Detailed Report
of the Independent Panel

Electricity Distribution and Service Delivery for the 21st Century

Queensland

July 2004

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THE CLERK OF THE PARLIAMENT

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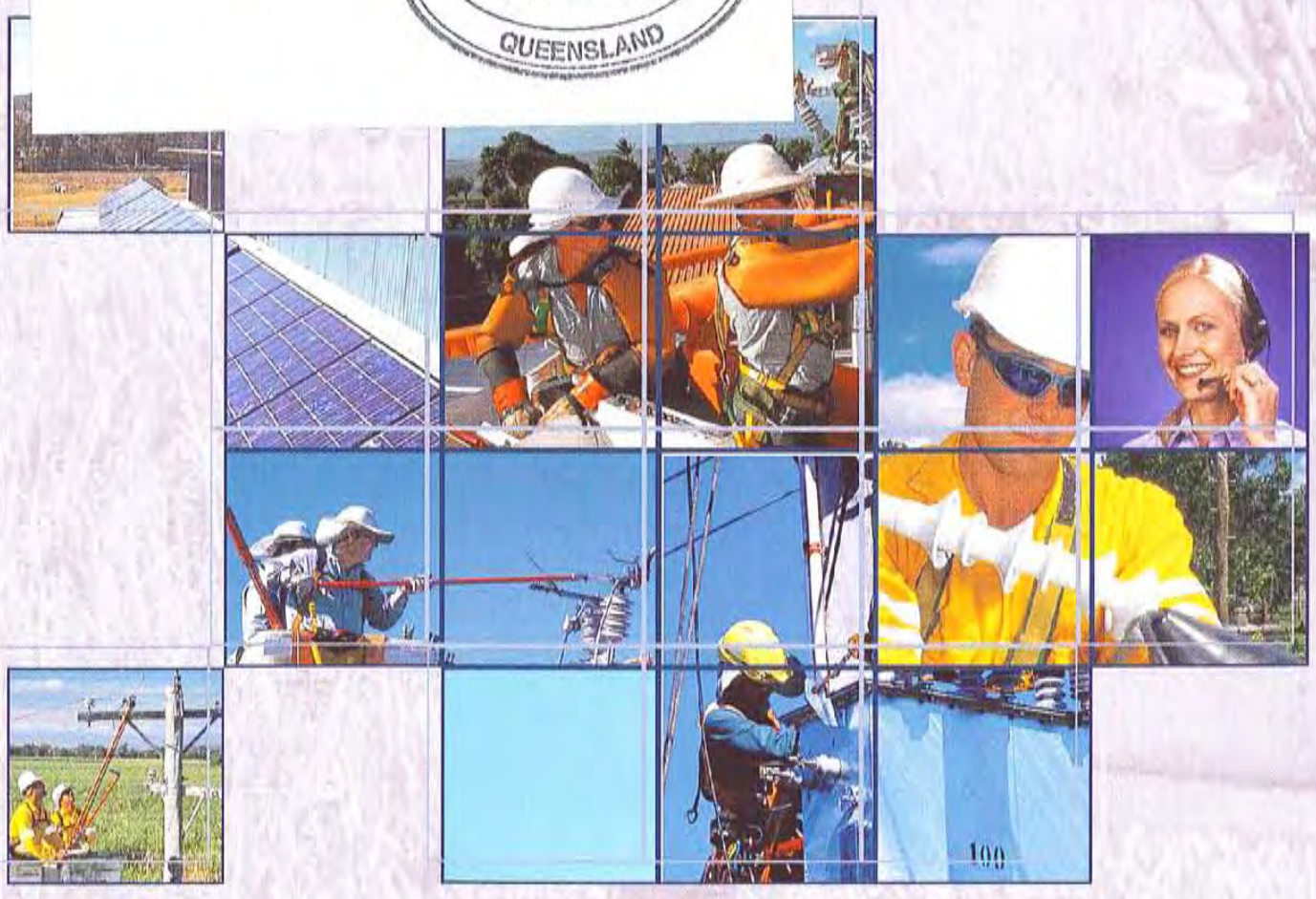

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FOREWORD FROM THE CHAIRMAN

The Electricity Distribution and Service Delivery Review has taken place at an interesting point in time. It is a Review of the Queensland distribution system, large parts of which were built in the years immediately following the Second World War. As many of the components of the networks are recognised as having a useful life of around 40 to 50 years, decisions now need to be made about replacing, or upgrading, these parts of the networks. In addition, the industry has undergone very significant change in the past decade with the introduction of a regulated competitive environment.

Both ENERGEX and Ergon Energy are moving towards the end of their first regulatory period at the time of this Review, and are in the process of preparing their submissions to the Queensland Competition Authority (QCA) for their next regulatory period. In this context, and against the background of the outcome of the storms and hot weather in early 2004, the Independent Panel (the Panel) was asked to consider the current state of Queensland's electricity distribution networks, capital and operating expenditure levels, internal systems and the future reliability of supply.

Conducting businesses such as ENERGEX and Ergon Energy is complex and made even more difficult against the background set out above. Although they had many other functions to perform during the course of our Review, we found the Boards, management teams and personnel at both organisations exceptionally helpful in providing the information necessary to conduct this Review. We also had a similar response from the QCA, with whom we had fruitful discussions. Assistance was also provided by the Electrical Trades Union (ETU) which provided a detailed submission and made available members for a Technical Review Group, which the Panel established to assist it to understand some of the issues facing the industry.

The Panel members, Mr Steve Blanch, Mr Jack Camp and myself, wish to thank the people involved within these organisations for their openness and assistance.

The Office of Energy provided the Secretariat for the Panel. The Office engaged consultants, Deloitte Touche Tohmatsu, who were assisted by engineering consultants, Evans & Peck Pty Ltd. Many of the Panel's findings are based on the data collected by these consultants. The Government was careful to ensure that the Panel could act totally independently and free from influence and engaged KPMG to act as Probity Advisor for this Review. We are indebted to Mr Robert Grice, KPMG consultant, for his wise counsel.

Readers will understand the challenges which the Queensland electricity distributors face with the vast distances, sparse population and exceptional load growth in parts of Queensland.

The distributors accept that the current state of their networks, taken with the strong growth in population and electricity loads, means that there is considerable work to be done. They have plans in place to increase both capital and maintenance expenditure. In addition, the Panel has made some recommendations for further measures to be taken. These measures, together with the plans of the distributors, are necessary to ensure reliable networks into the 21st century.

Darryl Somerville **19/07/04**

Chair - Independent Panel

This Report necessarily contains a significant number of technical terms and abbreviations which are standard in the industry. Readers unfamiliar with this terminology will find a description in Appendices 4 and 5, which are located at the end of this Report.

TABLE OF CONTENTS

SUMMARY REPORT

This is the Summary Report of the Independent Panel appointed by the Queensland Government in March 2004 to undertake the Electricity Distribution and Service Delivery Review (the Review). It is important to note that it is a summary. The matters which were the subject of this Review are complex and a full understanding of the Panel's findings and recommendations can be gained by a complete reading of the Detailed Report.

The Terms of Reference for the Review required the Panel to examine certain matters relating to the electricity distribution services provided by Ergon Energy and ENERGEX (the distributors). This included an assessment of reliability and levels of capital and operating expenditure and whether those factors together with existing or proposed internal systems will ensure reliable networks for the 21st century. Power generation, transmission and retail activities were not the subject of the Review.

The Panel, chaired by Darryl Somerville (PricewaterhouseCoopers Partner) and including Steve Blanch (Electricity Industry Consultant) and Jack Camp (Queensland Commissioner for Electrical Safety), followed a process of gathering information, establishing and reviewing the facts and making findings and recommendations in line with the Terms of Reference. The Panel gathered information by meeting with personnel from the distributors and other organisations such as the Queensland Competition Authority (QCA) and the Electrical Trades Union (ETU). Meetings with the various Regional Electricity Councils throughout Queensland were also undertaken and the Office of Energy and its consultants were an additional information source. A Technical Review Group with representatives from the distributors and the ETU was established and met with the Panel on several occasions.

Some 122 submissions were received by the Panel in response to an invitation to the public accompanied by an Issues Paper. A summary of the matters raised by submitters is included in the Detailed Report.

A probity advisor was appointed to ensure that independence was maintained and proper procedures were followed. The probity report, provided to the Minister for Natural Resources, Mines and Energy, concluded that the review was conducted in accordance with the Terms of Reference and had been carried out with independence, confidentiality, security, transparency, accountability, consistency and fairness.

Background

The Queensland distributors supply electricity to around 1.7 million customers. ENERGEX services the south east corner of the State while Ergon Energy covers the remainder with the exception of an area in south west Queensland serviced by

Country Energy from NSW. Both ENERGEX and Ergon Energy are Queensland Government Owned Corporations.

Readers of this Report should be mindful of the conditions in which both distributors operate. Those conditions mean that performance comparisons with each other and with other distributors need to be treated with caution. For example, Ergon Energy operates a geographically dispersed network covering an area of 1,698,100 square kilometres - approximately six times the area of Victoria. Queensland's weather conditions also make comparisons difficult. As explained in Chapter 11 of the Detailed Report, Queensland has some of the hottest and wettest areas in Australia and some of the country's highest incidences of lightning strikes.

The Timing of the Review

The Review was established by the Queensland Government in response to concerns expressed about the performance of the distribution networks during the series of storms and hot weather in January and February 2004.

While the Review came about as a result of the storms, the Terms of Reference required the Panel to look at the distributors' network performance, expenditure programs and systems and processes. In view of the findings of the Panel outlined in this Report, it was timely that this Review took place when in did.

Context

This Review has occurred at a time when many of the network components are reaching an age (around 40 to 50 years) where replacement or refurbishment is a prime consideration. This follows from the fact that large parts of the network were built in the 1950s to 1970s. This is an issue facing many networks around Australia.

In addition, the industry is approaching the end of its first regulatory period, the Review has been undertaken at a time when the distributors are preparing their submissions to the QCA. These submissions will have, as "building blocks", forecasts of the capital and operating expenditure which the distributors believe they will need to incur over the next regulatory period. As these matters are within the Panel's Terms of Reference it could be expected that the submissions made to the Panel by the distributors would have been prepared with the forthcoming QCA submissions in mind. It was not the Panel's responsibility to usurp the role of the QCA in determining the required revenue for the next regulatory period. A significant amount of the material considered by the Panel will also need to be considered by the QCA.

Submissions

At the outset, it is worth addressing briefly some of the matters raised in many of the submissions. Some have also been the subject of recent press commentary. These are:

***Undergrounding*:** A number of submissions suggested that many electricity distribution reliability problems could be solved by undergrounding the network.

Currently some key parts of the network are undergrounded and more undergrounding work is planned. Undergrounding does, however, have its limitations. Undergrounded assets are not immune from damage (e.g. it is not uncommon for them to be accidentally dug up). When damage does occur the repair times (and resultant outages) are much longer. In addition, of course, the cost of undergrounding is much greater. It is estimated that the cost of undergrounding the entire Queensland electricity supply system would be in the order of $50-60 billion – around half the current value of Queensland's annual Gross State Product. While this is clearly not economically feasible, ENERGEX and Ergon Energy both currently do underground certain key assets and have plans for further undergrounding works. The Panel endorses the use of cost-effective strategic undergrounding. It is also noted that services to new developments are generally undergrounded.

***Special Dividends*:** A number of submissions proffered the view that the distributors have been forced to underspend on their networks because the Government had taken special dividends from them and left them short of funds. The Panel examined this matter and found the distributors' ability to spend on the networks was not affected by the payment of special dividends. The distributors have ample availability of funds and the decision to spend funds resides with the management of the businesses. Furthermore, the Panel found that the proposal to pay the special dividends was first raised by ENERGEX rather than as a result of a demand from the Government.

***Financial position* –** The Panel did not undertake an independent assessment of the distributors' financial positions as part of this Review as this is done annually by various credit rating agencies and the Queensland Treasury Corporation. The Panel notes that both distributors have investment grade credit ratings and therefore have strong capacities to raise debt in their own right.

***The January 2004 Storms*:** The Detailed Report provides a comprehensive review of the storms of early 2004 and the effects they had. It is not economically feasible to build a network which will be capable of withstanding such a series of storms without some damage. It is possible to mitigate the damage with measures such as appropriate vegetation management and the Detailed Report comments on this aspect of maintenance undertaken by the distributors.

It is worth noting that the submissions commenting on the storms and the restorative work undertaken were emphatic in their praise of the work undertaken by the field workers from the distributors. Other commentary heard by the Panel supported these views.

***Retail prices*:** The Panel received a number of submissions that commented on Queensland's retail electricity prices. In Queensland, customers of the same class pay a uniform tariff regardless of where they are located in the State. In other jurisdictions, retail prices typically vary depending on the location of the customer. In 2003/04, Queensland had the third lowest residential and non-residential retail prices in the National Electricity Market (NEM), slightly higher than NSW and the Australian Capital Territory and significantly lower than Victoria and South Australia.

***Generation Capacity*:** Some submissions raised the question of whether Queensland has sufficient generation capacity. The position is that Queensland's generation capacity is approximately 10,000 MW compared with the record peak demand of 7,934 MW set in February 2004. In terms of the State's electricity demand, there are now sufficient electricity reserves for several years.

This is reflected by the size and direction of flows on the Queensland – NSW interconnect. In 2002, power flowed south around 65% of the time and averaged 294 MW. In 2003, the southward flow increased to about 90% and averaged around 418 MW. On a number of occasions in 2004, Queensland has provided 9% of NSW's peak demand via the interconnector.

The Central Issue

The electricity supply system is fundamental economic and social infrastructure in the economy. A mature developed economy such as Queensland's requires an appropriate service standard from the distribution system. There are trade offs above an appropriate service level.

There will always be a small number of outages as a result of matters such as motor vehicle accidents, storms, lightning or animals. While some alleviating measures can be taken to reduce or avoid outages as a result of these causes, such problems can never be totally eliminated.

Other outages are caused by asset failure or the system being over loaded in peak times. It is possible to provide a service which will almost certainly never fail as a result of these causes. This is generally achieved by having spare assets and a degree of spare capacity in the system which allow, in the case of failure or over loading of a particular asset, the employment of either alternative assets or the automatic switching of load so that customers can be supplied via an alternative asset without noticeable interruption. This is the standard that should be expected for large urban and developed areas.

The difficulty is that building a network with the spare assets and capacity to be outage proof in peak times is extremely expensive. This is because the peaks only last for relatively short intervals, predominantly over the extremes of the summer and winter periods (e.g. on very hot days in summer when air conditioner use is high). In recent years, Queensland has experienced summer peaks of extended length. For the remainder of the year, the additional network assets needed to guard against outages in the case of asset failure during those short peak times remain idle or underutilised.

The likelihood of an outage being caused by asset failure during peak times in a well maintained network operating at a level of reasonable capacity is very low. Furthermore, in the event that a failure does occur in such a network at peak times, the number of customers affected is likely to be low (e.g. less than 10,000) and the time of the outage reasonably short (e.g. an hour).

In other states in Australia, the decisions which have been made as to the appropriate service levels vary. Importantly, however, in almost all cases various Governments,

regulators or distributors have made such decisions and those have been published so that the public is aware of what service levels it can expect.

The Panel believes that the Queensland Government should make decisions as to the service levels it requires and make these known to the distributors and the general public. This should be done in the context of the regulatory environment which currently exists.

The Panel considers that developing appropriate service standards is essential to establishing a "regulatory bargain" which provides appropriate incentives for the distributors to focus on both financial and service quality outcomes. To date, in the Panel's view, the distributors have not had a sufficient focus on the service quality they deliver.

While the Panel accepts that it would not be economically prudent to "gold plate" the networks, it is clear that there needs to be sufficient expenditure to maintain them adequately and to develop them to meet new customer demands. For the reasons explained in this Report, the Panel believes that the networks have not had sufficient expenditure outlaid on them to adequately maintain them and to meet increased demand from growth.

In the case of Ergon Energy, the Panel believes that this position has resulted from the fact that it inherited six networks of varying quality, with some having been poorly maintained. It has taken five years for a proper assessment to be made of the networks and for the necessary remedial work to be undertaken. In the Panel's view this has taken too long.

In the case of ENERGEX, it is the Panel's view that this position has been reached because there has been too much focus over a considerable period on producing an improved financial result. While expenditure has certainly been reduced, the Panel believes that this has been at the expense of the condition of the network. It is now operating at a utilisation of about 76%, whereas the prudent industry level is around 60% to 65%. The assets are stressed and this impacts on reliability.

In short, there is a need for greater accountability and some catch up expenditure on both networks to bring them back to an acceptable condition.

The Regulatory Environment

The regulatory environment in which the distributors operate is complex. It is fully explained in Chapter 4 of the Detailed Report. The distributors are State owned monopolies and the legislative framework that has been established aims to ensure the prices for network services are efficient. It does this by establishing a Regulator (the Director-General of the Department of Natural Resources, Mines and Energy) and the QCA.

The Regulator, through the Office of Energy, licenses the distributors and sets the licence conditions. The role includes monitoring compliance with the *Electricity Act 1994*, settling certain disputes and investigating customer complaints.

The QCA is responsible for regulating the revenues and prices of the distributors, developing market conduct rules and monitoring any service standards established by the Queensland Government. In effect, the QCA's role is to ensure that the prices charged by the distributors to their customers reflect the efficient cost of providing them. It has available to it a number of options for doing this. For the four year period which commenced in July 2001, it chose to do this using a maximum revenue cap approach and has announced that a similar approach will be used for the next regulatory period which commences in July 2005.

The process followed is that the distributors make very detailed submissions to the QCA setting out forecasts as to the revenue which they will require during the regulatory period to conduct their businesses. The "building blocks" used in preparing these submissions include details of the amounts of capital and operating expenditure which the distributors believe they will need. The QCA reviews the submissions, seeks independent expert advice as to the reasonableness of the distributors' forecasts and then makes a determination.

Once the determination is made, the role of the QCA is to approve the annual tariffs and to monitor the performance of the distributors. The distributors are responsible for operating their businesses. Indeed, they can spend more or less than the amounts which the QCA determines. Importantly, if the distributors spend more on capital or operations and maintenance than the "building blocks" used by the QCA in setting their revenue cap, they do not earn revenue on the additional amounts expended during the regulatory period. However, the distributors do retain their full revenue cap in the event of any underspend.

The Panel believes there are several shortcomings in the current system, which require rectification. Because the QCA has already decided to use the revenue cap approach for the forthcoming determination, and because the submission process has already commenced, the Panel has not expressed a view on the suitability or otherwise of this approach. Some observations are, however, worth noting.

In times of volatile load growth, the revenue cap approach has serious shortcomings because the facts on which the original submissions and determination are based can change significantly during the period. This results in the revenue cap being below what it should be. That alone may not necessarily be a significant problem. In combination with other factors it can, in the Panel's opinion, result in undesirable long term outcomes. One of those other factors is that in Queensland no service quality standards have been set. There is provision under the *Electricity Act 1994* to set such standards.

The Panel believes that the absence of performance standards means that once the QCA has made its determination, the temptation is for the distributors to focus only on their financial outcomes. While it is clear that technically the distributors can spend above or below the amounts used in their submissions to the QCA, the fact that they are not allowed to earn a return on assets acquired with capital expenditure above

the amount submitted to the QCA can produce the result that the distributors are reluctant to spend in excess of this amount.

In times of high load growth, this could mean that capital expenditure which should be incurred to maintain and necessarily expand the network may not be spent. The Panel is of the view that if a revenue cap approach is to be used, it should be accompanied by other measures which allow the distributors, in cases where circumstances change significantly, to spend above the amounts included in their submissions without effectively being penalised. The regulatory regime should be more flexible and more focussed on establishing incentives to produce acceptable outcomes.

These measures could include a form of "off ramp" during the regulatory period when outcomes differ materially from forecasts. An off ramp would allow for the revenue cap to be adjusted without the need for a full re-opening of the determination. Another option would be putting in place a system for the QCA to issue rulings during the regulatory period to assure the distributors that additional investment, made during the current period, will be included in the regulatory asset base for the purposes of the next determination. Such a system would need to include the necessary checks and balances associated with such ruling systems (e.g. the ruling could only be relied upon provided the facts upon which it is based are valid). The QCA could be more pro-active in developing a more flexible system.

One of the findings which the Panel has made is that ENERGEX's capital expenditure programme fell short of what it should have been in years past. The Panel believes that for the reasons outlined above in relation to the current system, ENERGEX felt constrained to spend only slightly more than the capital expenditure "building block" amounts used by the QCA.

The Panel believes that the Government should also set minimum service quality standards. This would give direction to the distributors as to what standards their owners require them to achieve. Currently, that decision is left to the distributors themselves. The only "standard" against which the distributors are measured (other than those which they set themselves for the purposes of their Statement of Corporate Intent) are finance related and the Panel believes that in the absence of service quality standards, there is a risk that the distributors could conduct their businesses with too much of an eye for financial results at the expense of measures such as reliability.

It should be noted that there was an implicit set of service quality standards incorporated into the QCA determination, which were based on the understanding that the distributors would maintain at least the existing standards of reliability and quality of supply.

Reliability

The Terms of Reference required the Panel to evaluate network reliability and to report on the standard of the system using benchmarking against appropriate comparisons. At the outset it is important to note the limitations of such comparisons. As mentioned earlier, the Queensland distributors operate in a combination of geographic and climatic conditions generally not found in other parts of Australia. With these limitations, the Panel used the reliability measures endorsed by the Utility Regulators Forum in 2002 including System Average Interruption Frequency Index (SAIFI), System Average Interruption Duration Index (SAIDI) and Customer Average Interruption Duration Index (CAIDI). These were used to assess the distributors' performances against twelve other major distributors in Australia for 2002/03, which was the latest full year of data available.

Ergon Energy had the highest frequency of outages (SAIFI) and the longest duration of individual outages (CAIDI). The product of these poor outcomes resulted in Ergon Energy having the worst duration of outages of the Australian distributors for 2002/03. The Panel has treated these results with caution as should readers of this Report. The interstate distributors with which comparisons are being made operate networks with substantially smaller coverage areas and have markedly different geographic, weather and population densities. While taking those factors into account, the Panel is of the view that Ergon Energy's reliability performance is not satisfactory and improvement is required.

ENERGEX's SAIDI and SAIFI performance for the Brisbane CBD area was very good and ahead of comparable interstate distributors. Its overall performance based on all reliability measures was slightly better than the Australian average in 2002/03.

The Panel notes, however, that reliability in ENERGEX's service area varies significantly between feeders. The performance of ENERGEX's urban and short rural feeders both for number and duration of outages was worse than the Australian average. The 10% of worst performing feeders in ENERGEX's area have double the overall ENERGEX average as measured by SAIDI. Clearly, ENERGEX needs to improve its performance for these feeders.

As well as concerns about outages, a number of submissions described problems with quality of supply, such as low voltage and voltage dips. Because of lack of available data it was not possible to compare the Queensland distributors' quality of supply performance with other distributors. The only measure for each distributor was the number of customer complaints as reported to the QCA. The Panel notes that there has been no material improvement in this trend since the commencement of record keeping in 2002.

The Panel recommends that ENERGEX and Ergon Energy give more attention to eliminating load and voltage constraints in their sub-transmission and high voltage networks in order to address existing voltage problems. ENERGEX and Ergon

Energy also need to put strategies in place to replace their ageing 7/064 copper conductors in order to reduce voltage drops.

The overall conclusion that the Panel reached in relation to reliability (both outages and quality of supply) is that both Ergon Energy and ENERGEX need to implement measures to improve their performance.

Capital Expenditure

The Terms of Reference required the Panel to review levels of expenditure on capital works to assess adequacy to cater for current and future expected levels of demand, as benchmarked against appropriate comparisons.

At the outset, it is worth making the observation that in businesses with very large capital bases, such as the distributors, the actual amount of capital expenditure in a particular period will depend on a number of factors. Past expenditure patterns will have a big impact. If past spending has been too low a catch up may be in order. If it has been too high a capital expenditure "holiday" may be appropriate. Similarly, an underspend in maintenance expenditure could impact upon the amount of capital expenditure needed in a period as assets wear out more quickly and need replacement sooner than if they had been adequately maintained.

It is also the case that an underspend in capital expenditure may result in problems which do not become evident for several years after the underspend occurs. These factors, combined with the fact that levels of capital expenditure necessarily fluctuate from year to year in any organisation, make it difficult to draw any worthwhile conclusions from benchmarking the distributors' capital expenditure for a particular year or years with their peers. For that reason, the Panel did not rely on benchmarking of capital expenditure in making its findings.

In the Panel's view, the best method of assessing whether capital expenditure has been adequate is to look at the current state of the network. The Panel's review highlighted significant base load growth and high peak load demand growth driven by strong economic growth, population growth and an increase in air conditioning load, particularly in south east Queensland. The Panel also noted that there is limited contingent capacity in key parts of the networks.

The status of each distributor's network needs to be considered individually.

ENERGEX

In ENERGEX'S case, the Panel found that there is limited contingent capacity, which has resulted from two factors. The first was the adoption in 1989 of a planning methodology (Reliability Assessment Planning) designed to promote increased system utilisation and reduced spare capacity. In addition, ENERGEX was faced with peak demand growth over the past two years well in excess of its forecast.

The ENERGEX network has utilisation of around 76%. The Australian average is around 56% and the professional advice that the Panel obtained was that prudent practice dictates that utilisation should be around 60% to 65%. It is clear that, as

mentioned above, some of this over utilisation came about as a result of ENERGEX not accurately predicting growth in peak demand levels in 2002/03 and 2003/04.

ENERGEX's annual average demand growth prediction for 2001/02 to 2004/05 was 4.2% - this prediction was accepted by the QCA for the purposes of its 2001 revenue determination. ENERGEX's annual average growth rate for 2001/02 to 2003/04 has slightly exceeded this forecast at 4.9%. However, the need for infrastructure is largely driven by the growth in peak demand and ENERGEX's three year average annual peak growth rate has been 9.0%, or 7.5% on a weather corrected basis (i.e. where the peak load is adjusted to reflect normal weather conditions).

Despite this increase in peak load growth, and a doubling of customer driven works during the period, ENERGEX's overall capital programme did not increase significantly in this period.

It must be understood, however, that to a very significant degree the over utilisation resulted from a deliberate decision to work the assets much harder than had previously been the case. The ENERGEX management took a decision as early as 1989 to take a greater risk than had previously been the case. The risk taken was that, if there was equipment failure at the time of peak demand, there could be an outage to a part of the network until load switching took place. The assessment made by ENERGEX management was that the chances of the outage occurring and the time for which the outage would last if it did occur were small enough to justify the risk being taken in view of the financial savings made from avoiding or deferring capital expenditure.

The Board / management saw this as prudent business practice. They estimated that it reduced spending on the network by around $1 billion over a 10 to 12 year period.

ENERGEX was not alone in employing this Reliability Assessment Planning (RAP) system. Other distributors also have used it but generally it has been used in conjunction with a philosophy which dictates that all major components in the system will have an "N-1" capacity. This simply means that if there is equipment failure in one of the major assets, such as a bulk supply sub-station or a zone sub–station, there will be enough spare capacity to allow alternative assets to be used or load to be switched thus avoiding an outage. Such a philosophy also allows existing assets to be operated under normal conditions at levels well within the capacity for which they are designed.

The Panel accepts that RAP is a valid planning tool. It has some concerns, however, with the way that ENERGEX has used it. As mentioned, the aim of the application of RAP is to increase the utilisation of the assets and to ensure that unnecessary investment does not occur. One would expect that with the adoption of RAP, the distributors would regularly calculate and monitor the network utilisation. ENERGEX has advised the Panel that such assessments were not made regularly prior to 2001. The Panel noted that at December 2002, the ENERGEX network utilisation was found to be at 76%. As indicated earlier, this is much higher than the level generally accepted as good practice.

It is the Panel's view that ENERGEX should have been monitoring the utilisation level of its network such that when it reached the prudent level of around 60% to 65% it should have set its capital expenditure programme at such a level as to maintain it at that utilisation level. The Panel believes that its failure to do this has led to capital expenditure being too low for at least the past two years and perhaps considerably longer.

The primary cause of this over-utilisation was the inappropriate use of the RAP system without adequate supporting data. The unexpected growth in peak demand in 2002/03 and 2003/04 also contributed to the high utilisation. The high peak demand would not have been problematic if the system had been operating at an appropriate utilisation rate. Another element was the desire not to exceed the capital expenditure "building block" used in the QCA's determination.

The current position with ENERGEX is that 69% of bulk supply sub-stations and 79% of zone sub-stations do not meet the "N-1" criteria. It is accepted that there is some switching capacity available. Nevertheless, the Panel lacks confidence that ENERGEX has sufficient data at its disposal to know whether it would be able to successfully switch load in the case of equipment failure in peak demand times. This follows from the overall high utilisation of the network and the lack of load data collected by ENERGEX in recent years. This data is necessary to allow ENERGEX to make an assessment of its ability to switch load.

