission considers that, as currently scheduled, Power and Water's recently established contingency gas supply arrangements with ConocoPhillips, together with its diesel fuel stocks and (uncertain) MSA4 gas, will provide sufficient back-up to cover any shortfalls under Power and Water's primary gas contracts at times of system peak demand.

Gas supply-demand in the medium term

6.20 The Commission estimates that Power and Water will require secure supplies of approximately 22PJ of gas in 2008-09, increasing to 25PJ in 2011-12, to meet its gas supply requirements in the medium term. [18]

6.21 For 2008-09, supplies under the existing gas contracts are unlikely to be adequate to meet Power and Water's gas supply requirement, and further use of diesel is likely to be necessary to meet intra-day peaks. This situation will improve when the contingency gas supply from ConocoPhillips becomes available, and if additional gas is made available on the 'reasonable endeavours' basis under the MSA4 contract.

6.22 On 30 June 2009, the Mereenie contracts expire (with the exception of the gas available on a 'reasonable endeavours' basis under the MSA4), and the first supply of gas is expected from the Blacktip field. For 2009-10, the contract quantities currently scheduled to be available under the Blacktip agreement should be adequate to meet gas supply requirements, provided supply matches contract quantities.

6.23 However, the Commission estimates that for 2010-11 and 2011-12 projected gas requirements could marginally exceed the contract quantities available under the Blacktip agreement.

Gas supply-demand in the longer term

6.24 In the longer term, the Commission estimates a gas supply shortfall under the high growth scenario of approximately 2PJ in 2012-13, increasing to 3PJ in 2017-18. Under the low growth scenario, the Commission estimates a supply shortfall of approximately 2PJ in 2012-13, decreasing to 0PJ in 2017-18.

6.25 However, the Commission notes that the projected shortfall may be reduced if Power and Water's average plant efficiency of gas use improves with the commencement of the new Weddell and Owen Springs power stations.

[18] For the purposes of this analysis, Power and Water is assumed to continue as the sole generator/retailer on the three regulated systems. Power and Water's gas requirement is therefore equivalent to the aggregate regulated system requirement. The gas requirement estimates are based on the Commission's energy forecasts and an average rate for gas usage per GWh generated.

6.26 The Commission also notes that supplies of Blacktip gas in excess of contract quantities are likely to be available in the future. Eni is understood to be building reserve capacity into their facilities and have reported the existence of further probable Blacktip reserves for potential development in the future. [19]

6.27 The Commission also considers that Power and Water's contingency supply arrangements (the contract with ConocoPhillips to supply supplementary gas from the Bayu-Udan gas field and its diesel fuel stocks) to be adequate to provide sufficient back-up to cover any shortfalls under Power and Water's primary gas contracts.

[19] Eni Australia BV, Notification N70460, May 2006, ACCC Exclusive Dealing Notifications Register.

APPENDIX A

GLOSSARY

ABDP – An abbreviation for the Amadeus Basin to Darwin gas pipeline.

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 – Involves the capture of exhaust heat (or other useful thermal energy such as steam) from a generating facility that produces electricity, for use in industrial, commercial, heating, or cooling processes.

Demand – The amount of electricity consumed by customers at any given time or over a period of time.

Demand Side Management – The planning, implementation, and monitoring of utility activities designed to encourage consumers to modify patterns of electricity usage, including the timing and level of electricity demand. It refers only to energy and load-shape modifying activities for the purpose of reducing peak load and the need for generating capacity at such times.

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

Gigawatt-hour (GWh) – A measure of electricity consumption in gigawatts for a one-hour continuous period. One gigawatt hour equates to one million kilowatt hours.

Interruptible Load – Load that, in accordance with contractual arrangements, can be interrupted at times of peak load. Load can be disconnected, either manually or automatically, and usually involves commercial and industrial consumers.

Kilowatt-hour (kWh) – The total amount of energy used in one hour by a device that uses one kilowatt of power for continuous operation. Electric energy is commonly sold by the kilowatt-hour, which equates to 1000 watt-hours.

Line Pack – Refers to the gas that is in the pipeline at any given point in time for the purpose of maintaining minimum pipeline operating pressure. Line pack does not increase gas supply availability, but increases short term deliverability by moving gas from one place on the pipeline to another.