Approximately 10% of ENERGEX's zone sub-stations are operating in peak demand times at levels in excess of their design capacity. This means that 22 zone sub-stations are effectively overloaded at peak demand times.

In addition, ENERGEX has operated some transformers at levels which have increased the probability of asset failure and negatively impacted their economic lives.

Over two-thirds of ENERGEX's zone sub-stations are supplied from the 33kV network. ENERGEX has advised that prior to March 2004, it had not conducted load flow analysis on the 33kV network for some years. It did, however, provide results of a load flow analysis conducted in March on the network using forecasts for 2004/05 loads. Approximately 7% of the 33kV feeders operate in excess of normal cyclic rating under normal operating conditions. ENERGEX estimates that 22 of the 292 33kV feeders operated above their normal cyclic capacity during the summer of 2003/04 and that 31% of 33kV feeders would exceed their "N-1" capability.

In February 2004, ENERGEX installed emergency cooling for some of its transformers in the form of soaker hoses in order to reduce their insulation temperature, which had become too high because of the ambient temperatures and very high loads. While this practice is sometimes adopted by other distributors, engineering advice to the Panel has indicated that it is unconventional and the effectiveness of such an approach in reducing insulation temperature at the core of the transformer is not proven. ENERGEX has advised that tests which it has conducted

on the oil contained in a number of these transformers indicated that insulation damage had occurred on about half of them. This will shorten the lives of these transformers.

In the Panel's view, the decision as to whether to improve financial performance by taking the risk of losing supply (even for short peak periods) should not be left to the management of ENERGEX. Rather the Government should set the standards required and ensure the business achieves those standards. However, accepting for the moment that ENERGEX was free to make that decision, the Panel believes that the unfettered application of the RAP approach to a highly utilised network subject to high load growth and a very temperature-sensitive peak load like that of ENERGEX was inappropriate.

ENERGEX itself accepts that with the high utilisation and longer summer peaks which Queensland now experiences, the RAP approach needs to be modified. It has advised the Panel that it intends to take investment decisions which will put capacity back in to the system and reduce utilisation to a more acceptable level of around 60% to 65%. This will take several years and require substantially increased investment.

Based on the above discussion, the Panel's overall finding is that ENERGEX's capital expenditure has not been adequate to cater for current demand and future growth.

Ergon Energy

Ergon Energy also has a network which in some locations is heavily loaded. Ergon Energy has undertaken its capital expenditure programme on the basis of an "N-1 (1%)" philosophy for major assets. This means that the assets will have "N-1" capability for 99% of the time. While 40% of Ergon Energy's bulk supply sub-stations do not meet "N-1" on a nameplate basis, Ergon Energy believes that summer cyclic ratings (as opposed to nameplate rating) should be used in making the assessment along with sub-transmission transfer capacity. Adjusting for this factor, 22% of bulk supply sub-stations still did not meet "N-1".

The Panel believes, that for assets as important as bulk supply sub-stations, "N-1" should be the standard used. The Panel was advised that all six of the other major Australian distributors use "N-1" with very few exceptions for assets such as bulk supply sub-stations and zone sub-stations.

Approximately 4% of Ergon Energy's zone sub-stations are operating in peak times at slightly above the level at which they were designed to operate. The Panel does not consider this to be a matter of serious concern because many of these are small or in the process of being up-rated. Of more concern is the fact that around 47% of the 117 zone sub-stations above 5 MVA do not meet "N-1". In the Panel's view, this exposes the network to an unacceptable level of risk.

For Ergon Energy, the limited spare capacity in parts of the network related both to the strong load growth and the realisation that the networks it inherited from its six predecessor organisations had greater constraints than it first appreciated.

Ergon Energy has advised that 19% of its sub-transmission feeders are either capacity or voltage constrained (or both) under normal operating conditions. For the high voltage distribution network, 27.2% of the feeders were voltage constrained and 14% were capacity constrained. The level of constraints in the Single Wire Earth Return (SWER) system is of particular concern to the Panel and is discussed more fully below and in detail in Chapter 12 of the Detailed Report.

The inadequate contingent capacity in Ergon Energy's bulk supply and large zone sub-stations, combined with the fact that a considerable part of the high voltage distribution system is currently either capacity or voltage constrained, leads the Panel to believe that there is an unacceptable level of risk of supply interruptions in the event of equipment failure in Ergon Energy's network.

It is clear that it took Ergon Energy's management some time to fully assess the state of the network after it was formed in 1999. This led to an under-estimation of the amount of capital expenditure needed when the QCA submission was prepared for the current regulatory period. When Ergon Energy discovered that the state of the network was worse than it had anticipated, it correctly did not feel constrained by the amounts previously used by the QCA.

Ergon Energy has strongly increased its overall capital expenditure since 2001/02 and this steady increase is projected to result in 2004/05 capital expenditure being more than double the level in 2001/02. Customer driven expenditure and refurbishment expenditure have dominated Ergon Energy's capital works programme. Customer driven expenditure is projected to account for more than 50% of its total work programme in 2004/05. Expenditure on reliability related capital projects has historically been low and is forecast to decrease in 2004/05. However, Ergon Energy expects that much of the refurbishment work undertaken will lead to improved reliability by reducing asset failure.

Despite this increased expenditure, the Panel is aware that in many instances Ergon Energy has been slow to react to capital expenditure needs. As a result, the Panel considers that Ergon Energy's capital expenditure has not been adequate to cater for current demand and future growth.

Maintenance

In its assessment of whether sufficient maintenance expenditure had been incurred, the Panel chose not to rely on benchmarking the Queensland distributors with those interstate because publicly available information generally relates to total operating and maintenance expenditure rather than on maintenance expenditure alone.

In order to assess the level and adequacy of maintenance expenditure, it is helpful to consider the key causes of outages and the measures that the distributors are taking to address them from a maintenance viewpoint.

For ENERGEX, the three major causes of unplanned outages were overhead equipment, vegetation and animals (17.3%, 12.9% and 11.5% respectively). For

Ergon Energy, the three major causes of outages were equipment defects, lightning and animals (57.8%, 20.2% and 6.8% respectively).

The Panel reviewed maintenance expenditure in these areas and the results are set out below.

ENERGEX

ENERGEX has underspent the amounts it submitted as part of the "building blocks" for the QCA revenue cap setting process to date. ENERGEX attributed some of the underspend to issues such as efficiency gains, accounting policy adjustments and a superannuation "holiday"[1]. That being said, there was clearly less spent on actual maintenance of the network than ENERGEX predicted would be necessary at the time of its 2001 QCA submission. The Panel notes that the QCA's consultants did not consider ENERGEX's forecast maintenance expenditure for the regulatory period to be inappropriately high.

There are two areas where the Panel believes the underspend has clearly resulted in a greater incidence of outages than would have otherwise been the case. These are vegetation management and cross-arm inspections.

ENERGEX itself has stated that:

> *ENERGEX has realised that past vegetation management programmes have not kept pace with growth of vegetation in proximity to network assets and have not achieved sustainable cycle times.*

In 2001/02, expenditure on vegetation management was $12.95 million and it was only slightly above this in 2002/03 at $13.62 million. In the 2003/04 year, this was very substantially increased to $22.03 million and it is proposed that $29.08 million will be spent in the 2004/05 year. While recognising the problems associated with vegetation management, the Panel believes that the spending in the earlier years was clearly not sufficient. It is pleasing to see the increased attention to vegetation management. ENERGEX is not only proposing to devote more resources to vegetation management but is implementing a vegetation management plan that will address the entire ENERGEX network with a maximum 2.5 year cycle time.

Some years ago, ENERGEX abandoned its low voltage cross-arm inspection programme. This means that low voltage cross-arms have only been repaired or replaced when they actually failed. This has contributed to outages and has significant safety ramifications. There is little doubt that such failures have significant safety ramifications. During discussions with the Panel, ENERGEX advised that it intended re-introducing a low voltage cross-arm inspection programme from 1 July 2004. On the best evidence the Panel could gather, it appears there will be a substantial catch-up phase to bring the cross-arm population back to an acceptable level of repair.

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[1] A superannuation holiday arose because the superannuation fund was in surplus of the required actuarial balance.

In summary, the Panel considers that ENERGEX's maintenance expenditure has not been adequate over recent years. While ENERGEX reported a substantial increase in maintenance expenditure between 2001/02 and 2002/03, the Panel believes that much of this reported increase resulted from a higher allocation of common/shared costs to maintenance, rather than an increase in actual expenditure on maintaining the network. The highest causes of outages in ENERGEX's network have been overhead equipment failures which have been steadily increasing over the past five years. Contributing to this was the abandonment of some maintenance programmes such as low voltage cross-arm inspections.

The Panel welcomes ENERGEX's recently announced measures such as re-introducing low voltage cross-arm inspections and doubling the expenditure on its vegetation management programme.

Ergon Energy

It needs to be borne in mind that Ergon Energy inherited six diverse maintenance programmes from its predecessor organisations. Considerable time has been devoted by Ergon Energy to implementing an adequate level of control in its maintenance processes. The maintenance programmes to target and rectify its poor reliability are constrained significantly by lack of reliable data. Work is currently underway to gather this data and populate the new asset management system. A targeted effort will be required to complete this programme as soon as possible in order to achieve future performance improvements.

For poles and overhead distribution assets such as cross-arms, Ergon Energy is implementing an Asset Inspection and Defect Management programme (AIDM). Ergon Energy is currently two years through its first three year inspection and maintenance cycle. To ensure all maintenance issues are addressed, it is proposing at least one more three year cycle before reverting to a cycle more relevant to the assets being inspected and maintained. In Ergon Energy's own words it:

> *.....still has a maintenance backlog and an associated risk exposure. In addition not all assets are currently covered by the new maintenance disciplines. The current programme will be extended to pick up additional assets in 04/05.*

The Panel's ability to assess Ergon Energy's vegetation management programme was constrained by the limited availability of outage and expenditure data for 2001/02 and 2002/03. The Panel notes that in August 2002 an audit was conducted of Ergon Energy's full vegetation management contracts and no major problems were discovered. Ergon Energy has taken steps in recent years to consolidate a large number of vegetation management contracts into four major contracts and this has resulted in a more consistent and uniform approach to vegetation control. Ergon Energy itself has proposed that vegetation management be given greater priority in coming years. It has advised the Panel:

Additional contracts have been awarded for a concerted vegetation management programme to catch up on a backlog of clearing and trimming of vegetation encroachment into mains and causing outages of supply. A full cycle of clearing will then allow vegetation to be controlled on a more manageable and sustainable basis.

In summary, Ergon Energy is, to an extent, still assessing the assets which it inherited from its six predecessor organisations and establishing a suitable maintenance programme. In the Panel's view this has taken too long and there are risks associated with the current position.

Internal Systems

The Terms of Reference required the Panel to assess whether the internal systems and processes of the distributors were such as to ensure efficient and targeted allocation of resources to cover the capital works and maintenance of the networks and, in particular, whether the planning criteria used was appropriate.

Both distributors have numerous systems and processes in place and it was simply not possible for the Panel to review each one. The Panel particularly focussed on those relating to capital planning and delivery, forecasting demand for network planning purposes, maintenance planning and delivery and responding to customer outages.

The Detailed Report provides an analysis of each of these processes.

In the case of ENERGEX, the Panel has found that capital expenditure, planning and delivery processes have not achieved an efficient and targeted allocation of resources. Processes appear to be reactive rather than strategic and to focus on short term constraints rather than long term solutions.

ENERGEX's internal systems and processes for the allocation of capital expenditure appear to have given priority to financial measures over reliability measures. ENERGEX has used a weighting methodology and in the past the financial weighting was twice that given to reliability. This has constrained the ability to deliver necessary contingent capacity, reliability and replacement capital works and resulted in customer driven works being the dominant focus of ENERGEX's works programme.

It is pleasing to note that ENERGEX has in recent times changed the weightings to introduce a system which now gives equal weighting to financial and reliability measures.

The Panel looked at the network development plans prepared by similar interstate distribution businesses and compared them with the ENERGEX 2004 five year Network Development Plan. The ENERGEX Plan was found to contain much less detail and appeared to be based on data developed in 2002 which had not been updated. Many of the projects due for completion in 2003 were still on the 2004 Plan.

The Plan lacked an overall assessment of the state of the network including detailed information on bulk supply sub-station and zone sub-station loadings and limitations

within the sub-transmission system. It did not contain the details of load flow analysis for the 33kV network, which the Panel understands has not been undertaken for some years. There was also no detail of load flow analysis on the 11kV network which the Panel also understands has not been undertaken for several years.

The Panel was advised that analysis of the 11kV loadings commenced during the course of the Review. The Panel is of the view that, compared to interstate distributors, the number of network planning engineers at ENERGEX is low. It is noted that currently ENERGEX is seeking to recruit additional planning personnel.

ENERGEX advised the Panel that some years ago it had an independent assessment made of the planning resources it employed and it was found to be at about the right level. Since that time, however, ENERGEX has reduced the number of planning personnel. This has happened against the background of increased population and load growth that ENERGEX needs to service.

The Panel believes that ENERGEX's planning processes have been resource constrained. This has impacted on the completion of load flow analysis of the sub-transmission and high voltage networks and the acquisition of data on the low voltage system. While ENERGEX has reinstated load flow analysis on parts of these networks during the course of the Review, the lack of information on many parts of the system made it difficult for the Panel to assess whether the sub-transmission network meets the "N-1" criteria. The Panel is of the view that such critical assets should be fully evaluated using load flow analysis at least annually. The Panel has difficulty accepting that without this data ENERGEX would be in a position to properly evaluate the reliability of its network.

Forecasting demand is obviously important for distributors. The Panel believes that the process now used by ENERGEX is sound. ENERGEX prepares five yearly connection point forecasts for bulk and zone supply sub-stations using regression analysis. Low voltage forecasting takes into account known and new loads, such as residential sub-divisions. ENERGEX's forecasts are made for summer and winter temperature outcomes on the basis of various probability of exceedence (PoE) assumptions, including PoE 10 and PoE 50. A PoE 10 assumption involves investing in sufficient system capacity to cope with the daily mean temperature that occurs one in every ten years whereas a PoE 50 assumption involves a daily mean temperature that occurs one in two years. The forecast based on a PoE 10 assumption therefore plans for the system to cope with a more extreme weather event than under a PoE 50 assumption. Currently, ENERGEX uses PoE 50 planning assumptions when planning peak demand growth for its bulk and zone supply sub stations.

ENERGEX has recognised the limitations of using PoE 50 in an over-utilised network. In ENERGEX's own words:

> *With a highly utilised network, ENERGEX is finding it more difficult to cope with extreme weather conditions. A network designed to meet N-1 using 50% PoE forecasts will comfortably cope with extreme weather loads (10%*

of PoE), but a network with a high utilisation like ENERGEX will find it more difficult as experienced in January and February 2004. Until the network utilisation is reduced to 65%, ENERGEX will use 10% PoE forecast commencing in 2005/06.

The Panel endorses ENERGEX's intention to move to PoE 10.

ENERGEX is in the process of transitioning from a variety of legacy asset and maintenance management systems to the Mincom Ellipse system. Data is in the process of being transferred from the legacy systems and this means that there are currently deficiencies in the quality and scope of asset data, which impacts upon ENERGEX's ability to identify necessary maintenance work. ENERGEX's current strategy involves operating Ellipse in parallel with legacy systems for many years and the Panel believes that in order to ensure efficient and effective maintenance programmes, the transition to the Ellipse system should be expedited.

In the past ENERGEX's methodology for prioritising maintenance expenditure has given a much greater weighting to financial measures over reliability measures. ENERGEX has recently altered this approach to give an equal weighting to financial and reliability measures and the Panel endorses this change.

ENERGEX's current system does not recognise cross-arms as an asset or as part of a pole asset. With the reintroduction of a low voltage cross-arm inspection programme from 1 July 2004, the system will need to accommodate such recognition.

The Panel examined the ENERGEX processes for responding to customer faults under normal operating conditions and found that they were appropriate. However, while it is recognised that the primary function of the field crews is to repair faults, ENERGEX should encourage them to communicate regularly with the controllers to update them on the current position. Improved communications between the crews and the controller would allow the Interactive Voice Response (IVR) to be updated more regularly, and for customers to be better informed.

Ergon Energy

Ergon Energy inherited six maintenance programmes from its predecessor organisations. These were of varying quality. It is taking Ergon Energy some years to "validate" the existing data. Ergon Energy accepts that there is a substantial backlog of maintenance work to be undertaken.

Its initial approach has been to repair those assets which have failed or require immediate attention for safety or compliance reasons. It has taken steps to put in place the AIDM programme referred to earlier. The work undertaken on the first three year cycle of this programme will provide data to allow a fully populated maintenance programme to be established. It will, however, be necessary for the second three year AIDM programme to be carried out before sufficient data is available to allow all assets to be fully covered by its maintenance programme. Ergon Energy expects that this will take approximately four years.

At this point it is fair to observe that Ergon Energy's capital expenditure, planning and delivery processes have not in the past been sufficient to achieve the adequate, efficient and targeted allocation of resources needed to ensure a reliable supply. Importantly, however, the processes that are now in place will ensure that this will improve over time.

The lack of reliable data on the state of its networks has impeded Ergon Energy in the preparation of its sub-transmission and distribution augmentation plans. Ergon Energy recognises this deficiency and measures are in place to improve this information. Ergon Energy continues to identify constraints and augmentation needs in its system.

Ergon Energy's prioritisation processes for capital expenditure planning limit the priority given to the SWER network to compliance related works. This means that there is limited planning and capital expenditure undertaken for the more sparsely populated and isolated areas. More specific commentary on the SWER situation is set out below.

Forecasting processes used by Ergon Energy are consistent with industry standards. Ergon Energy uses a bottom up approach to its forecasting by using regional forecasts, which take into account local economic and demographic considerations. Ergon currently uses a PoE 50 in its forecasting process. In the Panel's view, Ergon Energy should examine the adoption of a PoE 10 forecasting assumption in its future planning for critical areas, e.g. high growth urban areas.

The processes used by Ergon Energy for responding to customer faults under normal operating conditions were examined and found to be appropriate.

Contact Centres

The performance of the Contact Centres (also known as Call Centres), operated by the distributors, was the subject of many of the submissions received by the Panel. Complaints about the Call Centres' performances have also been made to successive Ministers responsible for Energy and to the Energy Consumer Protection Office (ECPO). The previous Minister responsible for Energy, The Honourable Paul Lucas MP, in late 2003, had instigated a review of the Contact Centres by Call Centre Development Pty Ltd (CCD). This review is now complete and the Panel examined the results of that review.

It is worth mentioning that call centres are generally unpopular with some sections of the public. Clearly, many people would prefer to speak with a person rather than utilise interactive pre-recorded messages. Against this background, there will always be a number of complaints regarding call centres generally.

The overall assessment of the Call Centre performance indicates that both the ENERGEX and Ergon Energy Call Centres are performing below the overall industry average at this time. They are taking longer than average to answer calls and they have a cumbersome IVR system. Further, a significant number of ENERGEX's customers have been receiving busy signals during normal operating times. Both

distributors have accepted the shortcomings of their Call Centre performance and have taken steps to introduce improvements. These include a more streamlined IVR menu, additional phone lines and shorter, targeted response times.

The Panel notes also that in times of extreme call volumes, such as the storms in early 2004, it is unrealistic to expect any call centre to answer unlimited calls. For the period 24 January to 1 February 2004 there were in excess of 1,225,000 attempted calls made to the ENERGEX Contact Centre, of which approximately 383,000 were answered. Between 7.00pm and 8.00pm on 28 January, Telstra recorded approximately 179,500 attempted calls to ENERGEX and 510,000 during the full day.

Ergon Energy, due to the large geographic spread of its network and customer base, is not generally subject to levels of outages which give rise to such large numbers of calls.

Clearly, steps need to be taken to reduce the necessity for customers to make calls seeking information on supply during such emergencies. In particular, these measures should include much better use of communication through the media regarding outages and expected reconnection times. The Panel believes ENERGEX and Ergon Energy should investigate opportunities to increase focus on the use of the media as a means of providing customers with up-to-date information regarding restoration of service. This should include developing agreements with specific media groups and/or radio stations and developing public awareness campaigns to educate the public on measures to enable them to access information in the event of an outage. These campaigns should include measures which will reduce the reliance of the public on the ENERGEX and Ergon Energy Contact Centres in times of major power disruptions. The Panel also recognises that the public need to have battery-operated radios in order to benefit from this approach.

ENERGEX has itself undertaken a review of its Contact Centre performance during the storms and as a result has instituted a number of improvements. There was a noted improvement in the use of media during the March 2004 cyclonic storms compared with the January storms.

Resources

The Panel noted that both Ergon Energy and ENERGEX have plans in place for substantial increases in both capital and operating expenditure over the next five years. While the QCA of course needs to review such projections, it is important to note that if such expenditure is to occur, it can only be done prudently with sufficient resources being available. These resources include having a sufficient and properly trained workforce and the availability of the necessary materials such as transformers and switchgear.

The Panel believes that both Ergon Energy and ENERGEX will require additional personnel, especially in the field, going forward.

Both distributors have an ageing field workforce. There is a shortage in Queensland and nationally of qualified electricity field workers. While it may seem an attractive

short term financial option to reduce amounts spent on recruiting and training the distributors' workforces, the longer term repercussions are very serious. The Panel believes that the position has been reached where a major risk is faced if steps are not taken immediately to invest more in recruiting and training the workforce of the future.

Ergon Energy and ENERGEX currently have 180 and 125 apprentices respectively at various stages of training. Ergon Energy recruited 76 apprentices in 2004 which was four times the number they had recruited in 2003. ENERGEX recruited 24 apprentices in 2004 which was just above half the number they recruited in the previous year.

The Panel believes that there is significant potential for both distributors to work together to train field workers. Options for more efficient delivery of training should be explored including combining the training facilities (EsiTrain and ISES) and co-ordinating efforts to train network personnel.

The Panel believes that a fully documented plan needs to be put in place to understand resource needs going forward for both Ergon Energy and ENERGEX and to recruit suitable candidates to undergo apprenticeships to become linesmen, cable jointers and electrical fitter mechanics. These plans need to cover at least the next five years.

Failure to recruit and train a properly skilled field workforce for both distributors will mean that significant risk will exist that the networks will not be able to be adequately maintained and essential new work will not be able to be carried out efficiently and on a timely basis.

The Panel believes that in the area of network planning, ENERGEX will require more resources than it currently possesses. It notes that recruitment is currently underway. It is recommended that a review be undertaken independently to assess whether additional positions need to be created to provide adequate planning capacity going forward.

Storms in Early 2004

A series of severe thunderstorms in ENERGEX's area in the last week of January 2004 resulted in large numbers of customers being without power for extended periods. The number of customers without supply varied from 34,000 on 24 January to 120,000 on 30 January. The five storms between Saturday 24 and Friday 30 January, brought with them winds reported up to 145 kilometres per hour and featured extensive lightning, which brought down many trees and severely damaged ENERGEX's power lines, transformers and cross-arms. Restoring supply across the system required almost 10,400 field jobs in one week, which was about 4.5 times ENERGEX's monthly average of 2,400 jobs.

As mentioned earlier, the submissions to the Panel commenting on the storms and the restorative work undertaken were emphatic in their praise of the ENERGEX workers' efforts during this period and the Panel endorses these comments.

It was not so much the severity of the storms which caused the damage but rather the fact that there was a sequence of five storms very close to each other. The important point is that while Queensland may not get a series of five storms so close to each other for some time in the future, the networks need to be as prepared as possible for storms of the intensity which were experienced in January 2004 as they almost certainly will be repeated.

An important factor in reducing outages is an appropriate vegetation management programme. Many of the outages in January 2004 could have been avoided with adequate expenditure on vegetation management. ENERGEX accepts that it should have spent more in this area. It has significantly increased expenditure on vegetation management during 2004 and has plans to continue this increase throughout 2004/05.

ENERGEX also has plans in place to use the media better to reduce the number of calls to its Contact Centres in future. As a result, customers should be better informed in future as to outages and restoration times.

Single Wire Earth Return (SWER) Systems

Much of Ergon Energy's area in rural and remote Queensland is serviced by SWER feeders. These consist of an isolating transformer which converts electricity from the voltage on the backbone system (33kV, 22kV or 11kV) to the SWER voltage (typically 19.1kV and 12.7kV).

The SWER voltage uses a single wire (and the earth as return path) to distribute power to each customer. At the customer's premises, a SWER transformer converts from the SWER voltage to 240 volts for the customer's use.

Such lines have been successfully used to supply electricity to sparsely populated areas in New Zealand, Australia, Canada, India, Brazil, Africa and Asia. They are the preferred method of supplying isolated customers because they are cost effective and reasonably reliable alternatives to stand alone remote area power supply systems. The approximate cost of a SWER line is around $9,000 per kilometre, compared with $15,000 per kilometre for a two wire line of similar capacity and $33,000 per kilometre for a three phase network.

Nearly 65,000 kilometres of SWER lines are currently in use in rural and regional areas of Queensland. Ergon Energy estimates that there are approximately 68,200 customers connected to their long rural network, with many of these customers serviced by SWER. By any measure, Ergon Energy's SWER system is extensive. It adds an additional 65,000 kilometres of line to the 51,000 kilometres of high voltage backbone lines.

The main challenge in operating and being supplied from a SWER system is the limited load carrying capability and the long distances that energy travels.

There are reliability factors associated with SWER lines because the linear design of the networks means that the ability to connect to alternative supplies in the case of

equipment failure is very limited. Voltage problems are also common in SWER lines as voltage drops increase with the length of line and electrical load being supplied.

Over the years loadings on SWER lines have increased significantly. Whereas, in the past, customers on SWER lines may have used electricity to power only lights and a few appliances, they are now seeking to power computers, cold rooms and large air-conditioning units. Outages and voltage problems now have greater impacts than they have had in the past as lines originally intended to cope with lighting and refrigeration loads are now inadequate to meet the expectations of customers.

The electricity supply to sparsely populated areas will be less reliable and more costly than more heavily populated areas. This is because electricity networks are expensive and areas with small numbers of customers make recovery of asset investment difficult to achieve. Given that Queensland has a highly dispersed population, there are many areas which are supplied by SWER lines and, consequently, a very high cost for improving reliability to these customers.

The cost of building a network which would give "city like" reliability in areas currently serviced by SWER lines would be many billions of dollars. It follows that it is necessary to look at other options for improving the supply of electricity in remote areas. The Panel is aware that Ergon Energy has carried out a substantial amount of work in this area and applauds this initiative. It believes, however, that the problem is of such magnitude that more resources need to be devoted to finding ways to make the supply of electricity to areas currently serviced by SWER more reliable.

The Panel recommends that Government establish a working party, including representatives from Ergon Energy, to examine all the alternatives and to report to the Government so that informed decisions can be made as to how to improve reliability in these important areas. One option that needs to be considered to ensure that investments in the areas serviced by SWER are not assessed solely against commercial considerations is to transfer responsibility for these areas to a non-commercial Government entity.

Demand Side Management

As mentioned previously, a factor which adds considerable expense to the distributors' networks is having a network which will meet the peak load demands, even though those peaks may only last for relatively short periods each year. It follows that the identification of successful methods for eliminating or reducing the peaks would lead to very substantial savings.

Such measures are commonly referred to as Demand Side Management. While the Terms of Reference did not require the Panel to consider Demand Side Management in detail, it sees merit in Government and the distributors working collaboratively to explore it further as a means of managing the growth in peak demand.

Demand Side Management measures can either encourage customers to use energy more efficiently through the use of electrical appliances with high energy efficiency ratings or to reduce the overall consumption of electricity. The latter initiatives

include energy efficient building design or the installation of solar hot water systems to reduce the amount of electricity required for water heating during sunny days. Grid connected photo-voltaic cells, while expensive, also offer prospects for the future in terms of peak lopping of summer peak demands.

The Panel is aware, for example, that in some locations (such as Chicago, USA) distributors have arrangements with major customers (such as those who operate large commercial buildings) to alter their load patterns at times of peak system demand. This can be done, for example, by offering major customers lower tariffs in return for giving the distributors control of their air-conditioning thermostats to enable them to better manage the peak system. During high temperature peak demand periods, the distributors may increase the temperature in major commercial buildings and shopping centres by a couple of degrees to reduce the air-conditioning load. With proper management, each building may only have increased temperatures for very short periods.

Regulators in a number of Australian states have introduced legislative requirements, codes of practice or guidelines which provide a regulatory framework conducive to the active investigation and implementation of demand management programmes. For example, in New South Wales, one of the licence conditions for distribution businesses dictates that the holder is required:

> *....before expanding its distribution system, or the capacity of its distribution system, to carry out investigations (being investigations to ascertain whether it would be cost effective to avoid or postpone the expansion by implementing demand management strategies) in circumstances in which it would be reasonable to expect that it would be cost effective to avoid or postpone the expansion by implementing such strategies.*

The Panel recommends that similar requirements be introduced in Queensland.

The Panel also considers that there is scope for a review of the role played by tariffs in Queensland in managing peak demand. The application of kVA tariffs to large users is one option to better manage demand. These tariffs directly induce customers to install power factor correction equipment (also known as capacitors).

The power factor is the relationship between the actual capacity required and the theoretical capacity required on electrical devices. By way of example, a typical industrial plant will require around 25% more capacity in kVA terms compared to kW terms – a power factor of 75%. These tariffs charge the customer for the capacity supplied to them in kVA terms, rather than the energy received by them in kW terms. The customer therefore has a financial incentive to reduce any inefficiency "at their premises". By making the customer responsible for the difference between kVA and kW, the customer is induced to install power factor correction equipment. The application of kVA charges to large users is common practice across Australia and other parts of the world.

The Panel recommends that Government and the distributors work together to develop kVA tariff structures which better assist in the management of peak demand and lower the overall utilisation of the network. It is recommended that the outcomes of this process be input into the development of new distribution tariffs for the regulatory period commencing 1 July 2005.

Summary and Recommendations

The Panel believes that the current state of the networks operated by Ergon Energy and ENERGEX dictates that they require greater levels of expenditure on capital and maintenance than they have been accorded in recent years. In broad terms, the distributors do not disagree with the Panel's view. Both have plans in place for increased capital works and maintenance programmes and changes to some internal procedures.

Given the need to spend significant additional amounts of money in order to return the networks to an acceptable level of performance, the Panel believes that it is essential that an appropriate accountability and transparency regime be put in place for delivering the capital and maintenance programmes. There needs to be a balance between prudent expenditure and improved performance, in order to ensure Queensland retains a competitive position in the Australian and international market place.

There is an established process involving the QCA for setting revenue caps and the Panel does not want to circumvent, or interfere with, that process. The Government needs to set standards for reliability on which the QCA can base its determination and monitor the performance of the distributors. This is necessary to ensure both sides of the "regulatory bargain" are clearly defined.

The extent of capital expenditure increases proposed by the distributors dictates that the QCA undertake a rigorous review of the validity of the proposed capital "building blocks" for the next revenue determination. In addition to the capital expenditure requirements, the Panel has found the need for an increase in focussed maintenance expenditure to ensure that unnecessary outages on the networks are avoided. The Panel has no doubt that with an effective maintenance programme, outages of the type experienced in early 2004 would have been significantly reduced in magnitude.

There are 44 recommendations in the Detailed Report. The following summarises the major recommendations related to the substantive issues found by the Panel:

- There are currently no mandatory service standards for distribution services in Queensland as there are in other states. This has resulted in the distributors not having sufficient focus on the quality of service they deliver to end customers. The Panel recommends that the Government mandate minimum network service standards for ENERGEX and Ergon Energy. Provision currently exists in the legislative framework for the setting of such standards. They should be used by the QCA in a service quality incentive regime to be incorporated into its revenue determination for the next regulatory period;

- The Panel has doubts about whether the current regulatory regime provides appropriate incentives to deliver reliable supply to Queensland customers. The Panel recommends that the Government and the QCA consider alternative arrangements for increasing ENERGEX and Ergon Energy's investment certainty during a regulatory period, including but not limited to the possibility of mid-period re-openings, rulings issued by the QCA in relation to new investments and a flexible revenue cap based on variable demand levels;
- An "N-1" planning criteria is the accepted planning policy for bulk and major zone sub-stations and for sub-transmission feeders in Australia. A significant number of ENERGEX and Ergon Energy's assets do not meet a standard equivalent to "N-1". The Panel recommends that Government include in ENERGEX and Ergon Energy's Distribution Authorities a requirement that they meet a standard equivalent to "N-1" for bulk and major zone sub-stations and for their sub-transmission system;
- ENERGEX's system utilisation is currently about 76%, which is well in excess of the average Australian utilisation level of 56% and the generally accepted prudent level of around 60% to 65% . While ENERGEX has made significant financial savings in recent years by operating at high system utilisation levels, it has insufficient spare capacity to cope with contingency events given the projected continued growth in average and peak maximum demand. The Panel recommends that ENERGEX invest in its network to reduce its utilisation to around 60% to 65%;
- ENERGEX has not spent sufficient amounts in recent years on maintaining its system and, in particular, has not had an adequate focus on preventative maintenance, such as on vegetation management and cross arm inspections. This has significantly contributed to the number and duration of outages across ENERGEX's system. The Panel recommends that ENERGEX ensure that sufficient amounts are spent to deliver an effective maintenance programme. In particular, attention needs to be given to its overhead network;
- Ergon Energy inherited six diverse asset management systems when it was established in 1999. The lack of reliable asset information available from these systems has significantly constrained the effectiveness of Ergon Energy's maintenance activities. The Panel believes that Ergon Energy has taken too long to address this problem and recommends that it expedite the up-grading of its systems to ensure it can implement a comprehensive and effective maintenance programme as soon as possible;
- ENERGEX and Ergon Energy have to date applied a PoE 50 weather forecasting assumption for their network planning, which attributes a relatively low probability to extreme weather events. These forecasts have been significantly exceeded in recent years. The Panel recommends that both ENERGEX and Ergon Energy's network planning in high growth urban areas should be based on a PoE 10 weather assumption, which attributes a relatively

high probability to an extreme weather event occurring and therefore builds in greater contingent capacity into the system;

- There is currently insufficient rigour and transparency in the distributors' capital and maintenance expenditure planning and delivery. The Panel considers that Government should require both ENERGEX and Ergon Energy to publish an annual Network Development Plan as part of their licensing conditions. The Plan should be consistent with good industry practice and similar to that currently produced by distributors in NSW. ENERGEX and Ergon Energy should be required to report to Government on their performance against their Plans each year;
- ENERGEX received about 1.2 million telephone calls to its Contact Centre during the January and February 2004 storms. It is unrealistic to expect any call centre to be able to respond to this volume of calls. Improvements can, however, be made. The Panel recommends that ENERGEX and Ergon Energy should increase their use of the media in extreme weather events to provide customers with up to date information on the restoration of their services and to reduce the number of telephone calls made to their Contact Centres. In addition, call centre menus should be simplified, IVR capacity increased and response times and complaint handling improved. The Panel recognises that a number of these recommendations have already been addressed by the distributors during the period of this Review;
- ENERGEX and Ergon Energy have reduced their field workforce numbers in recent years. They now have relatively aged workforces. The plans to significantly increase the network expenditure will further increase the load on the existing workforce. There is a significant risk that the networks will not be adequately planned and maintained. Essential capital works will also be at risk given current personnel levels and age profiles. The Panel recommends that both distributors should immediately put in place a fully documented resource plan for the next five to ten years, which details the steps that they will take to recruit and train the necessary personnel. Joint training facilities and programmes should be investigated, particularly for linespersons;
- Ergon Energy's Single Wire Earth Return (SWER) system has been successful in servicing large parts of regional Queensland in an economically efficient manner. However, the quality of supply to customers serviced from the SWER system is significantly lower than for most non-SWER areas. The Panel recommends that Government and Ergon Energy establish a joint taskforce to examine options for improving the service quality to areas currently serviced by the SWER system; and
- Demand side management initiatives can be taken by distributors, retailers or customers to modify customer electricity demand and usage patterns. These initiatives can encourage customers to use energy more efficiently in order to reduce the overall consumption of electricity and to assist in managing peak

maximum demand. The use of capacity based kVA tariffs is a common demand management policy used elsewhere in Australia to encourage major industrial and commercial customers to install power factor correction equipment to reduce any inefficiency caused by low power factors at their premises. The Panel recommends that Government work with the distributors to develop tariff structures of this kind to manage peak maximum demand in the system.

1

TERMS OF REFERENCE

On 1 March 2004, the Government announced the following Terms of Reference for the Review.

1. Evaluate the reliability of the Queensland electricity distribution system:
    - Report on the standard of the Queensland electricity distribution system as benchmarked against appropriate comparisons, using recognised industry measures;
    - Review the levels of expenditure on capital works and maintenance required to cater for current demands and future levels of growth in the distribution system, as benchmarked against appropriate comparisons;
    - Determine whether legislative and regulatory requirements under the *Electricity Act (Qld) 1994*, the *National Electricity Code*, and the Queensland Competition Authority (QCA), are sufficient to ensure reliable supply of electricity for Queensland customers;
    - If deficient, recommend solutions for achieving reliability improvements including amendments to the *Electricity Act (Qld) 1994*, the *National Electricity Code* and *Electricity Regulation 1994;* and
    - Provide recommendations for effective ongoing evaluation and reporting of reliability performance including the setting and monitoring of service quality standards.
2. Evaluate capital and operational expenditure of ENERGEX and Ergon Energy to:
    - Determine adequacy of current levels of expenditure on capital works and maintenance to cater for current demands and expected growth, as benchmarked against appropriate comparisons;
    - Assess whether the internal systems and processes of the above entities ensure efficient and targeted allocation of resources to capital works and maintenance of the electricity distribution system. This assessment should include a review of the planning criteria used to trigger expansion and reinforcement of the distribution network; and

- If deficient, recommend solutions for achieving improved resource allocation by the entities.

3. Evaluate internal systems, planning and processes of distribution entities to determine whether they support the provision of a reliable electricity network and if deficient develop solutions for achieving improvements.
4. Determine whether communication systems used by industry bodies to advise the Queensland public of system interruptions caused by electricity distribution system failures, including extreme weather conditions, are adequate. If appropriate, the report should identify where any improvement can be made.

This Detailed Report is the Panel's response to these Terms of Reference.

1.1 Meeting the Terms of Reference

Terms of Reference	**Chapter of this report**
Report on the standard of the Queensland electricity distribution system as benchmarked against appropriate comparisons, using recognised industry measures.	5
Review the levels of expenditure on capital works and maintenance required to cater for current demands and future levels of growth in the distribution system, as benchmarked against appropriate comparisons.	6 and 7
Determine whether legislative and regulatory requirements under the *Electricity Act (Qld) 1994*, the *National Electricity Code*, and the Queensland Competition Authority (QCA), are sufficient to ensure reliable supply of electricity for Queensland customers.	4
Recommend solutions for achieving reliability improvements including amendments to the *Electricity Act (Qld) 1994*, the *National Electricity Code* and *Electricity Regulations 1994.*	4
Provide recommendations for effective ongoing evaluation and reporting of reliability performance including the setting and monitoring of service quality standards.	4 and 5
Determine adequacy of current levels of expenditure on capital works and maintenance to cater for current demands and expected growth, as benchmarked against appropriate comparisons.	6 and 7
Assess whether the internal systems and processes of the above entities ensure efficient and targeted allocation of resources to capital works and maintenance of the electricity distribution system. This assessment should include a review of the planning criteria used to trigger expansion and reinforcement of the distribution network. If deficient, recommend solutions for achieving improved resource allocation by the entities.	8 and 10

Evaluate internal systems, planning and processes of distribution entities to determine whether they support the provision of a reliable electricity network and if deficient develop solutions for achieving improvements.	8
Determine whether communication systems used by industry bodies to advise the Queensland public of system interruptions caused by electricity distribution system failures, including extreme weather conditions, are adequate. If appropriate, the report should identify where any improvement can be made.	9

2

BACKGROUND TO THE REVIEW AND THE PROCESS FOLLOWED

2.1 Background

On 1 March 2004, the Queensland Government appointed an independent panel following community concern about the performance of the networks during and after a series of storms and a period of hot weather in January and February 2004. The Review was commissioned to examine the current state of Queensland's electricity distribution networks and their capacity to meet future needs.

It is important to note that the Terms of Reference for the Review related to distribution services provided by Ergon Energy and ENERGEX, not the generation (the responsibility of Tarong Energy, CS Energy, Stanwell and other privately owned generators), transmission (the responsibility of Powerlink) or retail sectors. The Terms of Reference were broader than a review of the performance of the networks during the storms and hot weather in early 2004.

The Terms of Reference required a review of the current state of Queensland's distribution networks, including an assessment of reliability, capital and operating expenditure, and whether those factors together with existing or proposed internal systems, planning and forecasting methods will ensure reliable networks for the 21st Century.

The Panel consisted of:

- **Mr Darryl Somerville** Partner PricewaterhouseCoopers (Panel Chairman);
- **Mr Steve Blanch** Electricity industry consultant; and
- **Mr Jack Camp** Queensland Commissioner for Electrical Safety.

Curricula vitae for the Panel members are provided in Appendix 6.

2.2 The Process Followed

In order to assess the state of the networks, the Panel obtained information from ENERGEX and Ergon Energy, examined business records and held both formal and informal discussions with personnel at a range of levels in the organisations. It also received presentations from ENERGEX and Ergon Energy's management teams on

several occasions and had several meetings with the QCA. The Chairmen of each distributor also met with the Panel.

The Panel was assisted in gathering information by a Secretariat (with representation from the Office of Energy, the Department of the Premier and Cabinet, Queensland Treasury and the Electrical Safety Office), and by consultants engaged by the Office of Energy as detailed in Appendix 3. The Panel also conducted its own thorough assessment of this information to ensure that the findings and recommendations in this Report are both accurate and reasonable.

The Panel met regularly over a four month period.

Public Submissions to the Review

On 24 March 2004, the Panel released an Issues Paper calling for public submissions on the Terms of Reference. The Issues Paper provided an explanation of the Terms of Reference for the Review and gave background information on the Queensland electricity distribution networks. Due to the interest generated by the Review and a number of requests, the submissions period was extended by a week until 30 April 2004. The Panel received 122 submissions, which provided details of customers' experiences in relation to electricity supply across Queensland. Detailed submissions were also made by ENERGEX and Ergon Energy.

Details of the submitters are provided at Appendix 2 and a summary of the key issues raised in the submissions is provided in Appendix 1.

Regional Tour and Meetings with Regional Electricity Councils

There are seven Regional Electricity Councils (RECs) appointed throughout the regions of Queensland. The RECs are community-based advisory bodies consisting of six to ten members from each of the respective communities, including a Minister-appointed Chairperson. The RECs cover:

- South East Queensland;
- South West Queensland;
- Capricornia;
- Mackay;
- Wide Bay-Burnett;
- North Queensland; and
- Far North Queensland.

The Panel conducted a regional tour in April 2004 as part of the consultation phase of the Review. Each of the RECs also provided submissions in response to the Issues Paper, which were very beneficial to the review process. Some of the key problems raised by the RECs with the Panel related to call centre performance, inadequate

reliability, maintenance of assets, field personnel morale, the SWER system and the use of Remote Area Power Supply systems (RAPS). The meetings with the RECs were beneficial to the Review.

The Panel also had a meeting with representatives of the Waggamba and Inglewood Shire Councils and the Goondiwindi Town Council. These areas are serviced by Country Energy, and representatives of Country Energy also attended the meeting.

Meetings with Ergon Energy and ENERGEX Field Personnel

The Panel met with Ergon Energy field personnel in regional centres and with ENERGEX field, control room and workshop personnel in Brisbane. These meetings included a range of workplace representatives including nominees from the ETU. The Panel also conducted a number of informal meetings with field personnel.

In addition, the Panel visited call centres operated by Ergon Energy and ENERGEX in Rockhampton and Brisbane respectively.

Technical Review Group

The Panel established a Technical Review Group (TRG) to provide input into the Review. The TRG consisted of two members nominated by the ETU and one member each nominated by ENERGEX and Ergon Energy. The TRG provided the Panel with:

- Technical expertise on industry matters;
- Information about training and resourcing issues; and
- Expert knowledge on infrastructure and maintenance issues.

2.3 Probity

At the commencement of the Review, KPMG was appointed as the Probity Advisor to establish probity processes to ensure independence and to provide advice to the Panel, its advisors and the Secretariat, on probity issues throughout the Review.

A detailed report from the Probity Advisor has been submitted to the Minister for Natural Resources, Mines and Energy in accordance with the Probity Advisor's terms of appointment.

In summary, the Probity Report concluded that the Review has been conducted in accordance with the Terms of Reference, and that all processes embodied appropriate attention to probity. The Probity Report concluded that the Review had been conducted with independence, confidentiality, security, transparency, accountability, consistency and fairness.

3

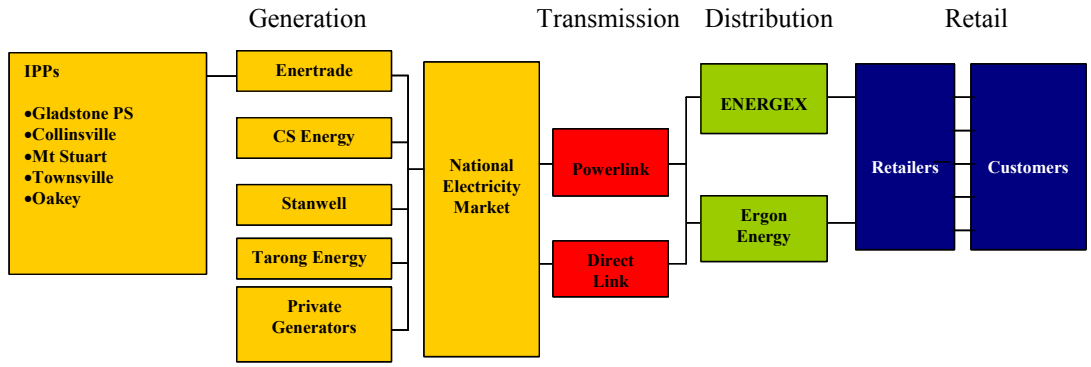
OVERVIEW OF THE QUEENSLAND ELECTRICITY SUPPLY INDUSTRY

This chapter outlines the current structure of the Queensland electricity supply industry. As already noted, the scope of this Review was limited to the distribution sector of the industry. The main bodies that regulate the industry are discussed in Chapter 4.

3.1 Queensland Electricity Supply Industry Structure

Chart 3.1A illustrates the current structure of Queensland's electricity supply industry.

Chart 3.1A Structure of Queensland Electricity Industry



Note – Country Energy also distributes electricity within an area in southern Queensland via its supply network that originates in NSW.

Generation of Electricity

There are three State owned generation businesses in Queensland (Stanwell, Tarong and CS Energy) and a number of private and joint State and privately owned generators that have been granted Generation Authorities under the *Electricity Act 1994*.

The Generation Authorities allow the holder to connect generating plant to the transmission system or a distributor's supply network, and to sell electricity in Queensland either through the National Electricity Market (NEM) or by other specified means. The generators produce electricity using a range of renewable and non-renewable fuel sources, including coal, gas, water (hydro), biomass and wind.

A number of the privately owned generators trade into the NEM through Enertrade, a Government-owned electricity trading company.

The National Electricity Market Management Company Limited (NEMMCO) operates the NEM through a centrally-coordinated dispatch process where it continually balances supply and demand requirements by scheduling generators to produce sufficient electricity to meet customer demand. Generators make offers and bids to supply electricity, which NEMMCO uses to schedule generators to meet demand.

The National Electricity Code Administrator (NECA) is currently responsible for supervising, administering and enforcing the National Electricity Code (the Code). The Code contains the market rules under which the NEM operates. NECA is to be incorporated into the Australian Energy Market Commission, which is to be established during 2004.

Transmission of Electricity

Powerlink is licensed to operate Queensland's 11,427 circuit kilometres of high voltage transmission network which transports electricity throughout Queensland. It transports electricity at 330kV, 275kV, 132kV and 110kV from generators to the distribution networks and to large customers, such as aluminium smelters.

Powerlink is also Queensland's Jurisdictional Planning Body and accordingly has responsibility under the Code for designing, constructing, maintaining and operating the transmission system to ensure adequate, economic, reliable and safe transmission of electricity.

Powerlink and TransGrid, the state-owned NSW transmission company, jointly own the 330kV Queensland - New South Wales Interconnector (QNI), which transports electricity between Queensland and NSW. Electricity is also transported between the two states through the underground direct current DirectLink transmission line operated by TransEnergie.

Powerlink's revenues are regulated by the Australian Competition and Consumer Commission. DirectLink is currently an unregulated transmission line.

Distribution of Electricity

In general terms, the role of a distributor is to build and maintain distribution assets, to receive electricity from the transmission system and to supply electricity, on behalf of retailers, to end customers.

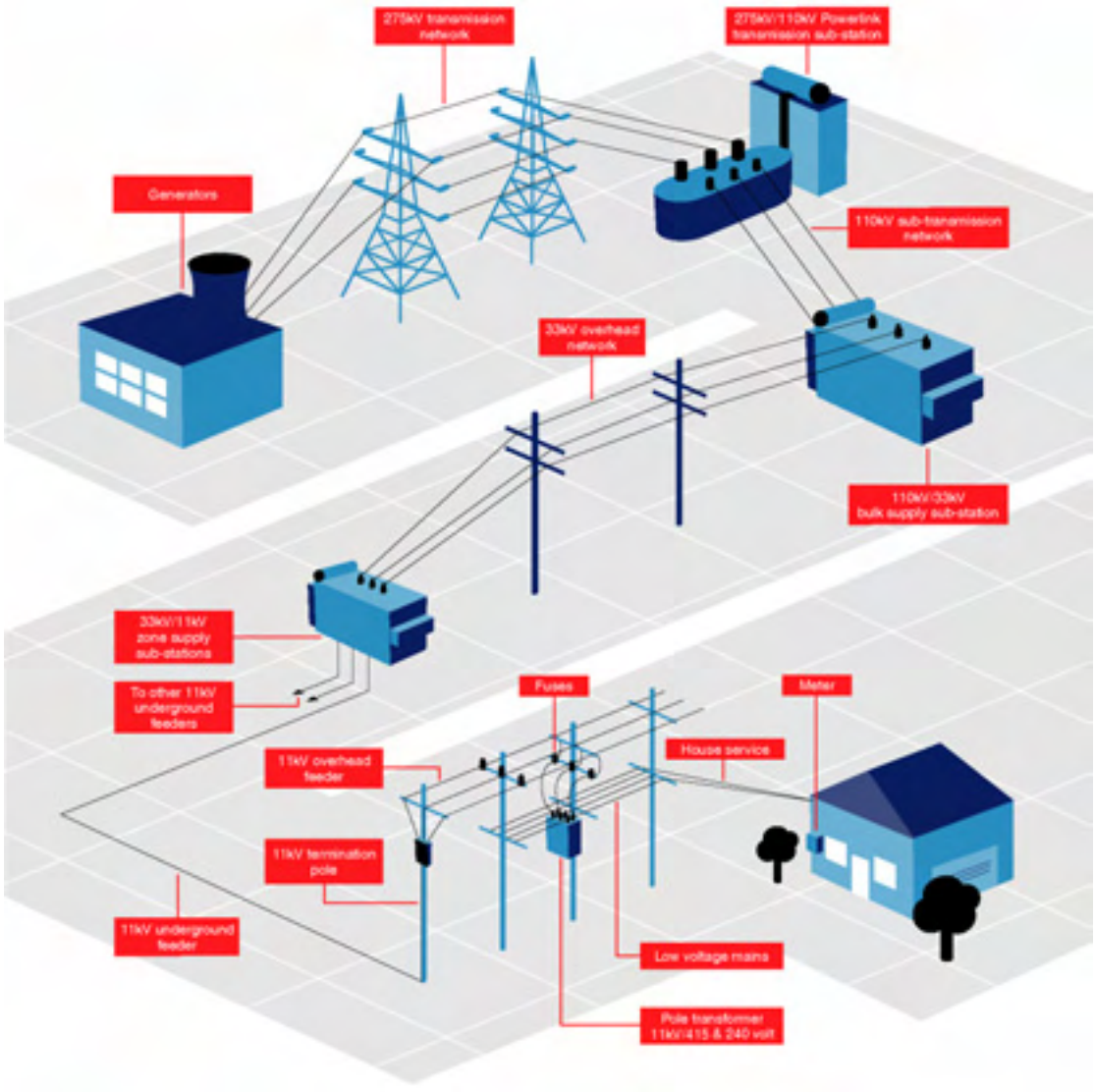
The following is a generic description of the key distribution assets that make up the distribution networks:

- Bulk supply sub-stations – these sub-stations transform electricity supplied from the 132kV or 110kV system to lower voltages for supply to zone supply sub-stations;
- Sub-transmission powerlines – these powerlines transmit electricity at 132kV, 110kV, 66kV or 33kV from the bulk supply sub-stations to zone supply sub-stations. In limited situations, large customers may take their supply from these feeders;
- Zone supply sub-stations – these sub-stations transform electricity supplied at sub-transmission voltage to 22kV or 11kV used in the distribution feeders;
- High voltage distribution feeders – these feeders distribute load between zone supply sub-stations (to provide contingency in the event of failure of other equipment) and provide connection to distribution transformers at the 22kV and 11kV level;
- Distribution transformers – these are used extensively across the networks to convert from feeder voltage (22kV or 11kV) to the low voltage level (415/240 volts), which is used by the majority of customers;
- Low voltage lines – these are used to take the output from distribution transformers to a number of customers in a discreet area. Typically between 50 and 200 customers are fed from each distribution transformer via these low voltage lines. These lines are often co-located on poles which also carry high voltage distribution feeders;
- Single Wire Earth Return (SWER) lines – these are used in rural environments to provide cost effective supply to sparsely populated areas. An isolation transformer converts the supply voltage to one of the several voltages used in the SWER system (12.7kV or 19.1kV). A single wire is used to distribute power to each customer with the return path through the earth. At the customer's premises, a SWER transformer converts the voltage to 240 volts for the customer's use. At larger load centres (e.g. small towns), a single SWER transformer supplies a 240 volt mini-network;
- Poles – these are used to hold up the wires. Most of the poles in the networks are timber, although concrete poles are used in some areas. ENERGEX has about 570,000 poles and Ergon Energy has about 900,000 poles;
- Cross-arms – these are connected to the poles and are used to mount the insulators which support the wires (conductors). These are normally wooden, however there are a small number of steel cross-arms in use across the networks;

- Conductors – these are the "wires" used to carry electricity throughout the system. They are made of different materials including copper, aluminium, steel-cored aluminium and steel, and vary significantly in diameter. The larger the diameter the greater the current that can be carried by the conductor. Bare conductors are usually used in the overhead networks but they can be insulated. Underground conductors are always insulated;
- Bridges – these are used to connect conductors to each other and to temporarily by-pass switches and other equipment on the lines as required;
- Circuit breakers (CB) and switches – circuit breakers are used to switch supply on and off throughout the system. Some CBs are remotely operated;
- Auto reclosers – these are automated circuit breakers located at various points along feeders to enable isolation of faulted sections of the feeder, therefore avoiding a need to switch the whole feeder while a fault is being repaired. These reclosers typically lead to momentary interruptions, although when operating effectively, they can significantly reduce the number of customers inconvenienced by long outages;
- Isolators – these are manually operated switches which are used to isolate a small faulted section of the feeder, thus enabling the remaining sections to be re-energised;
- Surge diverters – these devices are installed at various locations throughout the networks to protect equipment (such as lines, transformers and circuit breakers) from the impact of sudden, short duration high voltages, such as direct lightning strikes; and
- Meters – these are devices which measure how much energy has been consumed at all levels through to the end customer.

The main assets in the supply of electricity are illustrated in Chart 3.1B.

Chart 3.1B - Role of Distribution in the Supply of Electricity to Customers



The role of a distributor can be distinguished from that of a transmission business because:

- A transmission business transmits electricity at high voltage from generators to a limited number of supply points within a distributor's service area (or in a small number of cases directly to very large customers); whereas
- A distributor receives electricity from the transmission system at a limited number of points and converts it to lower voltages along the length of its network in order to supply large numbers of customers throughout its service area.

A transmission network can therefore be likened to a major highway whereas a distribution network can be likened to the streets and roads that run off the highway and lead to business, residential and other locations. In practice, some assets at the point of connection between the transmission and distribution systems could be built, owned, operated and maintained by either a transmission or distribution business.

By way of example, the proposed 132kV sub-transmission line from Bulli Creek to Goondiwindi is being built by Ergon Energy as a part of its distribution network – alternatively, it could have been built by Powerlink and incorporated into its transmission network.

The role of a distributor can also be distinguished from that of an electricity retailer (which is described further below) because:

- A distributor is responsible for the physical assets that supply end customers and while it generally does not have a direct relationship with a customer for billing purposes it does carry out fault and emergency services on the network down to the customer's connection; whereas
- A retailer does not have any direct responsibility for any of the assets that physically supply customers. Retailers sell energy and provide billing and other customer services to end users.

Distribution in Queensland

There are two distribution businesses in Queensland operating under Distribution Authorities (licences) issued under the *Electricity Act 1994* – ENERGEX and Ergon Energy.

Additionally, Country Energy, a NSW government-owned distributor, holds a Special Approval under the *Electricity Act 1994* which authorises it to distribute and sell electricity to about 5,500 customers within an area in southern Queensland from its network which extends across the State border.