LNG – An abbreviation for liquefied natural gas. LNG consists mainly of methane – the simplest hydrocarbon.

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

Load Duration – Indicates the proportion of time that particular levels of demand (expressed as a proportion of the maximum demand for a year) are exceeded.

Load Shedding – Occurs when there is inadequate generation to meet demand resulting in disconnected load. Load shedding protocols enable the System Controller to automatically disconnect load in order to maintain frequency and voltage and prevent the possible collapse of the system.

Megawatt (MW) – One megawatt equates to one thousand kilowatts.

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

NEM – An abbreviation for the National Electricity Market

Network – That part of the power system involved in the transmission and distribution of electricity from generation sources to end-use customers.

Operating Reserves – The generation arrangements required to maintain system security by handling short term disturbances in the system.

Petajoules (PJ) – A measure of energy in petajoules. One petajoule equates to 1000 terajoules.

Planned Outage – Occurs when a network provider disconnects supply in order to undertake maintenance or capital works on a part of its network.

Planning Reserves – The generation reserves required to maintain system adequacy by meeting annual demand peaks.

Regulated Power System – A system for generating and supplying electricity that is based on an electricity network that is subject to regulation under the *Electricity Networks (Third Party Access) Act 2000*.

Reserve Margin – The reserve level associated with the point at which, given the current demand and supply capabilities of a power system, intervention in the market is required to ensure risks to supply are minimised.

Sent-out Energy – The amount of electricity measured leaving a generator at its connection point to the transmission or distribution network, and therefore does not reflect network losses.

System Adequacy – The power system's ability to supply the aggregate energy requirements of end-use customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements.

System Security – The power system's ability to withstand sudden disturbances such as electric short circuits or unanticipated loss of system elements.

TCF – A measure of the size of a resource in trillion cubic feet. One TCF equates to 930PJ.

Terajoules (TJ) – A measure of energy in terajoules.

APPENDIX

B

IMPROVING THE EFFECTIVENESS OF CURRENT ARRANGEMENTS FOR POWER SYSTEM PLANNING AND RELIABILITY

The following summarises advice put to the Government by the Commission during 2006.

In the Commission's view, the current arrangements for managing power system planning and reliability are under-developed, incomplete in a number of important areas and only partially implemented in other areas.

For a number of reasons, including practical constraints imposed by the small NT system, the rearrangement of responsibilities, rules and procedures that accompanied the shift to the NEM in eastern and southern Australia has not occurred in the Territory. For all practical purposes, power system planning and reliability continues to be managed as it had been prior to the market reforms of 2000, as an internal matter by Power and Water.

This is inconsistent with generally accepted regulatory practice. Among a number of disadvantages it blurs the distinction between commercial interests and the public interest, makes the planning and investment process opaque and increases the risk of investment decisions that may be sub-optimal from a power system perspective.

Although replication of NEM arrangements in the Territory is impractical, the NEM is important both as a benchmark for generally accepted regulatory practice, and because of the move towards consistency across jurisdictions. Over the next two to three years there is likely to be increased weight placed by governments generally on the desirability of minimising differences in regulation. One possible outcome, which the Commission considers to have some potential benefits, is the extension of NEM regulatory jurisdiction to the Territory in some form.

The transitional arrangements applied in Tasmania prior to it joining the NEM in May 2005 may have some advantages for the small NT system. While the economic regulator carried broad responsibility for power system oversight, key technical functions, such as the determination of power system security and reliability standards, were allocated to a Reliability and Network Planning Panel established by the regulator in accordance with the requirements of the Tasmanian Code.

In general terms, the Commission considers that current arrangements in the Territory will be improved by:

- bringing greater clarity to the responsibilities, accountabilities and powers of the main participants – the System Controller, PW Generation and PW Networks and the Commission itself; and
- giving greater recognition to the desirability of separating public interest responsibilities from commercial interests.

More specifically, the Commission considers that the management of power system planning and reliability within the NT electricity market will be strengthened by:

- clarifying the role, powers and governance of the System Controller, including its relationship to Power and Water and the Commission;
- reviewing the System Control Technical Code to ensure that it is an effective instrument for the discharge of System Control functions and responsibilities;
- fully documenting the various technical parameters that define the safety, security and reliability of the power system;
- establishing a process for providing independent technical support and advice on power system matters (for example, the Tasmanian Reliability and Network Planning Panel); and
- establishing a process and instruments for providing oversight of network management, planning and investment, appropriate to the scale of the NT system.