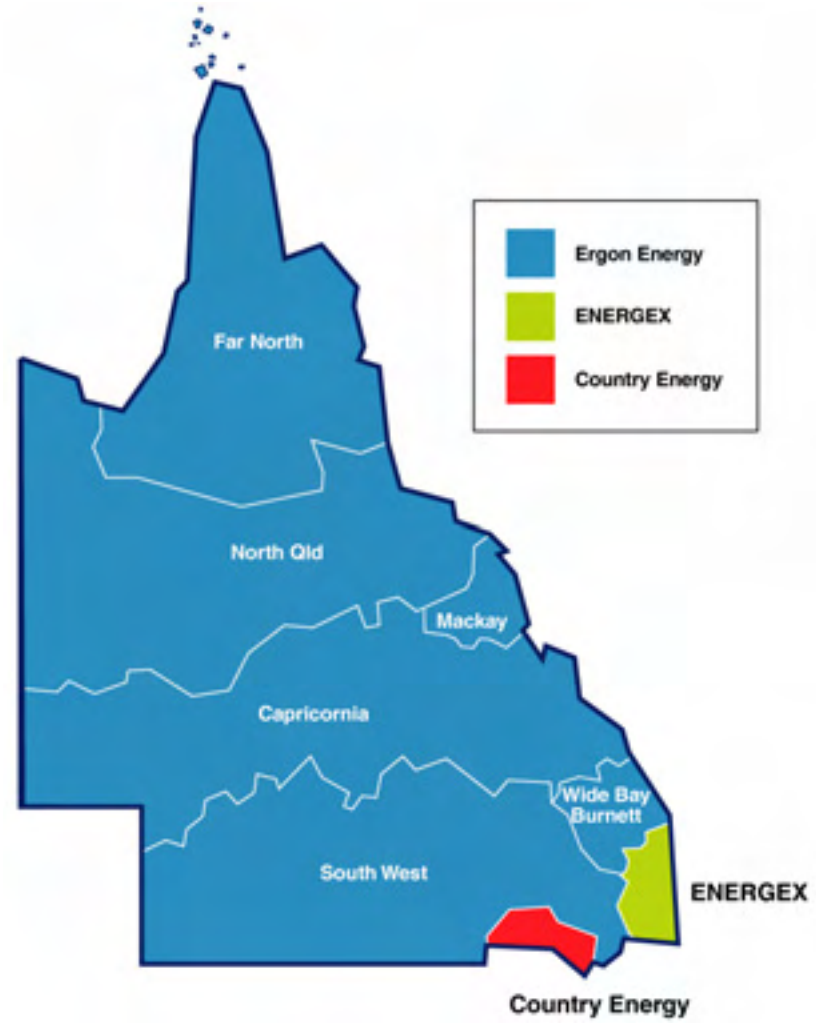
ENERGEX supplies electricity in the densely populated south-east corner of Queensland and Ergon Energy supplies electricity to the remainder of Queensland not serviced by ENERGEX or Country Energy. Both ENERGEX and Ergon Energy are Government Owned Corporations.

ENERGEX and Ergon Energy supply electricity to around 1.7 million customers through networks with very different characteristics.

- ENERGEX operates in a service area of 25,264 square kilometres in the south-east corner of Queensland. Its area has high customer density and is largely urban in nature; and
- Ergon Energy operates a geographically dispersed network in the remainder of the state covering an area of 1,698,100 square kilometres - approximately six times the area of Victoria. With the exception of the major regional centres, Ergon Energy's area has relatively low customer density.

ENERGEX and Ergon Energy's distribution areas, along with Country Energy's Queensland supply area, are illustrated in Chart 3.1C.

Chart 3.1C - ENERGEX and Ergon Energy's Service Areas



Retailing of Electricity

Retailers are responsible for buying bulk supply electricity from the wholesale market and on-selling it to customers. Retailers pay transmission and distribution businesses for the use of their networks in transporting electricity from generators to their customers.

There are two types of electricity retail businesses in Queensland:

- Retailers that hold a Retail Authority within a defined retail area and which provide services to franchise and contestable customers.[2] There are currently two such retailers – ENERGEX Retail and Ergon Energy Retail. Additionally, Country Energy is authorised under its Special Approval to provide customer retail services to franchise customers in its supply area in southern Queensland; and
- Retailers that hold a Retail Authority without a defined retail area and who may provide retail services to contestable customers only. There are currently fifteen such retailers in Queensland competing to supply about 16,000 existing contestable or potentially contestable customers.

[2] Contestable customers are those customers who are able to choose their electricity retail suppliers. Queensland franchise (non-contestable) customers are those who are unable to choose their retailer and are subject to uniform tariffs regardless of their geographical location or the cost of their supply.

4

QUEENSLAND'S REGULATORY ENVIRONMENT

The purpose of this chapter is to address the following Terms of Reference:

> *Determine whether legislative and regulatory requirements under the Electricity Act (Qld) 1994, the National Electricity Code, and the Queensland Competition Authority (QCA) are sufficient to ensure reliable supply of electricity for Queensland customers;*
>
> *If deficient, recommend solutions for achieving reliability improvements including amendments to the Electricity Act (Qld) 1994, the National Electricity Code and Electricity Regulations 1994; and*
>
> *Provide recommendations for effective ongoing evaluation and reporting of reliability performance including the setting and monitoring of service quality standards.*

This chapter examines whether the current legislative and regulatory framework provides incentives for reliable electricity supply by:

- Overviewing the regulatory regime and the way it is currently being applied; and
- Assessing whether the regulatory regime provides incentives for ENERGEX and Ergon Energy to take decisions which will deliver reliable supply.

4.1 Regulatory Framework for Electricity Distribution Services

There are four main pieces of legislation that regulate electricity distribution services in Queensland.

The *Electricity Act 1994* establishes the Director-General of the Department of Natural Resources, Mines and Energy as the Regulator under the *Electricity Act 1994*. The Regulator's functions are carried out by the Office of Energy, and are[3]:

> *a) To ensure only suitable persons become electricity entities;*
>
> *b) To review and make recommendations about standards and practices under this Act;*

[3] Section 63(1) of the *Electricity Act 1994.*

c) *To assist the settlement of disputes between electricity entities and between electricity entities and others;*

d) *To investigate complaints by customers about the performance or operation of electricity entities;*

e) *To monitor compliance with this Act, including compliance with conditions of authorities, approvals and licences;*

f) *To perform other functions given to the regulator under this Act or another Act.*

The Regulator has issued Distribution Authorities to ENERGEX and Ergon Energy.

The *Electricity Act 1994* and the associated *Electricity Regulation 1994* also give the Regulator powers to set minimum distribution service standards, however to date no such service standards have been set.

The *Queensland Competition Authority Act 1997* establishes the QCA and sets out its functions under Section 10 of that Act. This Act, together with the *Electricity Act 1994* and the Code, give the QCA responsibility for:

- Regulating the revenues for electricity distribution networks as the Jurisdictional Regulator under the Code;
- Making and enforcing rules of conduct;
- Monitoring service quality standards of electricity entities; and
- Assessing competitive neutrality under Part 4 of the *Queensland Competition Authority Act 1997*.

The passage of the *Electricity Safety Act 2002* introduced a new emphasis on reducing Queensland's historically poor electrical safety record.

For the first time, electricity safety was supported by stand-alone legislation; the administration of electrical safety was vested in a body apart from the industry; and, the legislative regime moved from a prescriptive to an outcomes focus.

Responsibility in this area had previously been shared by separate organisations in several departments, operating under different legislation (the Electrical Safety Office in the Department of Mines and Energy under the *Electricity Act 1994* and Workplace Health and Safety in the Department of Industrial Relations under the *Workplace Health and Safety Act 1995*), and with separate inspectorates. Since 2002, there has been one Act, one responsible department and a substantial increase in resources.

That resource increase was most evident in the appointment of 22 Senior Electrical Inspectors throughout the State, backed up, amongst other things, by a significant commitment to public education and awareness activities and a network of consultative bodies directly advising the Minister through the Commissioner of Electrical Safety.

The purpose of the Electrical Safety Act 2002 includes:

> *...eliminating the human cost to individuals, families and the community of death, injury and destruction that can be caused by electricity...preventing persons from being killed or injured by electricity, and preventing property from being destroyed or damaged by electricity.*

The *Electricity – National Scheme (Queensland) Act 1997* applies the *National Electricity Law* and the Code in Queensland.

4.2 Legislative Measures Impacting Service Quality

Minimum Service Performance Standards

There are two main ways in which minimum standards can be set for distribution services under the *Electricity Act 1994*.

Section 92 of the *Electricity Act 1994* enables service quality standards to be prescribed in the Regulation and provides for a penalty to be set for failing to meet any prescribed standards. Section 92 provides for the QCA to administer any such standards.

Section 45 of the *Electricity Act 1994* provides that it is a condition of a Distribution Authority that the distribution entity comply with any standards, protocols and codes applicable to it under regulation, including those which relate to minimum service standards. A breach of a standard would therefore constitute a contravention of the Distribution Authority.

The Panel notes that neither of these service quality mechanisms are currently being utilised. As a result, ENERGEX and Ergon Energy do not have any mandated service quality standards that they must deliver to their customers.

The Panel considers that setting mandated service standards is a necessary first step in ensuring ENERGEX and Ergon Energy deliver reliable electricity supply to Queenslanders. It recommends that such standards should be introduced as a matter of priority.

All the other states in the NEM have minimum service performance standards as part of their regulatory arrangements.

Regulating Distribution Service Revenues and Prices

The QCA's role in regulating distribution services is to ensure that the prices charged by ENERGEX and Ergon Energy to their customers reflect the efficient cost of providing them.

In performing this role, the QCA must have regard for the provisions of the Code. Chapter 6 of the Code sets out the objectives, principles and processes for setting prices for distribution services. The Code gives considerable discretion to the QCA in

determining the form of regulation that will apply, although the Code requires that the form of regulation must:

- Be of a prospective CPI minus X form or some incentive-based variant;
- Involve either a maximum revenue cap, a weighted average price cap or a combination of the two; and
- Involve a regulatory period of at least three years.

The Code also requires the QCA to have regard for any applicable service standards (amongst other things) that apply to ENERGEX and Ergon Energy in setting the regulatory cap.

The QCA decided to regulate ENERGEX and Ergon Energy's distribution services for the four years from 1 July 2001 to 30 June 2005 under a maximum revenue cap whereby an Aggregate Annual Revenue Requirement (AARR) is set. The AARR caps the maximum revenue that ENERGEX and Ergon Energy can earn each year from their distribution services. The QCA has decided to continue to use the AARR method for the next regulatory period. The Panel has not considered in detail the relative merits of alternative forms of regulation, such as a price cap, given that this decision has been made and is now being effected.

The AARR is determined by assessing:

- The return on the assets that the distributors require in order to provide their distribution services (including a return on projected capital expenditure during the period);
- A return of the assets consumed during the course of the regulatory period (i.e. depreciation); and
- The efficient operating and maintenance expenditure required by the distributors to deliver their distribution services.

The process that the QCA has adopted in setting the AARR involves:

- ENERGEX and Ergon Energy providing submissions to the QCA in relation to their proposed revenue requirements. These revenue requirements are determined by the distributors and include estimates of required capital expenditure and operating and maintenance expenditure, which have regard for forecasts of demand growth;
- The QCA assessing the proposed revenue requirements, to determine whether the resultant prices reflect efficient costs of supply. A key element of this is the QCA's assessment of the reasonableness of the capital expenditure and operating and maintenance expenditure forecasts;
- The QCA issuing a Draft Decision, which sets out the QCA's preliminary view of the reasonableness of the AARR, based on its assessment of the distributors'

submissions. The QCA invites public comment on its Draft Decision, including from ENERGEX and Ergon Energy; and

- The QCA issuing a Final Determination on the AARR after considering public submissions on the Draft Decision and any new information that has become available.

ENERGEX and Ergon Energy translate the AARR into a set of distribution tariffs based on views of forecast demand. These tariffs must be approved by the QCA, in accordance with the Code, prior to the start of the financial year. If, at the end of a year, ENERGEX and Ergon Energy's actual annual revenue has exceeded the AARR cap, the AARR for the following year is adjusted by the amount of the over-recovery.

Set out below are the Panel's general observations in relation to the current application of the regulatory regime as well as specific observations in relation to its impacts on the capital expenditure and operating and maintenance expenditure of ENERGEX and Ergon Energy.

General Observations

The Panel has three high level observations about the regulatory regime, as it relates to the provision of reliable supply to customers.

Firstly, while the QCA caps the revenues that ENERGEX and Ergon Energy can recover from their customers, it can not directly influence actual capital or maintenance expenditure decisions. ENERGEX and Ergon Energy are ultimately responsible for running their businesses and for deciding what capital and maintenance expenditure is required over the course of the regulatory period to meet their network (and other) requirements. ENERGEX and Ergon Energy therefore ultimately have control of the reliability of their supply.

Secondly, ENERGEX and Ergon Energy are Government-owned businesses and the QCA is an independent Government regulator. Between them, they should be seeking to ensure that the public receives an essential service at an acceptable quality and at a fair price. The current regulatory regime appears to provide a very complex process for achieving this outcome. There is the potential for the distributors to concentrate so closely on maximising network revenue and defending their positions through the revenue setting process that they could lose sight of the real needs of their customers and the Queensland economy.

The Panel has been surprised at the extent to which the relationship between the QCA and ENERGEX has become unnecessarily adversarial over the first regulatory period. While the Panel has not taken a view on the merits of either ENERGEX or the QCA's positions, it is concerned about the inefficient use of valuable resources and the potential impacts on end customers.

Thirdly, having a revenue cap without service standards has the potential to create an incentive for the distributors to concentrate on financial returns at the expense of service quality.

The following paragraphs draw on these general observations to make recommendations for improving the nature and application of the current regulatory regime as it relates to service quality.

Capital Expenditure

The Panel considers that the current regulatory regime constrains ENERGEX and Ergon Energy's capital expenditure in three ways.

Investment Risk

The AARR only enables ENERGEX and Ergon Energy to earn a rate of return during a regulatory period on the initial asset base and the capital expenditure allowed by the QCA for the regulatory period. This can create an incentive for the distributors to invest only in capital improvements to their network up to the amounts allowed by the QCA on which they will earn a rate of return.

If a business decides to invest in greater capital expenditure during a regulatory period than was provided for in the QCA's capital "building block", it:

- Will not earn a return on that investment (nor receive an allowance for depreciation) during the current regulatory period; and
- Must convince the QCA that the additional investment be included in the regulatory asset base for the next regulatory period, in order for it to earn a return on it in the next and subsequent regulatory periods.

ENERGEX and Ergon Energy may therefore not earn a financial return on any "additional" capital investment until several years after the actual expenditure is made.

The Panel believes that the current regulatory regime has resulted in ENERGEX, in particular, deferring necessary "additional" capital expenditure because it is not sufficiently financially rewarding.

There are several options for addressing this issue, which should be examined further by Government.

One option is to incorporate a facility for a mid-period partial re-opening into the regulatory process, by which the QCA could assess the appropriateness of including significant "additional" capital expenditure in the capital base immediately. The main disadvantages of this option include the complexity in determining the threshold amount, difficulties in assessing whether the proposed works are actually "additional" to that already provided for and the potentially large administrative costs.

Another option that has been incorporated into regulatory decisions in other jurisdictions (including NSW and the Northern Territory) is a facility for "off-ramps" when outcomes differ materially from forecasts. These "off-ramps" allow the potential for the equivalent of the AARR to be adjusted to reflect the outcome of actual events. The Panel is aware that the ACCC is considering the use of flexible

revenue cap based on a range of demand bands, which have different capital expenditure, and therefore revenue, levels associated with them.

A further option is for the QCA to make rulings in relation to proposed new investments. This would give ENERGEX and Ergon Energy comfort that an "additional" investment would earn a regulated revenue stream, albeit with a delay until the next regulatory period. The Panel favours this "rulings" approach. It has not, however, sought to recommend a way forward as it needs to be considered in the context of the QCA's broader revenue determination for the next regulatory period. Instead, Government and the QCA should give further consideration to these issues and options before the start of the next regulatory period in July 2005.

New Customer Connections

A review of ENERGEX and Ergon Energy's budgeted and actual capital expenditure programmes has highlighted a significant re-allocation of capital expenditure from reliability and asset replacement works towards customer connection works over the period 2000/01 to 2003/04. This reflects a trade-off that the distributors have apparently made between the need to invest in refurbishing and augmenting their networks with the need to connect a higher number of new customers than was originally forecast, while operating within their revenue caps.

The Panel is aware that in other states the cost of new connections is deemed to be outside of the revenue cap if it can be shown that there is no monopoly power in constructing the connection assets. This means that the distributors are able to recover the cost of undertaking "contestable" works in addition to their revenue cap. In Queensland, however, the cost of such works is currently recovered within the revenue cap.[4] This means that ENERGEX and Ergon Energy's revenues are capped, but the potential cost of connecting new customers is not. The response from ENERGEX and Ergon Energy has been to connect customers at the expense of undertaking other necessary capital works. It is noted that ENERGEX and Ergon Energy have a statutory obligation to connect customers within their respective distribution areas, upon application from the customer, subject to some specific exemptions.[5]

The Panel recommends that Government, the QCA and the distributors form a working group to consider how new customer connections can be better managed in the next regulatory period commencing from 1 July 2005. This may involve excluding customer connections from the revenue cap, or some other means of ensuring that these works do not occur at the expense of necessary reliability works in the future.

Deferring Capital Expenditure

4 The Panel notes that ENERGEX and Ergon Energy may apply to the QCA to have a particular service defined as an "excluded service" and therefore for the costs of the provision of this service to be recovered outside of the revenue cap.

5 Exemptions are set out in Sections 40, 40D and 40E of the *Electricity Act 1994.*

The Panel considers that setting the AARR for a fixed period can create an incentive for ENERGEX and Ergon Energy to delay their capital expenditure in order to maximise profitability, and thereby to undertake necessary new works later than may otherwise be desirable.

This is because, while the QCA's capital expenditure "building block" used in the AARR reflects an underlying assumption about when capital works are necessary, ENERGEX and Ergon Energy do not need to invest in accordance with this profile, and can still recover the full amount of the revenue cap. The Panel considers that there is an inherent incentive for the distributors to defer expenditure until late in the regulatory period (i.e. "back end" investment), while recovering the full revenue cap.

While the Panel understands that it is common practice for regulated entities to "back-end" capital expenditure, it considers that it may have inappropriately impacted on ENERGEX's past willingness to spend necessary capital expenditure.

The Panel is aware that in NSW an annual Network Management Plan is submitted as a condition of distributors' licences, which has a number of features that the Panel considers would be useful in Queensland. The NSW Network Management Plans include:

- A statement of the plan's purpose and details of relevant performance indicators;
- A description of the distribution system and its design, construction, operation and maintenance philosophies, including the codes, standards and guidelines that the network operator intends to follow in the design, installation, operation and maintenance of the transmission or distribution systems;
- A description of the planning process and the asset management and safety management strategies employed;
- Details of any capacity constraints in the network and options for resolving them;
- A description of the demand management strategy and programmes to be implemented; and
- Capital and operating expenditure projections for the next ten years.

The Panel notes that similar requirements exist in the Victorian Electricity Distribution Code[6] and that both the NSW and Victorian documents are available to the public.

Given the Panel's findings on capital expenditure in Chapter 6 of this Report, the Panel considers that a requirement for the submission of an annual Network Management Plan addressing these matters would be a useful and appropriate addition

[6] Refer to Section 3.5 of the Code.

to the regulatory framework. The Panel has also made recommendations in relation to demand management initiatives in Chapter 12.

Operating and Maintenance Expenditure

The Panel is of the view that the current regulatory regime creates the potential for ENERGEX and Ergon Energy to constrain necessary operating and maintenance expenditure.

As noted above, the AARR includes a "building block" for efficient operating and maintenance expenditure and under a revenue cap, ENERGEX and Ergon Energy earn (and retain) the full AARR, if the actual volumes that they deliver equate to their forecasts for the year.

The Panel considers that there is potential for the distributors to seek to increase profitability by underspending the operating and maintenance expenditure "building block", knowing that any underspend is a windfall gain. Furthermore, there is a strong incentive on the distributors not to exceed the QCA's "building block" because (unlike capital expenditure) there is no opportunity to earn revenue from the additional operating and maintenance expenditure in the next regulatory period.

It is accepted that achieving operating and maintenance expenditure efficiency improvements is one of the primary objectives of this form of regulatory control. However, the Panel believes that there is a significant difference between underspending due to efficiency improvements and underspending due to not carrying out necessary maintenance activities.

The Panel is concerned that the incentive to underspend on operating and maintenance expenditure, if taken too far, has the potential to adversely impact service quality outcomes, particularly in an environment where there are no mandated service standards.

As detailed in Chapter 7, ENERGEX is projecting to underspend the QCA's operating and maintenance "building block" by around $170 million over 2001/02 to 2004/05. The Panel accepts that some of this underspend has related to changes in accounting methodologies and that the capital and operating and maintenance "building blocks" are considered by the distributors as a "bucket". It is concerned that the magnitude of this underspend reflects an avoidance of some necessary maintenance expenditure. The Panel notes that Ergon Energy is projecting to overspend the QCA's operating and maintenance "building block" by about $20 million for the same period.

The Panel recommends that the Network Management Plan proposed above should also be designed to address the adequacy of ENERGEX and Ergon Energy's maintenance programme.

Performance Monitoring and Reporting

In October 2001, the QCA established a service quality monitoring and reporting framework[7], which requires ENERGEX and Ergon Energy to report quarterly on a range of reliability, quality of supply and customer service measures.

This framework is based on the arrangements agreed by the *Steering Committee on National Regulatory Reporting Requirements* and is therefore consistent with that applied by regulators in other jurisdictions.

The service quality monitoring regime allows the QCA to monitor trends in ENERGEX and Ergon Energy's service quality performance over time, although the regulatory regime does not currently provide any mechanism for rewarding improved performance or penalising worsening performance. The Panel notes that the QCA intends introducing a service quality incentive scheme from the start of the next regulatory period (i.e. 1 July 2005), which would address this matter.[8]

The Panel supports the intent of this proposal as it would directly link the prices paid for electricity with the services delivered and would significantly improve on the current arrangements, which the Panel considers to be very unsatisfactory.

In its 2001 determination for the current regulatory period, the QCA believed that the distributors should be able to achieve significant operating and maintenance efficiency gains between 2001/02 and 2004/05. The QCA allowed ENERGEX and Ergon Energy to keep some of these gains so that they could apply them against service quality improvements over the regulatory period. The QCA believed that this would enable ENERGEX and Ergon to spend $13.3 million and $12.2 million respectively over four years on service quality initiatives.

The Panel considers that, while the QCA has acted within its powers and discharged its obligations under the Code, it is unlikely that its approach contributed to improving service quality outcomes because:

- The $13.3 million and $12.2 million allocated by the QCA to service quality initiatives were notional only – to obtain this money the distributors would have needed to make cost savings in the absence of any incentive to do so; and
- Even if the distributors did make these savings, there were no incentives on the businesses to spend the money on service quality initiatives, nor any enforceable service quality targets against which the QCA could judge their performance.

The Panel believes that before the QCA's revenue determination is finalised for the next regulatory period and the proposed new service quality incentive regime is introduced, the Government should develop appropriate service standards for the next

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[7] Refer to the QCA's *Electricity Distribution: Service Quality Reporting Guidelines*, October 2001.

[8] Refer to the QCA's *Service Quality Incentive Scheme for Electricity Distribution Services in Queensland - Draft Decision*, April 2004.

regulatory period. To set the AARR without having service standards in place would perpetuate the current problems with the regulatory system into the next regulatory period.

Customer Empowerment

The Panel considers that customer empowerment can play an important role in improving service quality. This is because customers often find it difficult as a "lone voice" to influence the behaviour of monopoly businesses. However, the Panel considers that there are shortcomings with the current arrangements for empowering electricity customers.

Section 40A of the *Electricity Act 1994* requires ENERGEX and Ergon Energy to prepare a standard Customer Connection Contract to establish the terms on which they provide connection services to customers (either directly or via retailers which provide "bundled" sale and supply services to customers). Customer connection services include both the connection of premises to a supply network and the supply of electricity (Schedule 5 of *Electricity Act 1994*). The Customer Connection Contract must be approved by the State as Regulator under Section 40B of the *Electricity Act 1994*.

While ENERGEX and Ergon Energy both have standard Customer Connection Contracts, neither of these contracts detail mandatory service quality standards that they will deliver. The Panel notes that both distributors provide "Guaranteed Service Quality" payments to customers if their service quality performance falls below defined threshold levels. These payments are voluntary, are not linked to the Customer Connection Contract as is typically the case in other jurisdictions, and are rarely enforced in practice.

The Panel considers that customer contracts might provide a convenient means of regulating service quality by providing a legal relationship between customers and distributors. The Panel is aware that such contracts operate effectively in NSW, Victoria and South Australia and recommends that these be investigated by Government as part of the distributors' licence conditions.

4.3 Findings and Recommendations

Finding 4.1 – Adequacy of Regulatory Regime

- **The legislative and regulatory provisions under the *Electricity Act 1994*, the *Electricity Regulation 1994* the *National Electricity Code* and the *Queensland Competition Authority Act* have not been fully utilised to ensure reliable supply of electricity for Queensland customers.**

Recommendations:

- **Government mandate minimum network service standards for ENERGEX and Ergon Energy to ensure that their capital, operating and maintenance expenditure is focussed on delivering both service reliability and financial outcomes. Government should investigate the use of distribution codes and the use of standard customer contracts, as employed in other states, to achieve this outcome;**
- **The QCA introduce a service quality incentive regime as part of its revenue determination for the next regulatory period based on a set of service standards determined by Government and the QCA. Service standards will therefore need to be set before the QCA finalises its revenue determination for the next regulatory period;**
- **Government and the QCA consider alternative arrangements for increasing ENERGEX and Ergon Energy's investment certainty during a regulatory period, including but not limited to the possibility of mid-period re-openings, flexible revenue caps and rulings issued by the QCA in relation to new investments;**
- **Government, the QCA and the distributors form a working group to consider how customer connections can be better managed in the next regulatory period, including the option of having these works regulated under a light handed regime outside the AARR, or not regulated at all;**
- **Government require each business to prepare and submit an annual Network Management Plan, similar to that currently required in NSW (and by Powerlink under the Code) which provides the basis for adequate capital and maintenance programmes; and**
- **The State, as licensing regulator, and the QCA work closely together to share information pertaining to the setting, monitoring and implementing of service standards to ensure that the compliance burden on industry is minimised, there is consistency in reporting requirements and the potential for regulatory "gaming" is limited.**

5

RELIABILITY OF THE DISTRIBUTION NETWORKS

The purpose of this chapter is to set out the Panel's findings in relation to the reliability and quality of supply of Ergon Energy and ENERGEX's distribution networks. It addresses the first of the Terms of Reference, which requires that the Panel:

> *Evaluate the reliability of the Queensland electricity system, and report on the standard of the system as benchmarked against appropriate comparisons, using recognised industry measures.*

The Panel assessed both the reliability (how often the supply is available) and quality of supply (performance of the supply when it is available) in addressing this part of the Terms of Reference.

5.1 Nature of Reliability and Quality of Supply

Customers and electricity distribution businesses view service quality from two distinct perspectives.

The public submissions made to the Panel confirm the widely held view that customers view electricity as an essential service and expect it to be available at a reasonable standard whenever and wherever they require it.

As with any product or service, customers principally form their views about the quality of their electricity supply from their own experience and can assess the impact of poor service quality on their day to day lives or business operations. However, customers have a limited capacity to objectively assess either:

- How the service they receive compares with that provided to other customers; or
- The performance of the electricity networks as a whole.

In contrast, electricity distributors generally should seek to maximise service quality to customers from their network bearing in mind their responsibilities to operate a financially sound business. Apart from receiving customer complaints, however, businesses have a limited capacity to objectively:

- Assess the impact of extended service outages on individual customers; and

- Factor those individual customer impacts into their decision making.

There is therefore no single, generally accepted view of what constitutes service quality. Rather, assessing the adequacy of service quality requires a balancing of different views of:

- The delivered service as quantified by standardised reliability and quality of supply measures; and
- The levels of service that individual customers receive and the impacts that supply problems have on these customers. There are no standardised means for measuring this information other than anecdotal evidence describing individual customer impacts.

Given this, the Panel assessed whether the reliability and quality of supply in ENERGEX and Ergon Energy's distribution systems were adequate or inadequate based on:

- Measures of past performance reported by the businesses, where system performance is tracked over time, based on a comparison against historic outcomes;
- Measures of comparative performance, where performance is compared within a system and across geographic areas;
- Measures of comparative performance between systems, where outcomes are compared between distribution businesses; and
- Information about customer impacts, where customers make known their views about the nature and impact of service quality. The Panel drew upon information from the public submissions for this purpose.

5.2 Assessment of Reliability of Supply

Businesses typically report on their reliability of supply using four main measures. These are the:

- System Average Interruption Frequency Index (SAIFI) – this measures the average number of times a customer's supply is interrupted in a year. This excludes momentary interruptions of one minute or less;
- Customer Average Interruption Duration Index (CAIDI) – this measures the average duration of each customer interruption. This also excludes momentary interruptions of one minute or less;
- System Average Interruption Duration Index (SAIDI) – this measures total number of minutes on average a customer's supply is interrupted in a year. It is calculated as the product of SAIFI and CAIDI; and
- Momentary Average Interruption Frequency Index (MAIFI) – this measures the total number of momentary interruptions of one minute or less on average that

customers serviced from a distribution system experience in a year. The Panel has not considered momentary interruptions (MAIFI) in this Report because there is no meaningful information available in Queensland.[9]

These measures were endorsed by the Utility Regulators Forum in 2002 for performance monitoring and reporting purposes although it noted a number of limitations with their application. The Forum noted that the measures:

- Are only accurate if the distributors' information systems can clearly link the physical networks to customer numbers - this is not always the case as systems vary between businesses across states;
- Focus on the system's average performance, whereas reliability can differ significantly between individual feeders. This can reduce meaningful comparisons within regions which have small numbers of very badly performing feeders;
- Do not provide information on the causes of interruptions, and therefore do not provide customers or regulators with an understanding of what caused the poor reliability outcomes; and
- Do not provide information on the size of customer loads that have been interrupted, nor the amount of electricity that may otherwise have been consumed during an interruption. This information can be important in assessing the impacts on customers. [10]

Despite these limitations, SAIDI, SAIFI and CAIDI measures are widely used throughout Australia and overseas and have been adopted by the QCA for performance monitoring purposes.

The Panel's consultants made a comparison of ENERGEX, Ergon Energy and other Australian distributors' performance using these measures.

Given the limitations of SAIDI, SAIFI and CAIDI noted above, the Panel has also drawn upon the public submissions it received to understand customers' perceptions of reliability. In particular, the submissions highlighted:

- The nature of customers' reliability problems, being the frequency and duration of outages; and
- The consequential impact of these interruptions, such as:
  - Food spoilage;
  - The need to reset digital equipment, particularly clocks and computers;
  - Inconvenience due to lack of lighting, air conditioning, heating and cooking facilities;

[9] Utility Regulators' Forum, National Regulatory Reporting for Distribution and Retailing Businesses, March 2002, page 7.
[10] Ibid, page 4.

- An inability to use essential medical equipment at home, such as life support or dialysis machines; and
- Interruptions to business operations, which may have consequential financial implications.

The Panel received many anecdotal examples of the impact of poor reliability in the public submissions and some extracts are provided below. These highlight the gravity of the impacts of poor reliability on some Queenslanders:

1. *As a (dairy farming) business the cost incurred due to power black outs is enormous. These costs are immediate and long-term.*
2. *…… the reliability of our power supply continues to cause us distress and frustration. It is not unusual to wake up and find no power – this means no showers, no toilet, no water, no cooking facilities with which to start the day before work.*
3. *I require a CPAP ventilator to sleep. Shutdown due to power failure, at full pressure causes alarm. I am unable to sleep during long outages.*

5.3 Performance of Ergon Energy and ENERGEX compared with Interstate Distributors

Limitations on data comparisons

Ergon Energy and ENERGEX's reliability outcomes were measured by SAIDI, SAIFI and CAIDI and compared against the reported outcomes for a range of Australian distributors for 2002/03.[11]

The Panel emphasises that care needs to be taken in comparing distributors' reported performance information because of differences in:

- Network length and service area, because reliability can be more difficult to ensure over large geographic areas and long lengths of line;
- The nature of vegetation, because outages can be more prevalent in densely vegetated areas; and
- Local weather patterns, because lightning, cyclones and other extreme weather events can impact on reliability.

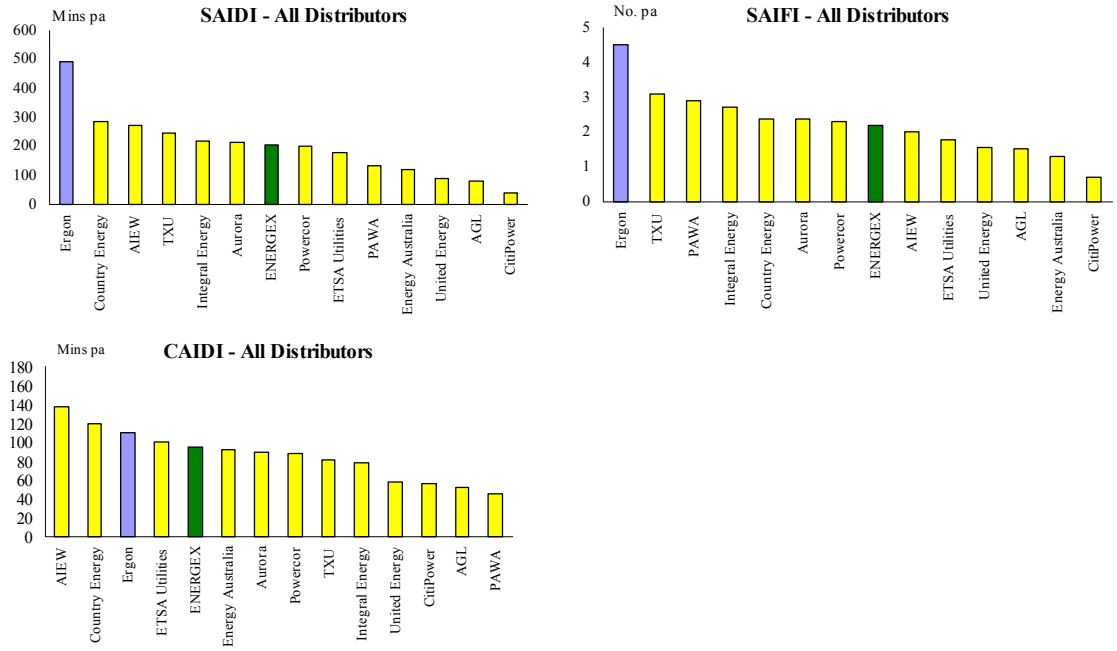
In order to account for individual circumstances some distribution businesses adjust their reported data. In Queensland, the distributors are allowed to exclude events which impact more than 5% of their customer base, for example the outages that

[11] ENERGEX and Ergon Energy information was obtained from QCA Reports and information about interstate distributors was sourced from reports prepared under Utility Regulators' Forum guidelines.

resulted from the January storms. Different approaches are adopted in other states. The Panel believes that the current approach is arbitrary and that a more statistically sound methodology should be investigated.[12] For the purposes of comparison, the Panel decided to use unadjusted data and to rely on peer group assessments to put the performance of Ergon Energy and ENERGEX in context.

Comparative Reliability Results for Ergon Energy and ENERGEX

Graph 5.3A – Reliability Performance 2002/03



Source: Jurisdictional Regulatory Reports, Ergon Energy and ENERGEX, 2004

[12] Refer, for example, to D.A. Kowalewski's paper entitled *A Comparable Method for Benchmarking the Reliability Performance of Electric Utilities*, published in "Power Engineering Society Summer Meeting", 2002, IEEE (http://ieeexplore.ieee.org/xpl/tocresult.jsp?isNumber=22355). This paper proposes a 3-beta approach for excluding SAIDI outcomes above a threshold determined on the basis of weather and extreme event variances within a distributor's own business region.

Graph 5.3A indicates that:

- The duration of individual outages (i.e. CAIDI) in Ergon Energy's area is among the highest of the Australian distributors and it has the highest frequency of outages (i.e. SAIFI). The product of the poor CAIDI and SAIFI outcomes resulted in Ergon Energy being the worst performing of the Australian distributors for 2002/03; and
- The duration and frequency of ENERGEX's outages for 2002/03 were in the mid range of Australian distributors.

The Panel has interpreted Ergon Energy's comparative position with caution. The interstate electricity distribution companies with which it is being compared have substantially smaller networks with markedly different geographic, weather and population characteristics. This notwithstanding, the poor SAIFI and CAIDI outcomes for Ergon Energy were also reflected in a number of public submissions received by the Panel. For example, one submission from the Darling Downs stated:

> *During the six months we have been here, we have had power blackouts:*
>
> - *Averaging once a fortnight – this may be two or three times in a week though*
> - *Lasting from one hour to ten hours.*

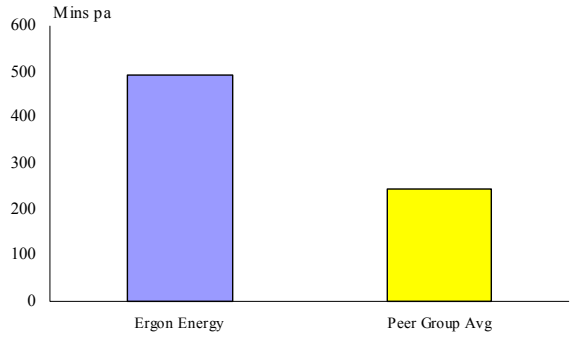
Another submission noted:

> *Breaks in supply last anywhere between 2 seconds to four hours at a time and can occur several times a day. We are concerned about the wear and tear on our appliances, cold rooms, fridges, computers etc as Ergon Energy itself warns of the dangers of power fluctuations to these units.*

In order to gain a better understanding of Ergon Energy and ENERGEX's comparative performances, the Panel's advisor grouped together combinations of utilities which, when averaged, would be more representative of their expected performance.

Graph 5.3B compares Ergon Energy's SAIDI performance for 2002/03 with a peer group of like Australian distributors - Country Energy (NSW country area), Powercor (western urban and rural Victoria) and TXU (eastern urban and rural Victoria). The graph shows that, on average, Ergon Energy's customers had more than twice the minutes off supply than the average for the peer group.

Graph 5.3B – Ergon Energy SAIDI Compared With Peer Group - 2002/03 [13]

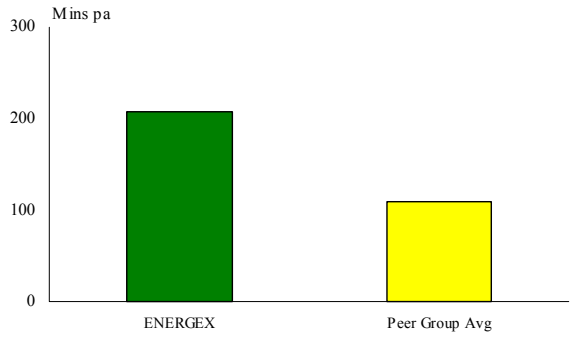


Source: Jurisdictional Regulatory Reports and Ergon Energy, 2004

Graph 5.3B shows that Ergon Energy had a significantly higher SAIDI outcome in 2002/03 than its peer group. While the Panel recognises that Ergon Energy will always be at the high end of SAIDI performance, to be more than twice the peer group average is unacceptably high.

Graph 5.3C compares ENERGEX's SAIDI performance for 2002/03 with a peer group of like Australian distributors - United Energy (Victorian urban and semi-rural), AGL (Victorian inner urban), Citipower (Melbourne Central Business District (CBD)), Energy Australia (Sydney, central coast and Hunter region) and Integral Energy (western Sydney, Wollongong and surrounding rural regions). The graph shows that on average, ENERGEX's customers had more than twice the minutes off supply than the average for the peer group, which in the Panel's view is excessive.

Graph 5.3C – ENERGEX SAIDI Compared With Peer Group 2002/03 [14]



Source: Jurisdictional Regulatory Reports and ENERGEX, 2004

[13] The data analysed did not exclude major events, such as outages impacting more than 5% of the customer base, from the dataset. Data shown is for distribution related outages only.

[14] The data analysed did not exclude major events, such as outages impacting more than 5% of the customer base, from the dataset. Data shown is for distribution related outages only.

5.4 Reliability Findings – Ergon Energy

Ergon Energy's SAIDI, SAIFI and CAIDI were compared over time. The results of this analysis are set out in Table 5.4A, which shows that reliability has deteriorated over the period 2001/02 to 2003/04.

Table 5.4A – Ergon Energy – Average Number and Duration of Interruptions per Customer 2001-2004

	2001/02	2002/03	2003/04 (a)
Average number of interruptions per customer (SAIFI)	4.2	4.5	4.9
Average duration of each interruption (CAIDI) – minutes	103	110	116
Average duration of all interruptions per customer (SAIDI) – minutes			
• Unadjusted	437	494	578
• Storm adjusted	437	494	520

Source: QCA and Ergon Energy, 2004

(a) It should be noted that data for 2003/04 includes the extreme weather events in January and February 2004. Accordingly, the Panel has been cautious in interpreting the extent of the worsening in reliability, as should readers of this Report.

It is noted that Ergon Energy believes that 2001/02 had few storms and a mild weather pattern, which resulted in better than normal reliability. Whilst the Panel notes this view, in the absence of any longer term data it remains the case that there has been a deteriorating performance as far as the customer is concerned over the period 2001/02 to 2003/04.

A number of submissions supported the Panel's view that Ergon Energy's performance has been deteriorating. For example, one submission noted:

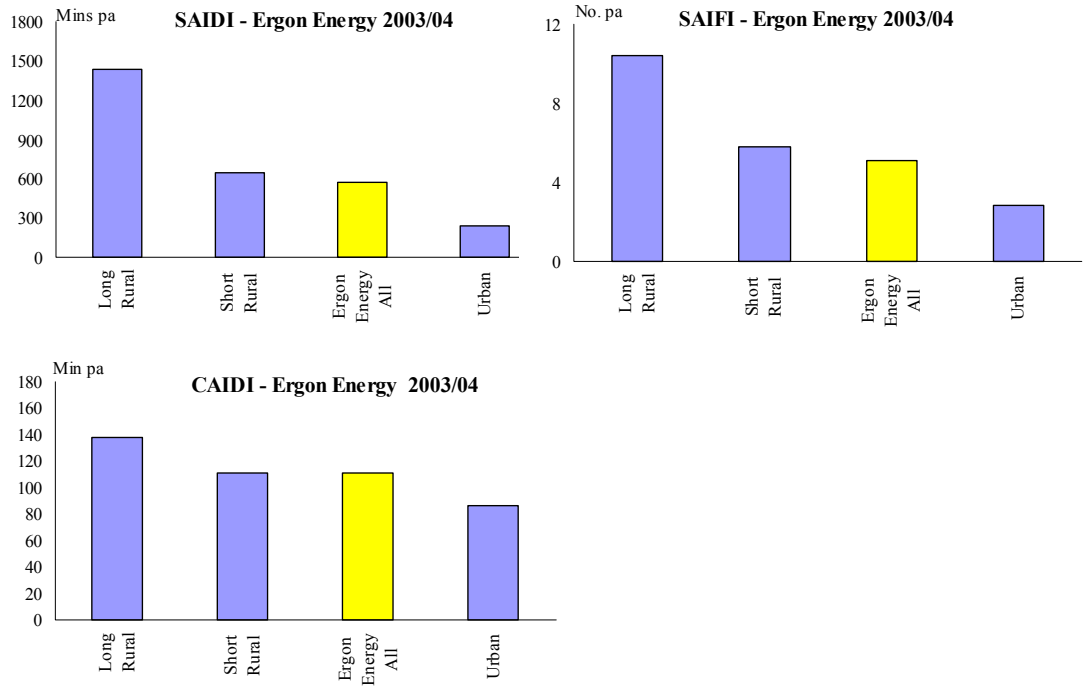
> *I have lived in Mt Perry since December 1991 and I consider that the reliability of electricity supply to be reasonably good apart from the past two years. Supply interruptions have occurred most frequently over the summer months when storm activity elevates damaging the network.*

Ergon Energy's reliability was analysed by feeder type in order to understand the differences in urban, short rural and long rural performance across its service area. The nature of these feeder groupings is described in Table 5.4B.

Table 5.4B – Ergon Energy Feeder Categories for Comparative Purposes [15]	
Feeder category	**Description**
Urban	A feeder, which is not a CBD feeder, with actual maximum demand over the reporting period per total feeder route length greater than 0.3 MVA/km.
Short rural	A feeder which is not a CBD or urban feeder with a total feeder route length less than 200 km.
Long Rural	A feeder which is not a CBD or urban feeder with a total feeder route length greater than 200 km.

Graph 5.4C shows reliability by feeder type for Ergon Energy for the period June 2003 to May 2004. The graphs show that Ergon Energy's reliability for long rural feeders is significantly worse that the overall Ergon Energy average.

Graph 5.4C – Ergon Energy – Type of Feeder 2003/04[16]



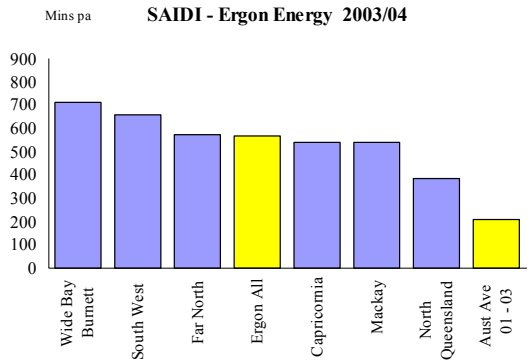
Source: Jurisdictional Regulatory Reports and Ergon Energy data, 2004

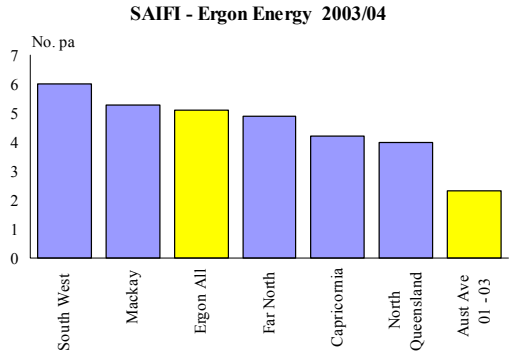
[15] Utility Regulators Forum, *National Regulatory Reporting for Electricity Distribution and Retailing Businesses,* March 2002, page 7.

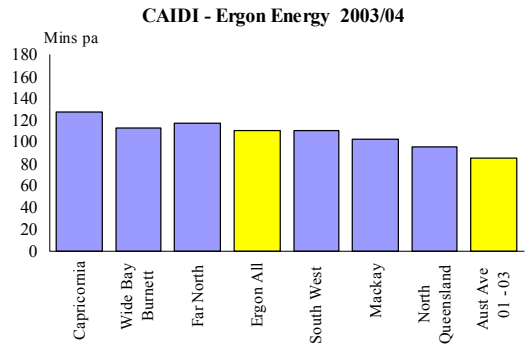
[16] The data analysed did not exclude major events, such as outages impacting more than 5% of the customer base, from the data set. Data shown is for distribution related outages only.

Graph 5.4D provides a regional break down of Ergon Energy's SAIDI, CAIDI and SAIFI outcomes compared with Ergon Energy's average.[17] The graphs show that reliability in the Wide Bay Burnett and the South West regions is worse than other regions.

Graph 5.4D – Ergon Energy - Reliability by Region June 2003 to May 2004







Source: Jurisdictional Regulatory Reports and Ergon Energy data, 2004

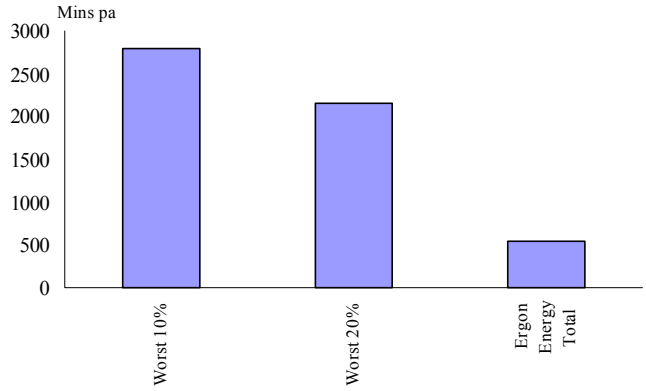
[17] Ergon Energy's regional data is presented in this report on the basis of six regions. The Panel notes that Ergon Energy now reports on the basis of three regions – Northern, Central and Southern.

The Panel received many submissions expressing dissatisfaction with reliability in Wide Bay Burnett and South West Queensland which support the above findings. For example, one customer in the South West Queensland region stated that:

> *Since the beginning of this year we have had four major power blackouts of four and a half, seven and a half, eleven and a half and twelve hours. The line supplying this town is obviously past its use by date and has not been upgraded in such a manner as to maintain a reliable supply to this town.*

The Panel notes that actual reliability varies greatly within regional areas. This is because outages occur on some feeders more often, and for greater durations, than for the overall regional average. This fact can be lost when data is simply averaged out across a region or network for the purposes of performance reporting.

Graph 5.4E – Ergon Energy SAIDI for Worst Feeders – 2002/03



Source: Jurisdictional Regulatory Reports and Ergon Energy, 2004

Graph 5.4E shows 2002/03 SAIDI for the worst 10% and worst 20% of Ergon Energy feeders compared with Ergon Energy's average system-wide outcomes:

- The worst 10% of Ergon Energy's feeders have 5 times the length of outages as measured by SAIDI than the overall Ergon Energy average; and
- The worst 20% of Ergon Energy's feeders have 4 times the length of outages as measured by SAIDI than the overall Ergon Energy average.

These observations were supported by a number of public submissions. For example, one customer in the Wide Bay Burnett region provided detailed records of 32 power supply interruptions of varying durations from January 2001 to February 2004.

The Panel's overall findings in relation to Ergon Energy's reliability performance are outlined in section 5.7.

5.5 Reliability Findings – ENERGEX

Table 5.5A shows ENERGEX's SAIDI, SAIFI and CAIDI over time.

Table 5.5A – ENERGEX – Average Number and Duration of Interruptions Per Customer 2001-2004 [18]

	2000/01	2001/02	2002/03	2003/04 (a)[19]
Average number of interruptions per customer (SAIFI)	2.0	1.9	2.2	2.5
Average duration of each interruption (CAIDI) – minutes	100	93	95	151
Average duration of all interruptions per customer (SAIDI) – minutes				
– Unadjusted	194	176	208	375
– Storm adjusted	n.a.	158	187	163

Source: QCA and ENERGEX, 2004

(a) It should be noted that data for 2003/04 includes the extreme weather events in January and February 2004. Accordingly, the Panel has been cautious in interpreting the extent of the worsening in reliability, as should readers of this Report.

Table 5.5A shows that reliability, as measured by SAIFI, CAIDI and SAIDI, has been broadly consistent between 2000/01 and 2002/03, but significantly worsened in 2003/04 as a result of the extreme weather events in January and February 2004. The table also demonstrates the effect on SAIDI results of adjusting for storm events.

Queensland's regulatory reporting regime permits electricity distribution businesses to exclude data when outages affect greater than 5% of their network. While such adjustments may assist comparability, they do not improve performance from a customer's viewpoint, as noted by public submissions. The Panel considers that arbitrary adjustments of this nature do not result in an appropriate indicator of the distributors' network performance, particularly when they can take measures to minimise the extent and impact of outages (such as by vegetation management, as is discussed in Chapter 7).

The Panel received a large number of submissions supporting the statistical observations that ENERGEX's performance has gradually worsened over time. For example, one submission noted:

> *The reason for this submission is the frustration we have encountered with our particular power supply over the last 30 years that we have lived at this address but more so in the last several months. Huge storms and*

[18] The data analysed did not exclude major events, such as outages impacting more than 5% of the customer base, from the data set. Data shown is for distribution related outages only.

[19] February 2003 to March 2004.

unforeseeable circumstances are understood but the things we have been putting up with over the recent months are very unsatisfactory.

Another submission noted:

On 6 March, my husband and I lost power just after midnight. It was restored late in the afternoon, a period of approximately 18 hours. .....We consider that outages of these lengths of time are not reasonable or acceptable. As Queenslanders, we have never experienced blackouts of this duration.

ENERGEX's reliability was analysed by feeder type in order to understand differences in CBD, urban and rural performance across its service area. The nature of these feeder groupings is described in Table 5.5B.

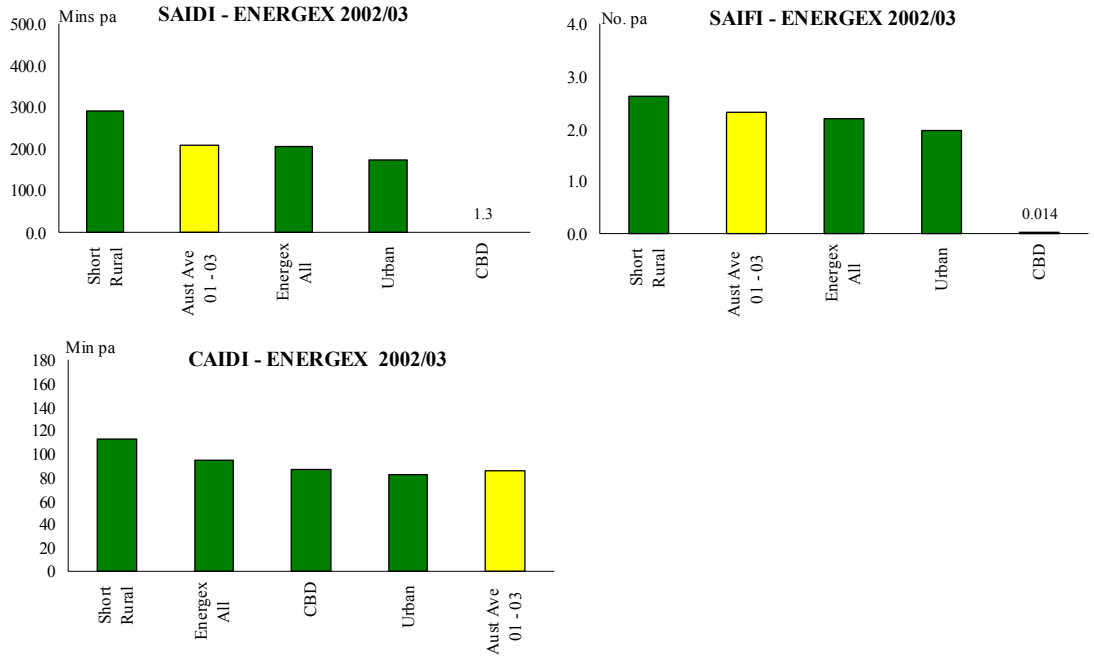
Table 5.5B – ENERGEX Feeder Categories for Comparative Purposes [20]

Feeder category	Description
CBD	A feeder supplying predominantly commercial, high-rise buildings, supplied by a predominantly underground distribution network containing significant interconnection and redundancy when compared to urban areas.
Urban	A feeder, which is not a CBD feeder, with actual maximum demand over the reporting period per total feeder route length greater than 0.3 MVA/km.
Short rural	A feeder which is not a CBD or urban feeder with a total feeder route length less than 200 km.

Graph 5.5C provides a break down of SAIDI, CAIDI and SAIFI outcomes for these feeders for the period 2002/03 and a comparison of outcomes against ENERGEX's overall performance and the average for other Australian distributors between 2000/01 and 2002/03.

[20] Utility Regulators Forum, *National Regulatory Reporting for Electricity Distribution and Retailing Businesses,* March 2002, page 7.

Graph 5.5C – ENERGEX - Reliability by Feeder Type 2002/03



Source: ENERGEX, 2004

It is clear from Graph 5.5C that:

- ENERGEX's SAIFI and SAIDI performance from CBD feeders is generally very good in absolute terms and when compared with the performance of other CBD distributors;
- As expected, ENERGEX's urban feeders are significantly less reliable than its CBD feeders; and
- ENERGEX's SAIDI performance for short-rural feeders was worse than the Australian average as a result of both the duration and high frequency of outages.

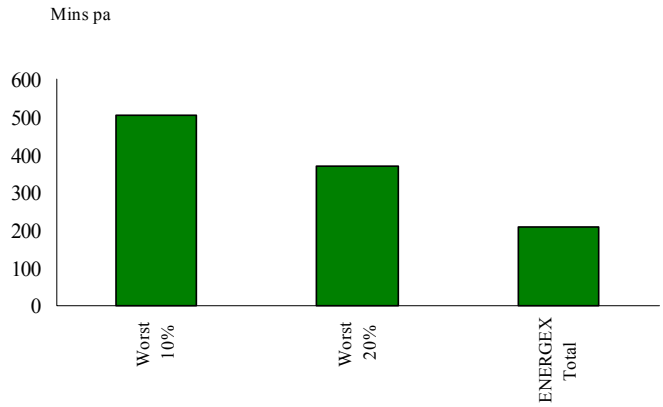
The Panel received many submissions expressing dissatisfaction with reliability in both urban and rural areas. While many of the outages addressed in the submissions could be classified as momentary interruptions (and therefore strictly outside the measurement of SAIDI, SAIFI and CAIDI), the submissions highlighted the impacts of outages in real-life terms, for example:

> *We are a retired couple, have heart problems and require a reliable power supply as a matter of urgency. Although residing 45 minutes from Brisbane city hall, we have suffered 154 power outages over the past 68 months.*[21]

[21] This submission was supported by documented evidence.