The Commission is mindful that its existing statutory responsibilities under the Reform Act and the Networks Act require it to respond to the shortcomings identified in the current arrangements.

However, it is also the case that in NEM jurisdictions matters of this nature are, in the main, typically decided by government, an approach that the Commission supports in principle and believes is the most desirable course of action.

Accordingly, the Commission recommends that shortcomings identified in the current arrangements for the administration of power system planning and reliability be addressed by:

- clarifying the functions and responsibilities of the System Controller;
- reviewing the System Control Technical Code to ensure that it is an effective instrument for the discharge of System Control functions and responsibilities;
- establishing a process for obtaining independent technical support and advice on power system matters along the lines of the Tasmanian Reliability and Network Planning Panel;
- documenting the various technical parameters that define the safety, security and reliability of the power system; and
- developing a framework for the oversight of network reliability appropriate to the scale of the NT power system.

APPENDIX

C

NETWORK PLANNING & RELIABILITY REPORT INFORMATION REQUEST

The Commission requires the following information from Power and Water for the performance of its functions under section 45 of the *Electricity Reform Act*:

1. All, or part of, a network planning and reliability report detailing how Power and Water Networks plans, over the following five years:
   (a) to meet predicted demand for electricity supplied through its transmission lines, subtransmission lines, zone substations and other high voltage lines; and
   (b) to improve reliability to its customers.

2. In fulfilling the requirements of 1(a), the report must include the following information:
   (a) the historical and forecast demand from, and capacity of, each zone substation;
   (b) an assessment of the magnitude, probability and impact of loss of load for each transmission line, subtransmission line and zone substation;
   (c) the network provider's planning standards;
   (d) a description of feasible options for meeting forecast demand including opportunities for embedded generation and demand management;
   (e) where a preferred option for meeting forecast demand has been identified, a reasonably detailed description of that option, including estimated costs; and
   (f) the availability of contributions from the network provider to embedded generators or customers to reduce forecast demand and defer or avoid augmentation of the network.

3. In fulfilling the requirements of 1(b), the report must include the following information:
   (a) a description of the nature, timing, cost and expected impact on performance of the network provider's reliability improvement programs; and
   (b) an evaluation of the reliability improvement programs undertaken in the previous year.

4. If Power and Water is able to provide only part of the prescribed content of the network planning and reliability report by the due date of **cob Wednesday, 25 February 2009**, it must provide a schedule by that date that specifies:
   (a) the information that it is not able to provide by the due date; and
   (b) a date (or dates) for the provision of the missing information, that will enable a complete report to be made available to the Commission.

APPENDIX

D

REGRESSION ANALYSIS

To investigate whether a statistical relationship exists that can add value to its forecasting task, the Commission undertook a regression analysis to investigate the extent of the relationship between selected economic and demographic variables and electricity consumption for the 2005 Power System Review. For this year's Review, the Commission has updated its regression analysis to include the most recently available data.

Econometric methods are commonly used to investigate the relationship between economy-wide economic and demographic variables, such as measures of aggregate output, employment and population, and the level of activity or consumption in a particular sector. If a statistically significant historical relationship can be identified, and the basis for a relationship is supported by logic and economic theory, then it can prove useful in forecasting exercises.

In its Power System Review, the Commission is required to make quantitative estimates of electricity demand in the Territory's three regulated power systems over the coming 10 years. While in practice these will always involve a substantial level of informed judgment, the Commission is keen to build a framework for making these judgments that is as rigorous as possible, given the constraints.

In the Territory context, these constraints are considerable. The Commission's forecasting approach has been to first identify the likely economic and demographic conditions over the period and the principal range of uncertainty, and then consider the implications for electricity demand.

As a small, principally resource-based economy, the Territory is subject to considerable swings in activity. The influence of large projects can make electricity demand particularly volatile. As a result not only are stable relationships between variables less likely, but the standard value-based measures of economic activity in the Territory, such as Gross Product or Final Demand, are difficult to estimate and often erratic.