Graph 5.5D shows SAIDI for the 10% and 20% of worst performing feeders compared with the overall ENERGEX average for 2002/03.

Graph 5.5D – ENERGEX SAIDI for Worst Feeders - 2002/03 [22]



Source: ENERGEX, 2004

Graph 5.5D shows that:

- The worst 10% of ENERGEX's feeders have 2.5 times the length of outages as measured by SAIDI than the overall ENERGEX average; and
- The worst 20% of ENERGEX's feeders have 1.8 times the length of outages as measured by SAIDI than the overall ENERGEX average.

Submissions supported the finding that reliability varies across the regions. For example, while there were, on average, 2.2 and 2.9 outages for ENERGEX's urban and rural areas respectively for 2002/03, one submission stated that "this year to date we have had ten outages, of which 6 outages were long outages".

Another submission stated:

> *As a resident of the Noosa Hinterland for the past four years, we have had power failures almost every week and in some weeks more than one. Power blackouts range from hours, eg two hours on Christmas day 2003 at lunchtime, to short blackouts during the day and at night during sleep hours.*

The Panel notes that ENERGEX has recently taken a number of measures to address its current system constraints and reliability issues, including:

- Up-grading power transformers at existing bulk and zone supply sub-stations and upgrading 33kV and 11kV feeders to allow for the transfer of loads during contingency conditions;

[22] The data analysed did not exclude major events, such as outages impacting more than 5% of the customer base, from the dataset. Data shown is for distribution related outages only.

- Upgrading or installing new pole mounted transformers or padmount transformers at 149 sites across its network;
- Specific reliability related works on certain lines, such as the installation of line re-closing switches, low voltage spacers, line fault indicators, wildlife proofing and small conductor upgrades; and
- Targeted rebuilding of sections of long radial feeders in fringe urban areas.

The Panel's overall findings in relation to ENERGEX's reliability performance are outlined in section 5.7.

5.6 Quality of Supply

The key features of quality of supply are voltage and harmonics. Voltage levels have been likened to the pressure in a water supply system whereas harmonics have been likened to the purity of the water supplied.

Within sections of Queensland's electricity distribution networks, voltage related quality of supply is becoming a significant issue. This has been brought about by the heavy loading of the networks at both high and low voltage levels. Chapter 6 of this Report outlines the extent of the constraints in the networks and until such time as these constraints are removed, there is likely to be an increase in voltage related complaints. Sustained increase in air conditioning loads will exacerbate this issue in the absence of significant capital expenditure.

Voltage levels can vary significantly between customers and across regions – resultant customer impacts can be either short-term or sustained. Harmonic problems are similar and can impact customers in a range of ways. Table 5.6A sets out key types of voltage problems that customers can face and examples of their impacts.

Table 5.6A – Types and Impacts of Different Voltage and Harmonics Problems

Symptom	Examples of customer impact
Low voltage	Dim lights and over-heating motors
Voltage dip – minor	Flickering lights and resetting digital clocks
Voltage dip – severe	Industrial process interruptions
Voltage swell	Blown lights and equipment damage
Voltage spike	Damage to appliances and wiring
Waveform distortion / unbalance	Erratic performance of equipment
Television or radio inference	Reception problems
Noises from appliances or lights	Unwanted noises / audio-frequency interference

The *Electricity Regulation 1994* set out the voltage levels at which electricity must be supplied in Queensland. Section 9(2) of the Regulation details the standard low voltages for single and three-phase supply – the standard low voltage between a phase

conductor and the neutral conductor is 240 volts. Section 10 of the Regulation allows an electricity entity and a customer to agree to a higher voltage level. Section 11 of the Regulation requires that electricity supply be maintained at the standard (or agreed) voltage plus or minus an allowable margin, which for low voltage supply is 6%.

Voltage can be measured at individual customer premises. However, there is no cost effective way of aggregating individual customer voltage data and reporting on it at a system-wide level. On this issue, the Utility Regulators Forum noted:

> *While voltage levels are subject to an increasing number of complaints (due partly to the sensitivity of customer equipment) there is currently little relevant data collected, and no means of translating data into performance measures.*[23]

It is therefore not possible for the Panel to assess whether ENERGEX and Ergon Energy are complying with their statutory requirements in relation to voltage at an aggregate level.[24]

Consequently, the number and nature of complaints made by customers has been used by the Panel as a proxy for assessing the quality of supply provided by distribution businesses.

In making its assessment of the adequacy of the quality of supply, the Panel also noted the large number of public submissions that commented on voltage problems.

The Panel attempted to benchmark the Queensland distributors' quality of supply complaints against those for a number of interstate distributors. The Panel found that there were problems with the benchmarking and has decided not to place reliance on these results. The specific problems with the benchmarking included that it:

- Relied on data provided to the QCA from the distributors and was therefore subject to them accurately collecting, collating and reporting the data;
- Assumed that a customer complaint can be readily attributed to a quality of supply issue (rather than, for example, to a reliability or customer service complaint) and that the complaint information can attribute a specific symptom to the lower than expected quality of supply, for example, low voltage;
- Did not provide information on the magnitude of the problem, nor the nature of the impact, about which the customer was complaining;
- Did not capture information about customers that experienced a sub-standard quality of supply but did not complain to their distributor; and
- Had only been collected and reported for a relatively short period of time (i.e. since September 2002). Consequently, data varied significantly between

[23] Utility Regulators Forum (March 2002), op cit, page 5.
[24] The Panel notes that compliance can be assessed for individual customers at a point in time.

periods and it proved problematic to draw definitive conclusions about performance when using a base of less than two years of information.

Quality of Supply Findings – Ergon Energy

Table 5.6B details the total number of quality of supply complaints per quarter in Ergon Energy's service area since the QCA began reporting performance information in September 2002.

The table shows that the reported number of quality of supply complaints fluctuated within a band of approximately 550 to 750 complaints each quarter until the March 2004 quarter, when there was a large increase.

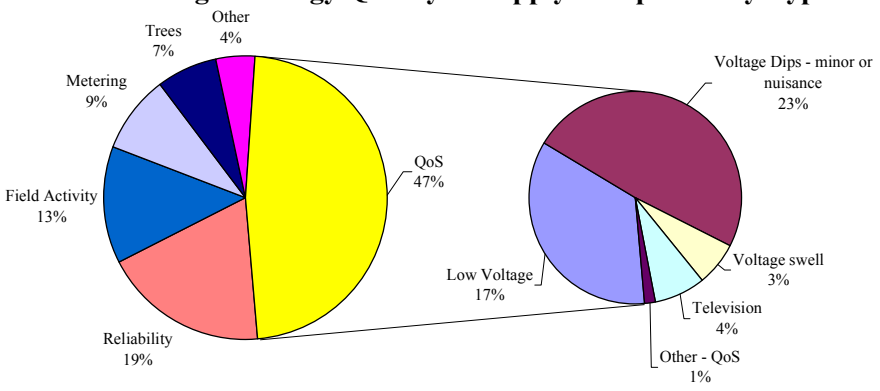
Table 5.6B – Ergon Energy Number of Quality Supply Complaints (by Quarter)

Quarter	Sep-02	Dec-02	Mar-03	Jun-03	Sep-03	Dec-03	Mar-04
Number of Complaints	585	761	759	589	557	669	967

Source: Queensland Competition Authority, 2002/03, Ergon Energy 2004

Chart 5.6C shows Ergon Energy's total customer complaints by type for 2002/03.

Chart 5.6C – Ergon Energy Quality of Supply Complaints by Type – 2002/03



Source: Ergon Energy, 2004

The chart shows that quality of supply complaints:

- Comprised almost half the total number of complaints that Ergon Energy received in 2002/03, highlighting the importance of quality of supply to customers and the inconvenience caused by poor quality of supply; and
- Were more than double the number of reliability complaints.

The two major categories of quality of supply complaints were voltage dips (23%) and low voltage (17%). In practical terms, voltage problems cause issues for customers such as dimming and flickering lights, over-heating of motors such as air-conditioners and problems with industrial machinery. This was supported by submissions to the Panel, one of which noted:

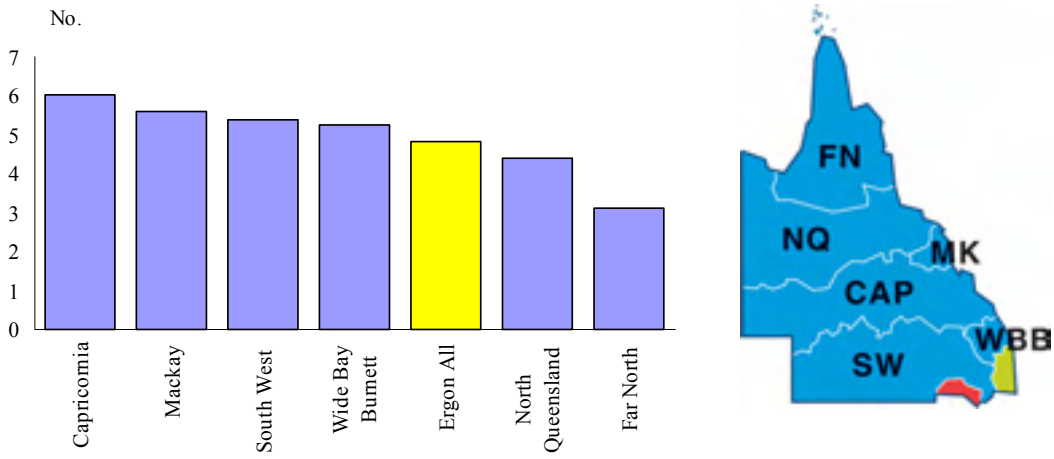
> *Brown outs are a great concern, where we have 40 volts on one phase, 180 volts on another and approximately 230 volts on the other. We believe this situation is causing considerable damage to equipment and has the potential to cause fire and loss of life.*

A further submission asserted:

> *Recently we had an electrician here to do a job and he put his volt meter on for a couple of hours and the highest our power supply went to was 215 volts! No wonder our motors etc burn out and we have brown/black outs all the time!*

Quality of supply complaint data was also examined on a regional basis for Ergon Energy's supply area. This is shown in the Graph 5.6D.

Graph 5.6D – Ergon Energy Quality of Supply Complaints per 1,000 Customers by Region 2003/04



Source: Ergon Energy, 2004

The graph shows that:

- South West Queensland and Wide Bay Burnett, which had poor reliability outcomes, also have high numbers of quality of supply complaints. These regions have also experienced high load growth in the past five years; and
- The regions with the highest numbers of quality of supply complaints per 1,000 customers are Capricornia and Mackay.

Table 5.6E details the average time required to fix quality of supply issues in Ergon Energy's supply area per quarter since the QCA began reporting performance information in September 2002.

Table 5.6E Ergon Energy Average Time to Fix Quality of Supply Issues (by Quarter)							
Quarter	Sep-02	Dec-02	Mar-03	Jun-03	Sep-03	Dec-03	Mar-04
Average Days to Fix Fault	35.0	27.0	41.0	63.0	33.0	31.0	n.a[25]
Source: Queensland Competition Authority 2002/03, Ergon Energy 2004							

Table 5.6E shows that the average number of days that Ergon Energy takes to rectify a quality of supply fault has varied between 27 and 63 days, but typically appears to be in a band between 30 and 40 days.

Quality of Supply Findings – ENERGEX

Table 5.6F shows the total number of quality of supply complaints in ENERGEX's service area since the QCA began reporting quarterly performance information in September 2002. The table shows that the number of complaints has fluctuated within a band of 600 to 770 complaints per quarter.

Table 5.6F – ENERGEX Number of Quality of Supply Complaints (by Quarter)							
Quarter	Sep-02	Dec-02	Mar-03	Jun-03	Sep-03	Dec-03	Mar-04
Number of Complaints	768	672	696	596	630	672	696
Source: Queensland Competition Authority 2002/03, ENERGEX 2004							

The Panel received a number of submissions that indicated a decrease in ENERGEX's quality of supply. For example, one submission noted:

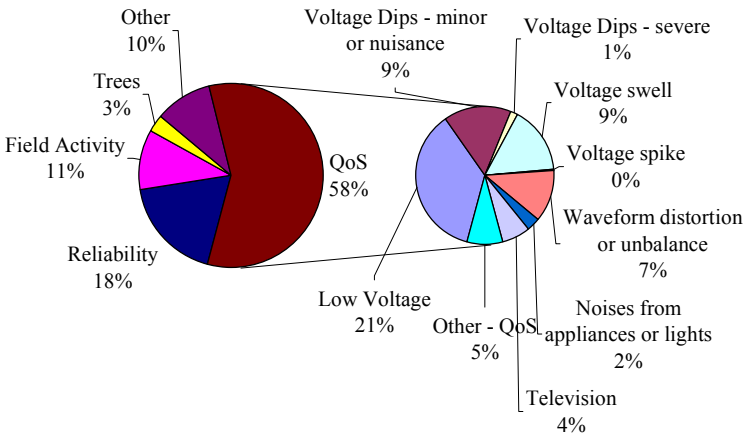
> *I suffered low voltage problems for many months – ENERGEX test confirmed. During those months, a refrigerator, dishwasher, deep freeze, DVD Video failed.*

ENERGEX does not produce quality of supply data by region or suburb and it was therefore not possible for the Panel to compare localities within ENERGEX's service area.

Chart 5.6G shows ENERGEX's total customer complaints by type for 2002/03.

[25] Quality of supply data is not yet available for the March 2004 quarter.

Chart 5.6G – ENERGEX – Quality of Supply Complaints by Type – 2002/03



Source: ENERGEX, 2004

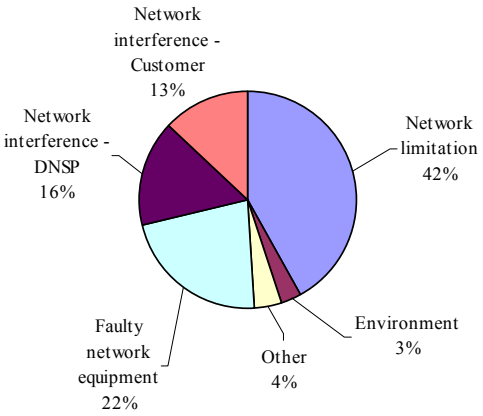
Chart 5.6G shows that quality of supply complaints:

- Comprise more than half the total number of complaints that ENERGEX received in 2002/03, highlighting the importance of quality of supply to customers; and
- Accounted for more than three times the number of reliability complaints.

Low voltages, voltage dips, voltage swells and waveform distortion or unbalance are the key reasons for quality of supply complaints.

Chart 5.6H illustrates the main causes of quality of supply complaints.

Chart 5.6H – ENERGEX – Quality of Supply Complaints by Cause – 2002/03



Source: ENERGEX, 2004

Chart 5.6H indicates that network limitations, (i.e. inadequate network or plant capacity or inappropriate control settings) were the highest cause of quality of supply faults in 2002/03, with faulty network equipment being the second highest cause. Several submissions indicated that new residential developments have contributed to these voltage problems, for example one submission noted:

> *Low voltage readings are another problem in some areas, especially areas that have had development, eg. A street in the CBD that is 7/0.064 or 7/0.080 copper conductor that once only fed 50 homes is now feeding 30 houses and 10 new blocks of units.*

Table 5.6I shows the average time required to fix quality of supply issues once they have been reported by a customer.

Table 5.6I – ENERGEX Average Time to Fix Quality of Supply Issues (by Quarter)

Quarter	Sep-02	Dec-02	Mar-03	Jun-03	Sep-03	Dec-03
Average Days to Fix	7.9	10.6	10.6	14.6	10.1	10.4

Source: Queensland Competition Authority 2002/03, ENERGEX 2004

Table 5.6I shows that the average time for ENERGEX to fix quality of supply issues has fluctuated from quarter to quarter but averages approximately ten days. In the Panel's view this is not unreasonable.

5.7 Findings and Recommendations

Finding 5.1 – Ergon Energy and ENERGEX - Comparative Reliability

- **Ergon Energy was at the worst performing end of Australian distributors for the duration of individual outages (i.e. CAIDI) and had the highest frequency of outages (i.e. SAIFI) of the Australian distributors for 2002/03. It also performed significantly worse than its peer group. While taking into account the much greater length of Ergon Energy's network, the Panel believes that Ergon Energy's reliability performance needs to be improved; and**
- **The duration and frequency of ENERGEX's outages for 2002/03 were in the mid-range of Australian distributors but ENERGEX is performing significantly worse than its peer group. The Panel believes that ENERGEX should be performing at least as well as its peer group.**

Finding 5.2 – Ergon Energy – Reliability

For Ergon Energy, the Panel notes that for the standard industry reliability measures:

- **There has been a slight deterioration in performance between 2001/02 and 2003/04;**
- **As would be expected, given the length of Ergon Energy's long rural feeders, they are a significant contributor to Ergon Energy's overall poor reliability performance; and**
- **Wide-Bay Burnett and South West Queensland were Ergon Energy's two worst performing regions in 2003/04. Wide-Bay Burnett had an average of 6.3 outages per customer, each lasting on average 113 minutes, and South West Queensland had an average of 6 outages, each lasting on average 110 minutes.**

Finding 5.3 – Ergon Energy – Reliability of Worst Feeders

- **Reliability in Ergon Energy's service area varies significantly between feeders with the 10% of worst performing feeders having more than five times longer outages as measured by SAIDI than the overall Ergon Energy average.**

Finding 5.4 – ENERGEX – Reliability

- **ENERGEX's SAIFI and SAIDI performance from CBD feeders is very good;**
- **Although reliability in ENERGEX's service area as measured by SAIDI, SAIFI and CAIDI was reasonably stable between 2000/01 and 2002/03, it significantly worsened in 2003/04 as a result of the storm events in January and February 2004;**
- **Both the number and duration of outages for ENERGEX's short-rural feeders was worse than the overall Australian average in 2002/03.**

Finding 5.4 – ENERGEX – Reliability of Worst Feeders

- **Reliability in ENERGEX's service area varies significantly between feeders, with the 10% of worst performing feeders having more than double the duration of outages as measured by SAIDI than the overall ENERGEX average.**

- **ENERGEX's overall performance based on all reliability measures was slightly better than the Australian average in 2002/03 however against its peer group it was significantly worse. The Panel expects that ENERGEX should be performing at the same standard as its peer group; and**
- **Excluding events which exceed 5% of customers from SAIDI, SAIFI and CAIDI reporting distorts the reliability statistics. It is recognised that some consideration needs to be given to excluding extreme events when determining compliance with set standards. This normalisation in statistics does not, however, assist customers.**

Finding 5.5 – Ergon Energy - Quality of Supply

- **Quality of supply problems were the highest proportion of reported customer complaints for Ergon Energy in 2002/03, accounting for more than double the number of complaints attributed to reliability problems;**
- **The major quality of supply complaints related to voltage dips and low voltage – these typically result in dimming and flickering lights, over-heating motors such as air-conditioners and problems with industrial machinery;**
- **Quality of supply complaints were highest in the Capricornia and Wide Bay Burnett regions, which reported the worst reliability outcomes in Queensland; and**
- **On average it takes Ergon Energy between one and two months to resolve a quality of supply complaint. The customer inconvenience associated with these delays was reflected in the submissions made to the Panel.**

Finding 5.6 – ENERGEX - Quality of Supply

- **Quality of supply problems were the highest cause of reported customer complaints for ENERGEX in 2002/03, causing more than three times the number of complaints than those attributed to reliability problems; and**
- **The major cause of quality of supply complaints was low voltage – there was also a significant number of complaints attributed to voltage dips and swells and waveform distortion or unbalance.**

Recommendations

- **Ergon Energy should bring its SAIDI, SAIFI and CAIDI for short rural and urban feeders to the standard equivalent to its peer group;**
- **Government and Ergon Energy should agree performance targets for the long rural feeders, taking into account their unique nature. It is further recommended that Ergon Energy be required to develop a programme to achieve this in a reasonable timeframe. This requirement should be included in the regulatory framework;**
- **ENERGEX should be required to bring its SAIDI, SAIFI and CAIDI for urban and short rural feeders to the standard equivalent to its peer group. A further recommendation is that ENERGEX be required to develop a programme to achieve this in a reasonable timeframe. This requirement should be included in the regulatory framework;**
- **ENERGEX be required to develop a programme for improving the current 10% of worst performing feeders (which have more than double the duration of outages than the ENERGEX average) with the objective of bringing them within 50% of the ENERGEX average;**
- **ENERGEX, Ergon Energy and the QCA consider applying a statistically-based reliability approach to SAIDI, SAIFI and CAIDI normalisation;[26]**
- **ENERGEX and Ergon Energy give more attention to eliminating load and voltage constraints in their sub-transmission and high voltage networks in order to address existing voltage problems; and**
- **ENERGEX and Ergon Energy put strategies in place to replace their ageing 7/064 copper conductors in order to reduce voltage drops. This will also have the advantage of allowing the distributors to carry out more live line work, leading to reduced SAIDI.**

[26] Refer, for example, to D.A. Kowalewski's paper entitled *A Comparable Method for Benchmarking the Reliability Performance of Electric Utilities*, published in "Power Engineering Society Summer Meeting", 2002, IEEE (http://ieeexplore.ieee.org/xpl/tocresult.jsp?isNumber=22355). This paper proposes a 3-beta approach for excluding SAIDI outcomes above a threshold determined on the basis of weather and extreme event variances within a distributor's own business region.

6

CAPITAL EXPENDITURE ON THE DISTRIBUTION NETWORKS

The purpose of this chapter is to set out the Panel's findings in relation to the level and adequacy of ENERGEX and Ergon Energy's capital expenditure. It addresses the following of the Panel's Terms of Reference as they relate to capital expenditure:

> *Review the levels of expenditure on capital works and maintenance required to cater for current demands and future level of the growth in the distribution system, as benchmarked against appropriate comparisons;*
>
> *Determine adequacy of current levels of expenditure on capital works and maintenance to cater for current demands and expected growth, as benchmarked against appropriate comparisons.*

This chapter assesses the level and adequacy of ENERGEX and Ergon Energy's capital expenditure by:

- Examining the current state of their networks; and
- Reviewing the level of their capital expenditure between 2001/02 and 2003/04.

6.1 Context of Capital Expenditure Programmes

Much of Queensland's electricity distribution system was built in the early second half of last century. Given the age of this infrastructure, the geographic size and the range of weather conditions experienced within Queensland, and the move toward "the Smart State", it is now timely to review the level of capital investment across the system.

ENERGEX

In the mid to late 1990s, ENERGEX concentrated on maximising the functionality of its existing assets and reducing capital investment. This was in line with planning and management models utilised by distribution businesses throughout Australia. Supporting these decisions, ENERGEX has used a probabilistic planning methodology since 1989 which was designed to increase its network asset utilisation.

This methodology was known as Reliability Assessment Planning (RAP) and was based on the assumption that the network was designed to meet a system peak that was only a few hours long, with the probability of a fault during this peak being very small. The RAP methodology allows network equipment to be overloaded for short periods while load transfers are affected, following a breakdown of a piece of equipment.

The approach adopted by ENERGEX resulted in it operating at 76% system utilisation (excluding the benefits obtained from power factor correction capacitors) for the summer peak in 2004, which is the highest utilisation of any distribution utility in Australia. The Panel notes that the average Australian network utilisation is approximately 56% and that ENERGEX intends reducing its system utilisation over the next 5 years to around 60% to 65%. The Panel received professional advice that 60% to 65% is more consistent with prudent industry practice.

ENERGEX estimates that it reduced capital expenditure by between $800 million and $1 billion over the past 10 to 12 years using RAP. ENERGEX now accepts that the application of this methodology as a primary planning tool is no longer appropriate to produce an outcome which meets community expectations for reliability and security. ENERGEX predicts that significant capital expenditure will now be required to restore adequate contingent capacity.

Over the past five years, a number of significant changes impacted the appropriateness of this planning framework. These are:

- The change in Queensland's demand pattern from a winter to summer peak;
- Significant load growth in the south-east of the State caused by economic growth:
  - Growth in residential buildings involving a trend toward higher density living;
  - Increased industrial growth; and
  - An increase in air conditioner sales.

Economic growth in Queensland exceeded that of the rest of Australia in eight out of the last ten financial years. Over the past five financial years, the Gross State Product (GSP) in Queensland has grown by 5.1% annually, compared with the growth of 3.3% in the rest of Australia.

The QCA's determination covering the four year period 2001/02 to 2004/05 was based on forecast demand growth for ENERGEX of 4.2% and for Ergon Energy of 3.0%. No explicit differentiation was made in the determination between growth in average demand (energy sales) and growth in peak demand, although the Panel notes that peak demand growth is the key driver of investment in system capacity. The Panel assumes that the QCA and the distributors did not consider that there would be a significant difference between the growth in average and peak demand. This has not turned out to be the case.

The average annual growth in peak demand has exceeded the growth in average annual demand considerably. ENERGEX's annual average growth rate for the period was 4.9% and its average annual peak growth rate was 9.0%. Ergon Energy's annual average growth rate for the period was 2.8% and its average annual peak growth rate was 4.5%.

In ENERGEX's case, actual growth in average demand was 0.7% higher than forecast, while in Ergon Energy's case it was 0.2% lower. These variances in average demand in their own right are not significant, however the need for investment in the capacity of the distribution system is largely driven by the growth in peak demand, which has grown at around twice the average rate.

ENERGEX did not correctly predict the growth in peak demand between 2001/02 and 2002/03. For the summer of 2003/04, this underestimation was almost 500 MW at the time of system peak. On a weather corrected basis (i.e. peak load adjusted to reflect normal weather conditions[27]) the average growth in ENERGEX's peak demand over a three year period has been 7.5%, which is still 80% above the original 4.2% prediction.

Despite this increase in peak load growth, and a doubling of customer driven works, ENERGEX's overall capital programme did not increase significantly between 2001/02 and 2002/03.

Given these conditions and an acknowledgement that it did not successfully predict maximum growth rates, ENERGEX has now reviewed its planning processes and reduced its reliance on the RAP methodology. Along with the new planning methodology, and an acknowledged need for a substantial increase in capital expenditure, ENERGEX is planning to decrease network utilisation over the next several years to a more appropriate level.

Ergon Energy

Ergon Energy was formed in 1999 following the merger of six regional distribution companies and services more than one million square kilometres of regional Queensland (see Chart 3.1C). Among Ergon Energy's key challenges was the need to assess the state of the network it acquired as a result of the merger. There were significant differences in the policies and practices related to capital expenditure for the predecessor organisations.

Ergon Energy has now established common planning criteria based on an "N-1, 1%" concept, which is outlined in section 8.2.

Table 6.1A summarises Ergon Energy's sub-station utilisation by region. The overall asset utilisation is below the Australian average but this would be expected in a largely rural network. However, the Wide Bay Burnett region's asset utilisation is well above the Ergon Energy average and is reaching the level where reliability is

[27] The weather correction adjustments are those used by Powerlink in their annual forecasting process.

compromised. The projected utilisation for Wide Bay Burnett will push it above acceptable levels in the near future and significant capital will need to be spent in this region.

Table 6.1A - Ergon Energy - Sub-Station Utilisation by Region (%)							
Year	Overall	Far North	North Queensland	Mackay	Capricornia	Wide Bay Burnett	South West
2002/03	47.65	31.31	39.86	59.96	39.85	65.00	58.13
2007/08	50.44	33.45	40.90	60.84	44.89	77.81	53.31
Source: Ergon Energy, Network Utilisation Report NCU006/03, December 2003							

6.2 The Current State of the Networks

In submissions and presentations to the Panel, Ergon Energy and ENERGEX highlighted a number of key challenges in operating their networks in recent years, including:

- High load growth driven by strong economic growth, population growth and an increasing use of air-conditioners, particularly in south east Queensland. This has led to a shift in Queensland from a traditional winter peak demand to a summer peak demand; and
- Limited contingent capacity in key parts of their networks. In ENERGEX's case, this was a consequence of high load growth and the use from 1989 of a Reliability Assessment Planning (RAP) system, which sought to promote high system utilisation and low spare capacity – the nature and application of this system are discussed further in Chapter 8. In Ergon Energy's case, the limited spare capacity in parts of the network related both to the strong load growth and the realisation that the network that it inherited from its six predecessor organisations had greater constraints than management had initially appreciated.