Following the lead of Power and Water, the Commission attempts to make explicit allowance for the influence of large projects that have a good chance of coming on line. While this is useful in the near term its value rapidly diminishes as the forecasting period is extended. Even in the near term, an estimate is still required of the underlying 'trend' rate of growth, to which the influence of individual projects is added.

The regression is estimated for the 14 years from 1992-93 to 2006-07. To avoid problems with value-based data, population and employment were selected as independent variables.[20] Electricity consumption was the dependent variable.[21] Both the dependent and independent variables were converted to natural log form. This has the important advantage of producing coefficients that approximate the relationship between the rates of growth of the dependent and independent variables.

[20] Population and employment data has been sourced from Australian Bureau of Statistics (ABS) catalogues.

[21] Electricity consumption data has been sourced from the Energy Supply Association of Australia (ESAA), *Electricity Australia* publications (1998 and 2005) and NT Electricity Market Information published by the Commission (2006 and 2007).

In economic terms, this is equivalent to the 'elasticity' of the dependent variable with respect to the independent variable. The data and results are presented in the following tables.

Table B1 – NT Regression
Raw Data Inputs

Financial Year	Population	Total Employment (000)	Electricity Consumption (GWh)
1993	170,734	76.5	1,117
1994	173,375	74.8	1,104
1995	177,552	83.2	1,203
1996	181,843	86.0	1,357
1997	186,912	89.0	1,390
1998	189,880	90.5	1,525
1999	192,735	95.1	1,549
2000	195,561	90.3	1,550
2001	197,768	97.5	1,549
2002	198,665	98.7	1,559
2003	198,544	96.7	1,615
2004	199,834	95.8	1,607
2005	202,793	94.4	1,631
2006	210,674	101.7	1,662
2007	214,975	105.9	1,675

Sources: Population data - Australian Historical Population Statistics, 2006 (cat. no. 3105.0.65.001)
2006 Population data - ABS cat. no. 3218.0 Regional Population Growth Australia (table 7)
Employment data - ABS Labour Force, Australia, Spreadsheets, Oct 2007 (cat. no. 6202.0.55.001)
Electricity Consumption data – ESAA, *Electricity Australia 1998* and *Electricity Australia 2005*
2006 Electricity Consumption data - NT Electricity Market Information 2006 and 2007 (ref UC website)

Table B2 – NT Regression
Population
Summary of Results (Log_e form)

	R Square	Adjusted R Square	F Statistic
Regression	0.90	0.89	111.95
	Coefficients	**Standard Error**	***t* Statistic**
Intercept	-16.84	2.28	-7.39
X	1.98	0.19	10.58

Table B3 – NT Regression
Total Employment
Summary of Results (Log_e form)

	R Square	Adjusted R Square	F Statistic
Regression	0.91	0.90	136.72
	Coefficients	**Standard Error**	***t* Statistic**
Intercept	1.43	0.50	2.84
X	1.30	0.11	11.69

These results suggest that, on average, a 1 percentage point change in population will be associated with approximately a 2.0 percentage point change in electricity consumption, and a 1 percentage point change in total employment will be associated with approximately a 1.3 percentage point change in electricity consumption.

For comparison, the same regressions were run on Queensland data. Although Queensland is a much larger economy than the NT, it shares some characteristics in terms of the importance of its resource sector, a tropical to sub-tropical climate and a relatively high rate of population growth.

The results, summarized below, suggest a slightly higher level of sensitivity of electricity consumption in Queensland to changes in population and employment, with slightly stronger statistical significance. Please note that the results for the Queensland regression analysis have not been updated for 2006 and 2007 data.

Table B4 – Queensland Regression
Population
Summary of Results (Log_e form)

	R Square	**Adjusted R Square**	**F Statistic**
Regression	0.97	0.97	358.8
	Coefficients	**Standard Error**	***t* Statistic**
Intercept	-31.67	2.22	-14.24
X	2.79	0.15	18.94

Table B5 – Queensland Regression
Total Employment
Summary of Results (Log_e form)

	R Square	**Adjusted R Square**	**F Statistic**
Regression	0.95	0.95	191.6
	Coefficients	**Standard Error**	***t* Statistic**
Intercept	-2.69	0.95	-2.84
X	1.77	0.13	13.84