Taking these matters into account, the Panel gathered appropriate information in order to assess the current state of the networks. In assessing the networks, the following matters were considered:

- The growth in average and peak demand in Queensland since 2000, and in particular the impact of increased air-conditioning load – the key impact of this has been to make demand very sensitive to temperature variations;
- The extent of contingent spare capacity in the networks. Spare capacity is an important criterion on which to assess the adequacy of capital expenditure because it is a measure of the system's ability to cope with asset failure, contingency events and increasing levels of maximum demand; and
- The age profile of the assets. This is important because it enables a view to be taken of whether past capital expenditure has replaced, refurbished and

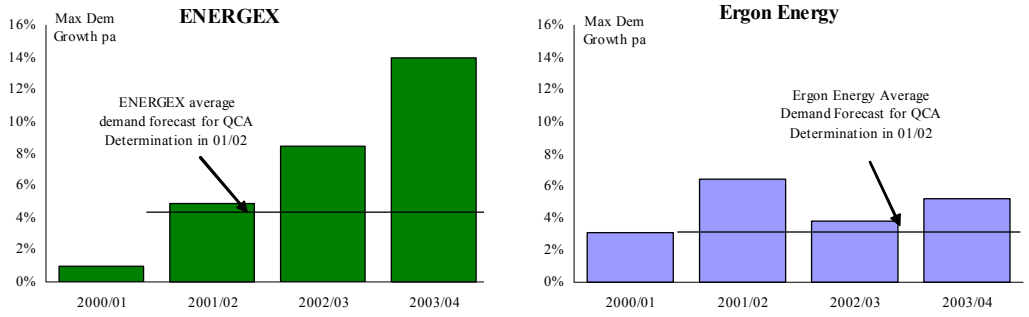
augmented the asset base appropriately over time and what levels of capital expenditure are likely to be required in the future.

The analysis and findings are discussed in the following sub-sections.

Growth in Peak Demand

Graph 6.2A sets out the growth in ENERGEX and Ergon Energy's peak demand between 2000/01 and 2003/04.

Graph 6.2A – Annual Growth in Peak Demand 2000/01 – 2003/04



Source: ENERGEX and Ergon Energy, 2004

Graph 6.2A indicates that:

- Ergon Energy experienced sustained growth in peak demand of between 3% and 6% between 2000/01 and 2003/04, which exceeded its forecast 3% average annual growth for this period. It is noted that this 3% per annum forecast was adopted by the QCA in setting Ergon Energy's four year revenue cap for 2001/02 to 2004/05; and
- ENERGEX's peak demand grew rapidly between 2000/01 and 2003/04 and significantly exceeded ENERGEX's average demand growth forecasts of 4.2% growth per annum over this period. Annual peak demand growth was highest in 2003/04 at around 14%. It is noted that the 4.2% average demand growth projection was adopted by the QCA in setting ENERGEX's four year revenue cap for 2001/02 to 2004/05.

Both distributors have advised that growth in peak demand was heavily influenced by growth in air-conditioning load, although this was particularly the case for ENERGEX and resulted in a shift from a winter peak demand to a summer peak demand.

ENERGEX, in its submission to the Review, advised that:

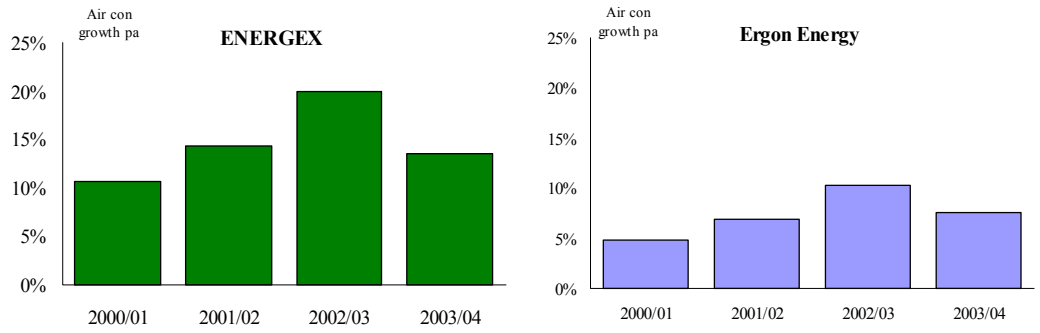
From 1990 to 1999, ENERGEX had been experiencing winter peak maximum demands for electricity with an average annual growth of around 3 per cent per annum. During this period, the average summer growth was 5-6 per cent, but was at a lower level than the winter peak. Since 2001, summer peaks have been predominant, with the 2002/03, 2003/04 maximum peak demand growth of 8 per cent and 14 per cent respectively. QCA forecast 4.2 per cent. [28]

Similarly, Ergon Energy advised that:

Ergon Energy's load is, on the whole, summer peaking with most of its network serving tropical and sub-tropical areas. The pre-existing incidence of air-conditioning load is believed to be higher than elsewhere, resulting in the effects of recent penetration increases being not quite as severe as that seen in more temperate areas, where high AC penetration rates have led to unexpectedly high summer peaks in networks designed for winter peaks when equipment ratings are less onerous.

Graph 6.2B shows indicative growth in air-conditioning load for ENERGEX and Ergon Energy between 2000/01 and 2003/04.

Graph 6.2B – Indicative Growth in Air-Conditioning Load 2000/01 – 2003/04



Sources: ENERGEX and Ergon Energy 2004

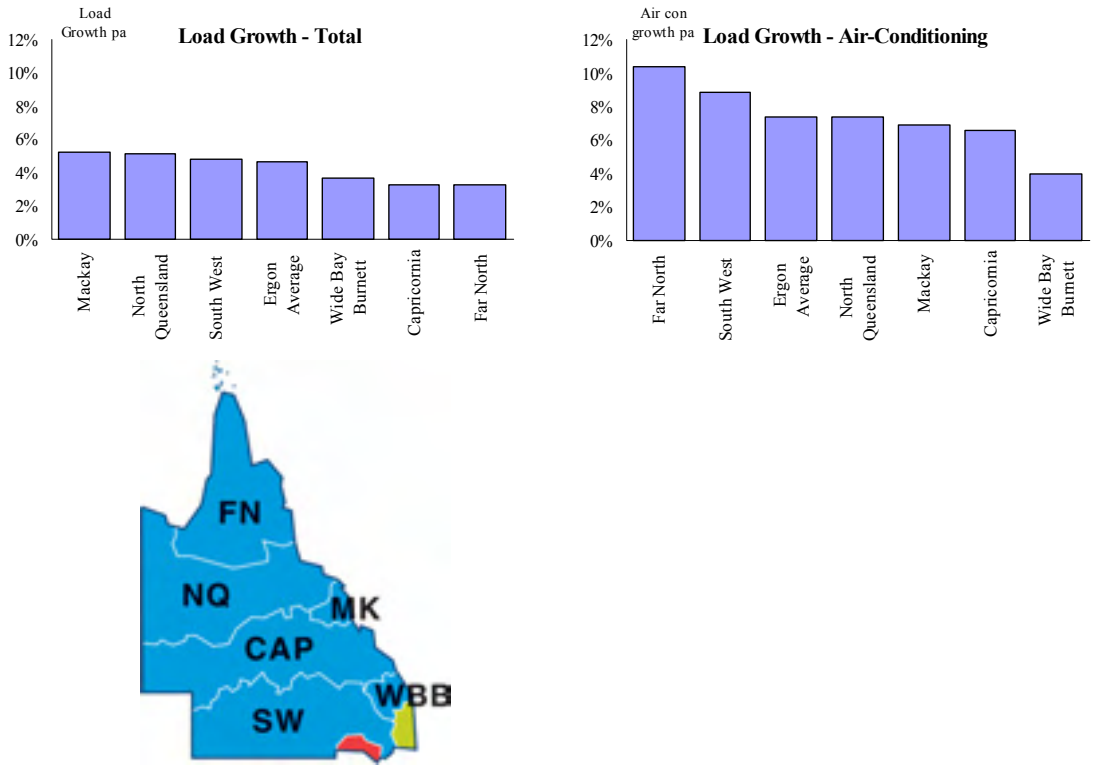
Graph 6.2B indicates that:

- ENERGEX's air-conditioning load grew very strongly over the period, with growth ranging between 10% and 20% per annum; and
- Ergon Energy's air-conditioning load grew steadily between 2000/01 and 2003/04, with annual growth being between 4% and 10%.

Peak demand growth within Ergon Energy's network grew at different rates between regions, as illustrated in Graph 6.2C.

[28] ENERGEX forecast of 4.2%, which was adopted by the QCA was related to average demand growth, and not peak demand.

Graph 6.2C – Ergon Energy Regional and Indicative Air-Conditioning Load Growth 2000/01 – 2003/04



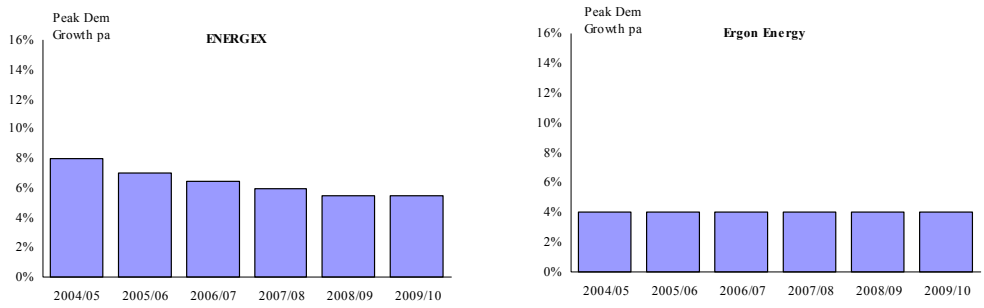
Source: Ergon Energy, 2004

Graph 6.2C indicates that:

- Average annual growth in peak demand in the Mackay, North Queensland and South West regions between 2000/01 and 2003/04 exceeded the average annual peak demand growth of 4.5% across Ergon Energy's network. These regions also experienced the poorest reliability in 2003/04, as noted in Chapter 5;
- Far North Queensland and South West Queensland experienced rapid growth in air-conditioning load over the same period, with Far North Queensland experiencing, on average, 10% demand growth in peak demand over the period; and
- Wide Bay Burnett, a region that had poor reliability outcomes in 2003/04, has had reasonably low annual average growth in air-conditioning load. It is noted however, that this region experienced estimated average growth of around 7% per annum in air-conditioning load between 2002/03 and 2003/04.

ENERGEX and Ergon Energy also provided the Panel with forecasts of peak demand for the period 2004/05 to 2009/10. These forecasts are detailed in Graph 6.2D.

Graph 6.2D – Forecast Growth in Peak Demand 2004/05 – 2009/10



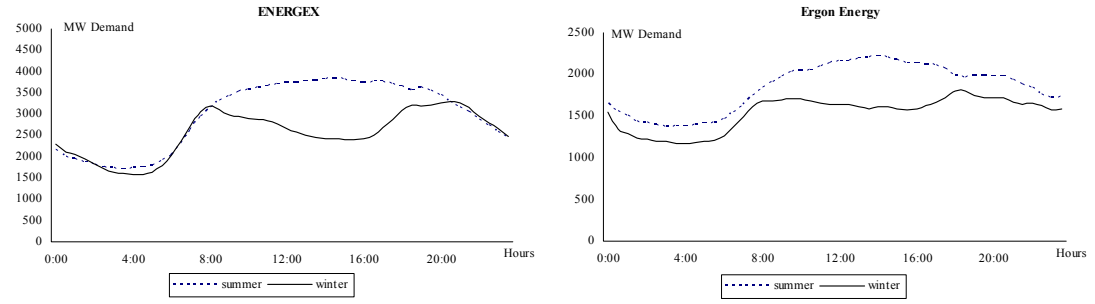
Source: ENERGEX and Ergon Energy 2004

Graph 6.2D shows that both ENERGEX and Ergon Energy have forecast that growth in peak demand will continue strongly between 2004/05 and 2009/10 with:

- ENERGEX forecasting an increase of 8% in 2004/05 declining to 5.5% in 2009/10 – this compares with an annual average peak demand growth over the period 2000/01 to 2003/04 of 7%; and
- Ergon Energy forecasting an annual average increase in peak demand of 4% per annum over the period 2004/05 to 2009/10 – this compares with an annual average peak demand growth rate over the period 2000/01 to 2003/04 of 4.6%.

In addition to significant increases in peak demand, both ENERGEX and Ergon Energy have experienced a shift from a short evening winter peak to a long afternoon summer peak over the last five to ten years. The differences in the nature of winter and summer daily peaks are shown in Graph 6.2E. The shift in demand peaks has significant implications for network planning. Firstly, the system has less load carrying capability during the heat of the day in summer. Secondly, the load carrying capability is dependent not only on the magnitude of the load but also on the duration of the peak. Winter peaks are typically of one to two hours duration and at low temperatures. Summer peaks are typically eight to ten hours duration and occur at the hottest part of the day. The system has up to 15% less load carrying capacity in summer than winter. This leads to a need for significant increases in capital expenditure to meet the summer peak, while still retaining the same levels of reliability.

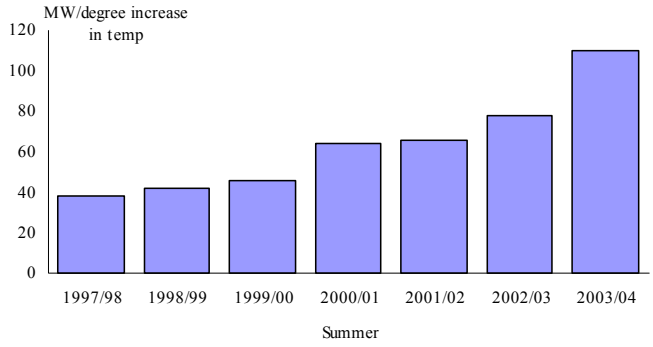
Graph 6.2E – Queensland Winter and Summer Daily Load Curve



Source: ENERGEX and Ergon Energy 2004

A key reason for the shift in peak demand to a long summer peak has been air-conditioning growth. Graph 6.2F below shows an estimate of the increasing impact of air-conditioning on ENERGEX's load. In 1997/98, a one degree increase in temperature on a hot day resulted in an increase in load of less than 40 MW. By 2003/04, this had increased by a factor of almost three to just under 120 MW.

Graph 6.2F – ENERGEX – Estimate of Load Temperature Sensitivity (MW/degree)



Source: Powerlink, 2004

Assessment of Contingent Asset Capacity

In order to gauge the adequacy of capital expenditure, the Panel assessed the existing contingent spare capacity of ENERGEX and Ergon Energy's bulk supply sub-stations, zone supply sub-stations, sub-transmission feeders, high voltage distribution feeders and Single Wire Earth Return (SWER) lines.

In engineering terms, contingent spare capacity is generally measured in the context of the supply scenarios "N" and "N-1":

- "N" refers to a supply situation where sufficient capacity exists under normal operating conditions, but, if a component fails (e.g. a sub-station, transformer or feeder), supply to customers will be interrupted; and
- "N-1" refers to a supply situation where if one component fails, the remaining components continue to supply customers, although there may be a momentary or short term interruption as the remaining components are brought into service.

In addition to the security benefits that "N-1" planning provides, it also:

- Allows the system to cope with unexpected increases in load or severe weather conditions; and
- Increases the likelihood of assets lasting up to, and beyond, their estimated useful lives.

It should be noted, however, that "N-1" planning necessarily results in a higher cost system because it builds in a level of duplication and/or redundancy which may only be drawn upon in limited circumstances. The Panel recognises the need to balance the use of "N-1" and "N" planning as it is simply not economically feasible for an entire system to meet "N-1".

The Panel contacted six of the other major distributors in the NEM and all confirmed that they used a minimum of N-1 (with very few exceptions) as the base planning criterion for bulk and zone supply sub-stations.

In considering the contingent spare capacity of ENERGEX and Ergon Energy's network, the Panel assessed the percentage of assets that were operating in excess of:

- Their "N" rating, being the manufacturer's assigned rating for a constant load under design conditions or their normal cyclic capacity, which, for sub-stations, is typically up to 10% above their nameplate rating and takes into account the fact that load is not constant and design conditions do not always eventuate; and
- Their "N-1" rating, being the manufacturer's rating with one unit out of service, or the emergency cyclic capacity, which, for sub-stations, is typically 15-20% above their nameplate rating and represents the short-term load carrying capability without significant loss of asset life.

Based on engineering advice, the Panel concluded that "N-1" contingency is prudent within certain parts of the networks, including bulk supply sub-stations, zone supply sub-stations, transmission and sub-transmission feeders and in the urban and CBD high voltage systems on the basis that:

- On an assumption of "N", it is acceptable to operate bulk supply sub-stations indefinitely up to their normal cyclic capacity. However, the failure of a component at "N" has a high risk of significant interruptions to customers, while that component is repaired; and

- Where multiple units are installed and a component fails, it is acceptable to operate up to the "N-1" rating for the equipment until repairs are affected, or load can be transferred to other sub-stations or feeders.

Bulk Supply Sub-Stations

Spare capacity at bulk supply sub-stations is very important because they supply a very large number of customers and an outage can impact tens of thousands of customers. The Panel acknowledges that in some circumstances load can be transferred between bulk supply sub-stations in the event of equipment failure. Detailed analysis of this capability was not conducted because:

- It requires a lengthy and complex analysis of a wide range of scenarios, which would take longer than the time available for this Review;
- In ENERGEX's case, the general high level of loading on its system significantly reduces the opportunity to transfer load; and
- In Ergon Energy's case, the geographic spread of its network limits the opportunity to transfer loads.

On this basis, the Panel considers that the following approach provides an adequate assessment of the current state of the networks.

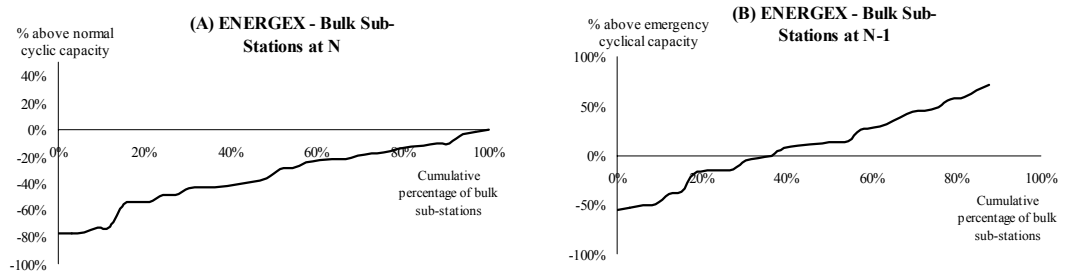
Assessments of the contingent spare capacity of ENERGEX and Ergon Energy's bulk supply sub-stations are detailed below.

a) ENERGEX Bulk Supply Sub-Stations

The Panel received professional advice that it is generally accepted Australian industry practice that bulk supply sub-stations should have "N-1" capability.

Graph 6.2G details the contingent spare capacity in ENERGEX's bulk supply sub-stations.

Graph 6.2 G – Contingent Spare Capacity of ENERGEX's Bulk Supply Sub-Stations – Summer Peak 2003/04



Source: ENERGEX, 2004
Note – Sub-stations with only one transformer are not illustrated on the "N-1" graph.

ENERGEX provided the actual peak summer demand data containing loading information and bulk supply sub-station rating details, based on normal cyclic capacity and emergency cyclic capacity. From this information, an analysis was made of the utilisation of individual sub-stations on the basis of:

- Normal cyclic capacity rating; and
- Emergency cyclic capacity rating.

Graph 6.2G shows that during the summer of 2003/04:

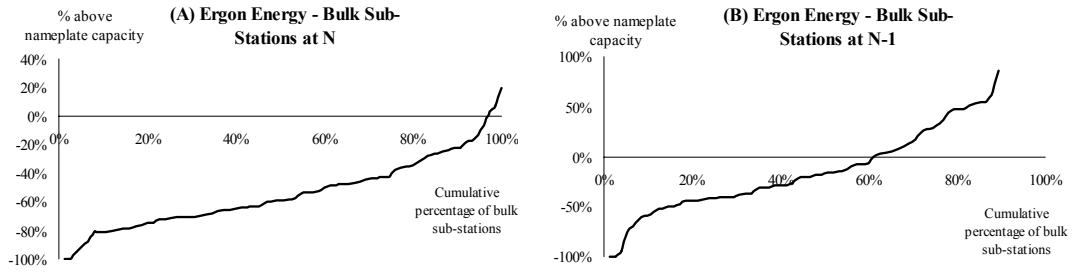
- All 33 of ENERGEX's bulk supply sub-stations operated within normal cyclic capacity at "N"; and
- Around 63% of ENERGEX's bulk supply sub-stations would operate above emergency cyclic capacity if an "N-1" event occurred. This is broadly consistent with material presented to the Panel by ENERGEX, which indicated that 69% of bulk supply sub-stations did not meet "N-1" criteria during the summer peak of 2003/04.

In the event of an equipment failure at a peak time, this will potentially result in thousands of customers being disconnected from the system until repairs are affected. The Panel recognises that some scope may exist to transfer load between sub-stations during emergencies. However, this is not expected always to be the case given the overall high level of loading on these sub-stations and in the sub-transmission feeder system.

b) Ergon Energy Bulk Supply Sub-Stations

The Panel believes Ergon Energy should also apply an "N-1" criteria for bulk supply sub-stations, although Ergon Energy believes that a slightly lesser standard is acceptable. Ergon Energy's standard is "N-1 (1%)", which means that "N-1" will be available for 99% of the time.

Graph 6.2H - Contingent Spare Capacity of Ergon Energy's Bulk Supply Sub-Stations - Summer Peak 2003/04



Source: Ergon Energy, 2004
Note – Sub-stations with only one transformer are not illustrated on the "N-1" graph.

Graph 6.2H shows that 39% of Ergon Energy's bulk supply sub-stations do not meet the "N-1" criteria. Ergon Energy has advised the Panel that there is a need for caution

in using this information. This is because the Panel has assessed its performance against nameplate rating rather than cyclic rating and has not included an assessment of sub-transmission transfer capacity. Ergon Energy has advised that it considers summer cyclic ratings and sub-transmission transfer capacity when determining capital expenditure priorities. This notwithstanding, the fact remains that 22% of Ergon Energy's bulk sub-stations do not meet "N-1" on cyclic rating. This is the standard that the Panel has been advised is appropriate for bulk supply sub-stations.

Zone Supply Sub-Stations

Zone supply sub-stations transform supply from sub-transmission voltage (generally 66kV or 33kV) to the distribution high voltage (generally 11kV or 22kV). An outage at a zone supply sub-station can impact many thousands of customers.

It is standard industry practice that zone supply sub-stations should have "N-1" capability where these sub-stations supply large or critical customer loads, for example, urban or CBD areas.

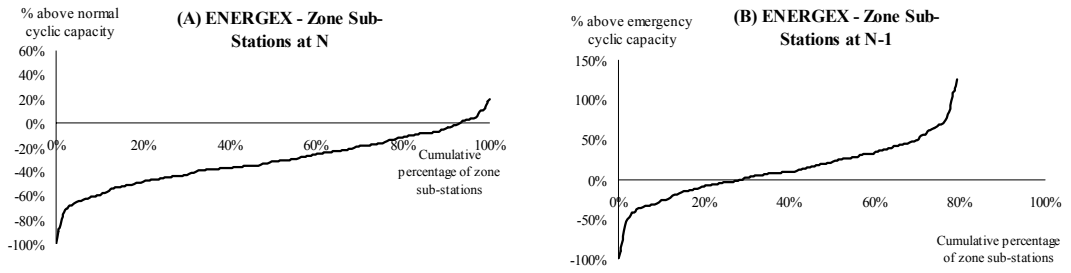
a) ENERGEX Zone Supply Sub-Stations

Consistent with the approach for bulk supply sub-stations, ENERGEX provided actual peak summer demand data containing loading information and zone supply sub-station rating details based on normal cyclic and emergency cyclic capacity. From this information, an analysis was made of the utilisation of individual zone supply sub-stations on the basis of:

- The normal cyclic capacity rating with all units in service (i.e. "N"); and
- The emergency cyclic capacity rating with one unit out of service (i.e. "N-1").

Graph 6.2I details the findings in relation to the contingent spare capacity in ENERGEX's zone supply sub-stations.

Graph 6.2I - Capacity of ENERGEX's Zone Supply Sub-Stations Summer Peak 2003/04



Source: ENERGEX, 2004
Note – Sub-stations with only one transformer are not illustrated on the "N-1" graph.

The Panel is concerned that a serious problem exists with ENERGEX's zone supply sub-stations, as illustrated in Graph 6.2I, in that:

- Approximately 7% of ENERGEX's zone supply sub-stations are operating above the level at which they were designed to operate under normal circumstances (normal cyclic capacity). On this basis, around 13 sub-stations are effectively overloaded during peak load conditions with all equipment in service. Prolonged operation at this mode would lead to increased probability of failure and the lack of spare capacity means that if a transformer was to fail, loss of supply would occur to some thousands of customers.

  Transformers are designed to operate up to their cyclic capacity under normal conditions for periods of time. It is not accepted industry practice to operate transformers above this level for extended periods of time.

  The Panel expects that all zone supply sub-stations should operate within normal cyclic capacity at "N", and considers this aspect of ENERGEX's operations to be unacceptable. The potential for ENERGEX to transfer load to address this problem is not, in the Panel's view, a sufficient safeguard; and

- About 71% of zone supply sub-stations would operate above emergency cyclic capacity if an "N-1" event occurred. ENERGEX has indicated to the Panel that it assessed that 79% of its 33kV-11kV sub-stations did not meet "N-1" criteria during the summer peak of 2003/04. Based on analysis of standard industry practice, it is the Panel's view that the majority of these zone supply sub-stations should meet "N-1" in order to provide appropriate security of supply to customers.

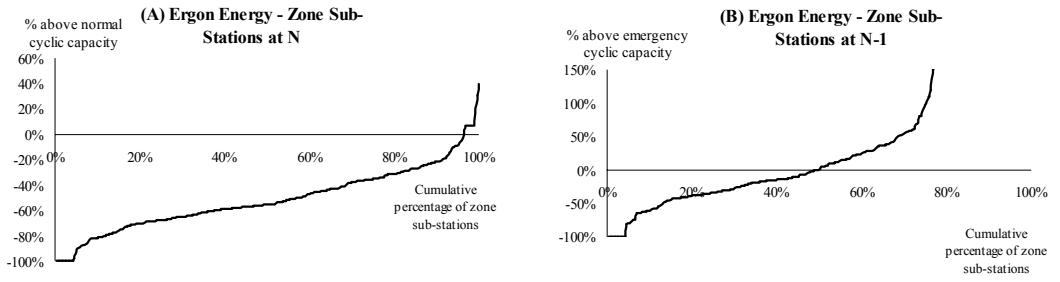
b) Ergon Energy Zone Supply Sub-Stations

Consistent with the approach for bulk supply sub-stations, the analysis for Ergon Energy's zone supply sub-stations was based on forecast 2003/04 loads adjusted for actual growth rates at a regional level.

In this case, Ergon Energy's information included ratings based on normal cyclic capacity and emergency cyclic capacity. An analysis of the utilisation of individual zone supply sub-stations was carried out on the basis of:

- The normal cyclic capacity rating with all units in service (i.e. "N"); and
- The emergency cyclic capacity rating with one unit out of service (i.e. "N-1").

Graph 6.2J - Capacity of Ergon Energy's Zone Supply Sub-Stations Summer Peak 2003/04



Source: Ergon Energy, 2004
Note – Sub-stations with only one transformer are not illustrated on the "N-1" graph.

Graph 6.2I for Ergon Energy shows that:

- About 3% of Ergon Energy's 260 zone supply sub-stations were operating slightly above their normal cyclic capacity rating at "N". Further analysis indicated that many of these sub-stations were very small, in the process of being up-rated or had been up-rated since the data was prepared. Accordingly, the Panel considers this to be acceptable; and
- About 51% of zone supply sub-stations would operate above their emergency cyclic capacity if an "N-1" event occurred.

After considering information provided by Ergon Energy, it would appear that a significant proportion of Ergon Energy's zone supply sub-stations serve loads of less than 5 MVA. It is common industry practice not to routinely apply "N-1" planning to sub-stations with relatively small connected loads.

Of the 117 zone supply sub-stations above 5 MVA, however, around 47% do not meet "N-1" criteria. In the Panel's view this is unacceptable.

Condition of Transformers

In February 2004, ENERGEX identified that a number of its transformers may overheat because of expected high ambient temperatures and sustained high loads. Information provided to the Panel suggests that ENERGEX installed emergency cooling in the form of soaker hoses on a number of transformers in order to reduce their insulation temperature. Engineering advice to the Panel has indicated that while sometimes distributors use such measures in emergencies, this is unconventional operating practice. Its effectiveness in reducing insulation temperature at the core of the transformer is not widely documented.

Under good operating practice, transformer insulation will last the economic life of the transformer but sustained overloading will result in high operating temperatures which reduce insulation life, and therefore transformer life.

The Panel is aware that ENERGEX conducted tests on the oil contained in a number of these transformers to determine whether insulation damage has occurred from overheating. The Panel understands outcomes from this analysis indicate insulation damage on about half of the transformers tested. This will significantly shorten the lives of these transformers.

Sub-Transmission and High Voltage Distribution Feeders

a) ENERGEX

Problems with sub-transmission and high voltage distribution feeders typically involve:

- Capacity constraints, which occur when the electricity being transmitted through a line exceeds the capacity of that line; and/or
- Voltage constraints, which occur when the electrical distance between a load and a user is long and voltage cannot be maintained at the desired levels.

As over two-thirds of ENERGEX's zone supply sub-stations are supplied from the 33kV network, analysis was undertaken of this part of the network in order to gain an understanding of the state of ENERGEX's sub-transmission system. In particular, the Panel considered:

- Material provided by ENERGEX; and
- The results of load flow analysis conducted by ENERGEX on its 33kV network using forecast 2004/05 loads.

The Panel found that:

- ENERGEX has a major programme in place to upgrade supply to the Brisbane CBD in conjunction with Powerlink. This entails extra bulk supply sub-stations and feeders into and around the CBD. These proposed upgrades have been subject to significant engineering review and approval processes and should meet the CBD's load needs in the foreseeable future;
- The 110kV network supplying the south coast region (Gold Coast) does not currently meet an "N-1" criteria. Detailed analysis on the north coast (Sunshine Coast) has not been completed by ENERGEX but it does not believe that an "N-1" criteria is being met. The Panel believes that it is unacceptable that this information is not readily available as a normal part of the planning process and is concerned that major feeders do not meet "N-1"; and
- Approximately 7% of the 33kV feeders operate in excess of normal cyclic rating under normal operating conditions (i.e. at "N"). ENERGEX itself estimated that 22 of the 292 33kV feeders operated above their normal cyclic capacity during the summer of 2003/04 and that 31% of 33kV feeders would exceed their "N-1" capability. The Panel does not consider this to be sound operating practice because, in the case of underground cables, overloading increases the

probability of failure and, in the case of the overhead network, overloading could result in lines sagging below their required clearance levels and thus present safety issues.

Table 6.2K shows ENERGEX's projection that, if there is a 10% increase in peak demand for the summer of 2004/05, the number of 33kV feeders operating above their normal cyclic capacity will increase from 22 to 36 and the number of 11kV feeders from 154 to 335. ENERGEX has projected that this could be reduced to four 33kV feeders and fifty 11kV feeders if its recently upgraded 2004/05 capital works programme proceeds as planned.

Table 6.2K – ENERGEX Sub-Transmission and High Voltage Distribution Feeder Capacity

	Number in system	Number above capacity in Summer 03/04	Number above capacity in Summer 04/05 (assuming 10% growth)	Number above capacity in Summer 04/05 (assuming 16% growth and capital projects)
33kV feeders	292	22	36	4
11kV feeders	1,351	154	335	50
Source – ENERGEX, 2004				

b) Ergon Energy

Detailed information was obtained from Ergon Energy on the approximately 1,000 132kV, 66kV and 33kV feeders and feeder segments as at April 2004.

The Panel notes that Ergon Energy has indicated that 19% of its sub-transmission feeders are either capacity or voltage constrained (or both) under normal operating conditions (i.e. "N").

In the case of its high voltage distribution network, Ergon Energy's analysis in December 2003 indicated that 27.2% of feeders were currently voltage constrained and 14.1% were capacity constrained. It projected that voltage and capacity constraints would increase to 37.2% and 21.1% respectively within five years if corrective action is not taken. A detailed breakdown of this analysis by feeder type is presented in Table 6.2L.

Table 6.2L – Ergon Energy – Overall Distribution Feeder Constraints					
	Immediate (2003/04) Constraints			Five year (2008/09) Constraints	
	Number of feeders	% voltage constrained	% capacity constrained	% voltage constrained	% capacity constrained
11kV feeders	709	20	23.7	27.5	36.5
22kV feeders	184	18.5	11.4	25.5	16.8
33kV	28	3.6	3.6	10.7	3.6
SWER	669	38.1	5.1	51.7	6.7
Total	1,590	27.2	14.1	37.2	21.1
Source – Ergon Energy Summary Distribution Capability Review, December 2003					

In a presentation to the Panel in May 2004, Ergon Energy management indicated that approximately 40% of its high voltage distribution system is currently either capacity or voltage constrained. The number of constraints in the SWER system is of particular concern to the Panel and is discussed in Chapter 12.

Assessment of Asset Age

The age profiles of certain classes of Ergon Energy and ENERGEX's assets were reviewed in order to understand:

- The profile of past expenditure; and
- The likely need for significant levels of replacement expenditure in the current capital expenditure planning horizons.

The Panel also reviewed asset life information for:

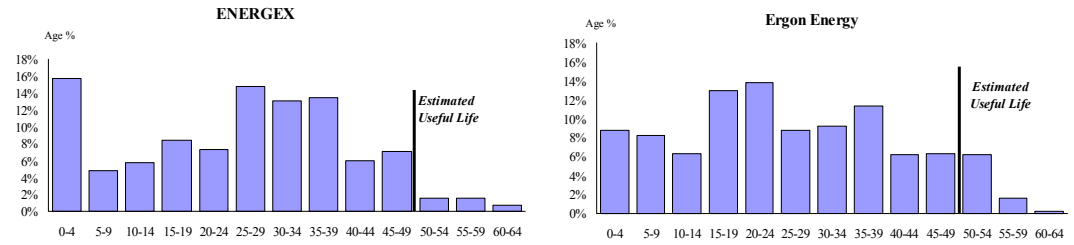
- Transformers used in bulk and zone supply sub-stations;
- Transformers used in distribution sub-stations; and
- Poles used in overhead line construction.

The Panel notes that this analysis considered the number of assets purchased over time, and not the asset's size or contribution to system security. Some individual assets, such as large bulk supply sub-stations, contribute more to system security than other assets, such as small zone supply sub-stations.

Graph 6.2M sets out the age profile of ENERGEX and Ergon Energy's transformers used in bulk and zone supply sub-stations.

Bulk and Zone Supply Sub-Station Transformers

Graph 6.2M - Age Profile of Bulk and Zone Supply Sub-Station Transformers 2003/04



Source – ENERGEX and Ergon Energy, 2004

Graph 6.2M for ENERGEX shows that:

- Installation of power transformers during the 1980s and 1990s declined relative to historic levels. This decline was particularly evident after ENERGEX introduced the RAP planning methodology in the late 1980s;
- The rate of installation has increased dramatically in the past four years; and
- Around 4% of power transformers are currently operating beyond their estimated useful lives but this will increase to about 17% within the next 10 years. Over the next ten years, transformers installed during the high growth period between the 1950s and 1970s will need to be replaced or refurbished.

Graph 6.2M for Ergon Energy shows that:

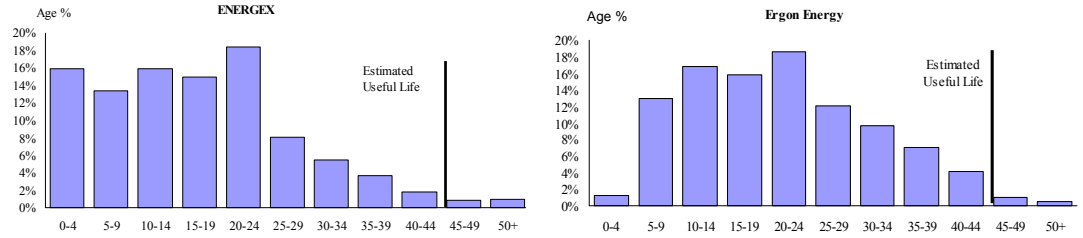
- The rate of installation of power transformers has been relatively uniform over the last 30 years, although it declined in the early 1990s; and
- Approximately 8% of power transformers are currently operating beyond their estimated useful lives but this will increase to about 20% within the next 10 years unless assets installed in the 1950s and 1960s are replaced or refurbished.

This highlights the need for ENERGEX and Ergon Energy to have replacement expenditure in line with this age profile over the coming years.

Distribution Transformers

Graph 6.2N sets out the age profile of ENERGEX and Ergon Energy's transformers used in distribution sub-stations.

Graph 6.2N - Age Profile of Distribution Transformers 2003/04



Source: ENERGEX and Ergon Energy, 2004

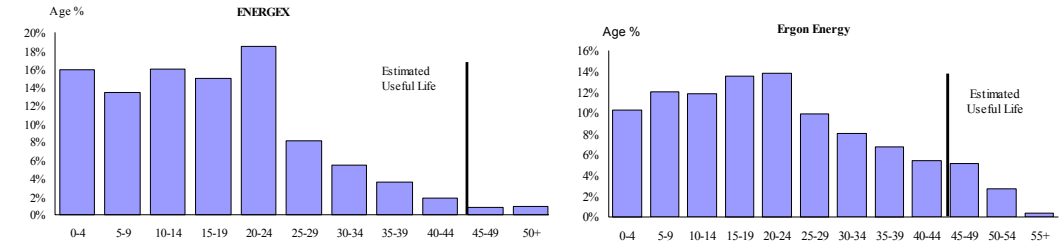
The graphs show that:

- The median age of ENERGEX's distribution transformers is between 10 and 15 years, which is considered low relative to industry counterparts;
- The rate of installation of ENERGEX's distribution transformers has been relatively uniform over the past 25 years;
- Only between 1% and 2% of ENERGEX's distribution transformers are currently operating beyond their estimated useful lives; and
- Only about 1% of Ergon Energy's distribution transformers are currently operating beyond their estimated useful lives.

Poles

Graph 6.2O sets out the age profile of Ergon Energy and ENERGEX's poles used in overhead line construction.

Graph 6.2O - Age Profile of Poles 2003/04



Source: ENERGEX and Ergon Energy, 2004

Graph 6.2O for ENERGEX shows that:

- The installation of poles has increased at a steady rate over the last 40 years, with a slight reduction in the late 1990s; and
- 11% of poles are currently operating beyond their notional useful lives. This is not considered to be a high proportion of poles given the pole inspection programmes in place within ENERGEX.

Graph 6.2O for Ergon Energy shows that:

- The installation of poles has declined over the last 25 years following a steady increase after the Second World War; and
- Approximately 8% of poles are currently operating beyond their estimated useful lives. This is not considered to be a high proportion of poles given the pole inspection programmes in place within Ergon Energy.

6.3 The Level of Capital Expenditure by ENERGEX and Ergon Energy

ENERGEX and Ergon Energy both divide their capital expenditure programmes into two parts – system related and non-system related expenditure. Non-system related expenditure refers to expenditure on assets such as buildings and information technology systems and is a relatively small component of the distributors' overall capital expenditure program.

This sub-section focuses only on system-related capital expenditure.

The distributors distinguish between the following types of system related expenditure:

- Non-load related – this expenditure primarily relates to asset renewals and is driven by the expected useful lives of the assets;
- Reliability – this is expenditure on assets to improve the service quality provided by the network (i.e. to reduce outages and improve supply quality);
- Refurbishment – this expenditure relates to the overhaul of assets in order to extend their service lives;
- Demand related – this is expenditure for works to accommodate increased demand across the network;
- Customer driven – this expenditure relates to works required to service an individual customer's new or increased load; and
- Land and rights of way – this relates to expenditure on the purchase of land and rights of way on which the electricity network is built.

In practical terms, there are many overlaps between these categories of expenditure and it is often difficult to make firm distinctions between them.

Capital Expenditure Between 2001 and 2004

As discussed in Chapter 4, the maximum revenue that ENERGEX and Ergon Energy may earn in any year from their prescribed distribution services is regulated by the QCA under a revenue cap.

The Panel considered carefully whether the existence of a cap on revenue gave rise to an effective cap on capital expenditure and sought specific advice from the QCA and the distributors on this issue.

On balance, the Panel is satisfied that the distributors were free to decide what level of capital expenditure in their networks was necessary during the current regulatory period 2001/02 to 2004/05, subject to the provisions of the Queensland Government's "*Investment Guidelines for Government Owned Corporations*". However, the Panel notes that although ENERGEX and Ergon Energy can spend additional capital above the capital expenditure "building block" used in the QCA determination, they receive no return on this additional expenditure until a regulatory reset.

This factor may have been a significant deterrent to ENERGEX in investing additional capital by:

- Approaching the QCA midway through the regulatory period (i.e. 2002/03) for a re-evaluation;
- Applying to the Government for an injection of capital; or
- Increasing their debt levels.

While the efficient level of capital expenditure is a key input into the AARR, the AARR does not define or dictate the amounts that the distributors can (or should) spend on capital works in any year. The distributors are free to spend more than the "building blocks" used by the QCA to arrive at the AARR and to finance their capital programme from any other funding sources at their disposal other than the AARR, such as retained profits, debt or equity.

As can be seen in Graph 6.3A:

- ENERGEX's capital expenditure has closely tracked the amount that the QCA "allowed" in determining the AARR for 2001/02 and 2002/03 and this is forecast also to be the case in 2003/04. However, ENERGEX has forecast to significantly "overspend" the QCA "building block" in 2004/05; and
- Ergon Energy spent significantly above the QCA capital expenditure "building blocks" between 2002/03 and 2004/05.

The distributors' actual and forecast capital expenditure is discussed further in the next section.

Graph 6.3A – Comparison of Actual/Forecast Capital Expenditure and that used by QCA for 2001/02 to 2004/05

Source: ENERGEX and Ergon Energy, 2004
Note – Both distributors' 2003/04 and 2004/05 capital expenditure amounts are forecast

ENERGEX's Capital Expenditure

Table 6.3B shows ENERGEX's actual expenditure for 2001/02 and 2002/03 and forecast capital expenditure for 2003/04 and 2004/05. The 2003/04 data includes actual expenditure to March 2004 and forecasts for the remaining quarter to 30 June 2004.

Table 6.3B – ENERGEX – Actual / Forecast Capital Expenditure 2001/02-2004/05 ($'000's)

	2001/02	2002/03	2003/04	2004/05	Total
Non Load Related	22,114	19,344	16,557	22,912	80,928
Reliability	6,253	2,098	8,217	27,048	43,617
Refurbishment	18,898	20,229	28,083	43,860	111,069
Demand Related	111,650	105,606	72,984	192,009	482,249
Customer Driven	66,280	95,884	132,085	116,628	410,877
Land & ROW	2,769	4,237	1,812	2,502	11,320
Non-System	42,636	34,302	18,900	(13,101)	82,737
Total	**270,600**	**281,700**	**278,639**	**391,858**	**1,222,796**

Source: ENERGEX, 2004

The Panel has considered carefully ENERGEX's pattern of capital expenditure over the first regulatory period. It held several discussions with the QCA and with ENERGEX's management and, in particular, sought to understand the movements in the approved capital expenditure budget during the current regulatory period.

The Panel found that ENERGEX sought generally to manage its capital programme within the "building block" that the QCA used for the 2001 revenue determination. However, ENERGEX's Board approved several increases in the capital expenditure budget, including:

- An increase of $35 million to the 2002/03 budget in December 2002 for increased demand in customer connection works and head works;
- An increase of $23.1 million to the 2003/04 budget in April 2003 to support increased network growth above regulatory forecasts;
- An increase of $10.2 million to the 2003/04 budget in March 2004 to increase the capacity of the low voltage distribution assets affected by the extreme hot weather of February 2004; and
- Three increases totalling $196.6 million to the 2004/05 budget for various works. These increases were submitted by ENERGEX management and approved by its Board during the course of this Review.

The Panel further notes that ENERGEX proposes to significantly increase its capital expenditure throughout the next regulatory period.

Table 6.3B shows that:

- ENERGEX's overall capital programme increased by about $11 million between 2001/02 and 2002/03 and was forecast to decrease by about $3 million in 2003/04. ENERGEX has forecast a 41% increase in expenditure in 2004/05, brought about by an increase in every category of works, other than customer driven and non system works, but principally attributable to the $120 million increase in demand related works;
- Reliability related works were a relatively minor component of ENERGEX's capital expenditure programme for 2001/02 and 2002/03. Reliability expenditure was forecast to increase slightly to around $8 million in 2003/04, and then to more than triple to $27 million in 2004/05. This highlights a re-prioritisation of reliability related works within ENERGEX's capital expenditure programme;
- Non-load related works were forecast to remain relatively stable over 2003/04 and 2004/05 and to average around $20 million per annum for the period;
- Refurbishment works were forecast to increase significantly in both 2003/04 and 2004/05 from around $20 million to $43 million. This reflects an awareness by ENERGEX of an ageing asset base and the importance of refurbishment to future reliability;
- Demand related works are the largest category of expenditure, accounting for more than 40% of the total four year capital programme. This category of expenditure was forecast to decrease by about 30% in 2003/04 to about $73

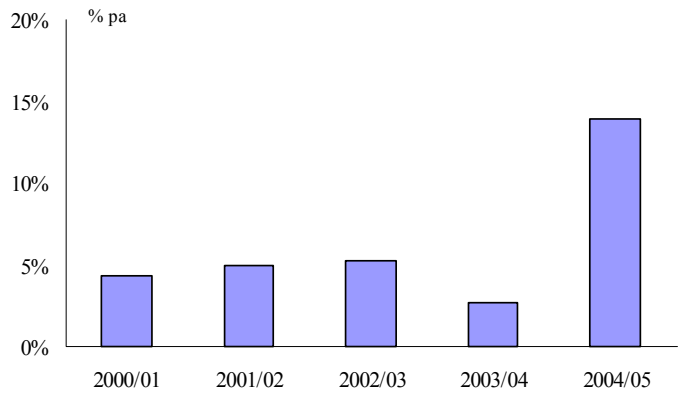
million but was projected in March 2004 to almost triple to $192 million in 2004/05;

- Customer driven works are the second largest category of expenditure accounting for around 35% of the total four year capital programme. This is largely reactive expenditure and reflects the large numbers of new connections and customer requested works since 2001. Expenditure was forecast to double in 2003/04 from 2001/02 levels to $132 million, but is forecast to fall slightly in 2004/05; and
- Works on land and rights of way are a relatively small part of the capital programme.

The result of the decrease in demand related capital expenditure during 2003/04 is shown in Graph 6.3C. The percentage increase in transformer capacity, as evidenced by the delivery of large power transformers, approximately halved in 2003/04 from 2002/03. This was despite upward revisions in demand forecasts and a heightened awareness within ENERGEX of the high utilisation of the existing system. The Panel understands part of this reduction in transformer deliveries can be explained by industrial action which affected the manufacture and delivery of transformers.

ENERGEX is planning to significantly increase its bulk and zone transformer capacity in 2004/05.

Graph 6.3C – Annual Increase in ENERGEX's Bulk and Zone Transformer Capacity



Source: ENERGEX, 2004

Ergon Energy Capital Expenditure

Table 6.3D shows Ergon Energy's capital expenditure for 2001/02 and 2002/03 and forecast capital expenditure for 2003/04 and 2004/05. The 2003/04 data includes expenditure to March 2004 and forecasts for the remaining quarter to 30 June 2004.

Table 6.3D – Ergon Energy – Actual / Forecast Capital Expenditure 2001/02-2004/05 ($000's)					
	2001/02	**2002/03**	**2003/04**	**2004/05**	**TOTAL**
Non Load Related	2,152	-	4,200	16,794	23,146
Reliability	8,847	10,223	8,578	7,960	35,608
Refurbishment	62,868	88,688	97,921	103,136	352,613
Demand Related	43,988	64,520	63,949	61,025	233,482
Customer Driven	66,800	95,837	102,789	194,073[(a)]	459,499
Non-System	50,344	53,532	59,998	84,463	248,337
Total	**235,000**	**312,800**	**337,435**	**467,451**	**1,352,686**

Source: Ergon Energy, 2004

(a) Customer driven capital expenditure for 2004/05 includes large customer requested projects of about $70 million.

As with ENERGEX, the Panel considered Ergon Energy's capital expenditure patterns over the current regulatory period. The Panel found that Ergon Energy's expenditure programme increased significantly in order to upgrade and refurbish assets and to meet growth in customer demand. The increased refurbishment works resulted from Ergon Energy discovering that the network it inherited from its six predecessor companies required significant upgrading. The growth in customer demand resulted from strong growth in residential sub-divisions and several large industrial projects which required sub-station investment.

Table 6.3D shows that:

- The overall capital programme increased by about $78 million between 2001/02 and 2002/03 and was forecast to increase by about $25 million in 2003/04. Ergon Energy has then forecast a significant 39% increase in expenditure in 2004/05, principally attributable to a $92 million increase in customer driven works;
- Reliability related works have been a relatively small component of the overall capital expenditure programme and were forecast to remain at around $8 million over 2003/04 and 2004/05. The total reliability works for the four years are projected to be only 3% of overall capital expenditure;
- There was no expenditure on non-load related works in 2002/03[29] after very low expenditure the previous year. Ergon Energy was forecasting a small increase in expenditure in 2003/04 and an increase to $17 million in 2004/05;

[29] This may reflect an accounting categorisation issue.

- Refurbishment related works are the second highest category of capital expenditure and were forecast to increase steadily in 2003/04 and 2004/05 to $103 million. Ergon Energy advises that a large proportion of these refurbishment works are intended to improve reliability through reductions in the rates of asset failure;
- Demand related works were forecast to remain relatively stable from 2002/03 to 2004/05; and
- Customer driven works are the largest category of expenditure comprising about 40% of the total four year capital programme. Expenditure was forecast to increase by about 40% between 2001/02 and 2003/04 and is projected to almost double between 2003/04 and 2004/05.

6.4 Benchmarking Capital Expenditure

The Panel has chosen not to rely on benchmarking to assess the level and adequacy of capital expenditure. This is because different accounting treatments, capital expenditure requirements and commercial incentives between businesses across Australia rendered comparisons invalid.

6.5 Findings and Recommendations

This section of the report covers the findings the Panel has made in relation to capital expenditure for ENERGEX and Ergon Energy in relation to:

- The current state of the networks; and
- The level of their capital expenditure between 2001/02 and 2003/04.

Given the differences in their geographic spread and population bases, the Panel considers it inappropriate to compare ENERGEX and Ergon Energy findings. For this reason, these findings are presented separately for each distributor.

Finding 6.1 – ENERGEX - Current State of the Network

- **Past levels of capital expenditure and high system utilisation have led to inadequate contingent capacity in ENERGEX's bulk supply and zone supply sub-stations. By 2002, system utilisation was 76%, which is well in excess of what is accepted as a prudent level for the industry of 60% to 65%;**
- **There was high growth in peak demand and a shift to a summer peak between 2001/02 and 2003/04. This growth significantly exceeded ENERGEX's demand growth forecasts and those that underpinned the revenue cap set by the QCA, and hence the projected capital expenditure "building block" for ENERGEX for the period 2001 to 2005;**
- **Much of this peak demand growth was driven by strong increases in air-conditioning load. ENERGEX has forecast that peak demand will continue to grow strongly between 2004/05 and 2009/10;**
- **The accepted industry standard for bulk and zone sub-stations is an "N-1" planning philosophy. ENERGEX has 63% of bulk supply sub-stations and 71% of zone supply sub-stations not meeting an "N-1" criterion. This presents an unacceptable level of risk of supply interruptions in the event of equipment failure;**
- **ENERGEX has operated some transformers at levels which have increased the probability of asset failure and negatively impacted the economic lives of this equipment. This may result in relatively higher capital expenditure to repair and replace this equipment in the long term;**
- **For ENERGEX's sub-transmission and high voltage distribution systems, there is evidence of unsustainable levels of loading and an inability to adequately cater for peak growth. The Panel notes that ENERGEX had an accelerated capital expenditure programme approved in March / April 2004 which, if satisfactorily implemented, will in part address this issue. The Panel believes this planned increase in capital expenditure should have commenced some years ago and certainly within the last two years;**
- **The age profiles of ENERGEX's power transformers for its bulk, zone and distribution sub-stations are within acceptable bounds, provided appropriate replacement expenditure is maintained; and**
- **The age profiles of ENERGEX's poles are within acceptable bounds, and will remain so provided appropriate replacement expenditure is maintained.**

Findings 6.2 – ENERGEX – Capital Expenditure between 2001 and 2004

- **ENERGEX is able to unilaterally determine the level of annual capital expenditure necessary to meet its requirements. The Panel notes that although ENERGEX can spend additional capital above the capital expenditure "building block" used in the QCA determination, it receives no return on this additional expenditure until a regulatory reset;**
- **Despite the load growth significantly exceeding forecasts between 2001/02 and 2003/04 and a doubling of customer driven works, ENERGEX's overall capital programme did not increase significantly over this period. During the period of this review and following the storms and hot weather in early 2004, ENERGEX revised its forecasts substantially upwards. ENERGEX's overall capital programme is now forecast to increase by 41% between 2003/04 and 2004/05; and**
- **ENERGEX's capital expenditure for reliability works was very low in the period 2001/02 to 2003/04 but was reforecast during the period of this Review and following the weather conditions in early 2004, to increase significantly in 2004/05. This suggests that ENERGEX gave a relatively low priority to reliability works in the past but has now recognised the need for more work in this area.**

Finding 6.3 – ENERGEX - Assessment of Capital Expenditure

- **Given the above findings, the Panel's overall finding is that ENERGEX's capital expenditure has not been adequate to cater for current demand and future growth.**

Finding 6.4 – Ergon Energy - Current State of the Network

- **There was high growth in peak demand between 2001/02 and 2003/04 which significantly exceeded the average growth forecasts prepared by Ergon Energy. These average growth forecasts underpinned the revenue cap set by the QCA, and hence the capital expenditure "building block" for Ergon Energy approved by the QCA for the period 2001 to 2005;**
- **Increases in air-conditioning load varied across Ergon Energy's regions, with Far North Queensland and South West Queensland experiencing the strongest load growth;**
- **Ergon Energy has forecast that peak demand will continue to grow strongly between 2004/05 and 2009/10 and that the shift in peak demand to mid-afternoon will continue;**

- **Past levels of capital expenditure have led to inadequate contingent capacity in both Ergon Energy's bulk supply and large zone supply sub-stations (i.e. 5 MVA and above). The accepted industry standard is an "N-1" philosophy for these assets. The Panel found that 39% of Ergon Energy's bulk supply sub-stations and 51% of large zone supply sub-stations above 5 MVA do not have "N-1" capability. This results in a high level of risk of supply interruptions in the event of equipment failure;**
- **In both Ergon Energy's sub-transmission and high voltage distribution systems there is evidence of unsustainable levels of loading, an inability to adequately cater for peak growth and the potential for severe voltage constraints, particularly in the SWER network;**
- **The age profiles of Ergon Energy's power transformers for its distribution sub-stations are within acceptable bounds, provided appropriate replacement expenditure is maintained; and**
- **The age profiles of Ergon Energy's poles are within acceptable bounds and will remain so provided appropriate replacement expenditure is maintained.**

Finding 6.5 – Ergon Energy - Capital Expenditure Between 2001 and 2004

- **The Panel notes that Ergon Energy was able to unilaterally determine the level of annual capital expenditure necessary to meet its requirements and the QCA revenue cap did not constrain capital expenditure during this regulatory period. The Panel notes that Ergon Energy spent significantly in excess of the QCA's "building block" for necessary capital works;**
- **Ergon Energy has strongly increased its overall capital expenditure since 2001/02. This steady increase is projected to result in 2004/05 capital expenditure being almost double the level in 2001/02;**
- **Customer driven expenditure and refurbishment expenditure have dominated Ergon Energy's capital works programme. Customer driven expenditure is projected to account for about 42% of its total work programme in 2004/05; and**
- **Expenditure on reliability related capital projects has historically been low and is forecast to decrease in 2004/05. Ergon Energy, however, expects that much of its refurbishment work will lead to improved reliability by reducing asset failure.**

Finding 6.6 – Ergon Energy - Assessment of Capital Expenditure

- **Given the above findings, the Panel's overall finding is that Ergon Energy's capital expenditure has not been adequate to cater for current demand and future growth.**

Recommendations

- **ENERGEX be required to maintain "N-1" on all bulk supply sub-stations, zone supply sub-stations and sub-transmission feeders. Critical high voltage feeders should also meet "N-1" with the exception of those where ENERGEX can provide satisfactory evidence that this does not put significant numbers of customers at risk. Where ENERGEX chooses to use interconnection to provide "N-1" capacity for single transformer bulk or zone supply sub-stations, it should be required to demonstrate that there is adequate transfer capability to meet "N-1" in a timely manner;**
- **ENERGEX should reduce its asset utilisation to a level consistent with good industry practice (i.e. 60% to 65%). ENERGEX should be required to develop a detailed programme to demonstrate how it intends to return to this prudent level of utilisation over the next regulatory period;**
- **Ergon Energy be required (unless otherwise agreed with major customers) to maintain "N-1" on all bulk supply sub-stations and large zone supply sub-stations (5MVA and above) and sub-transmission feeders. Critical high voltage feeders should also meet "N-1" with the exception of those where Ergon Energy can provide satisfactory evidence that this does not put significant numbers of customers at risk;**
- **Ergon Energy should bring its asset utilisation to a level consistent with good industry practice taking into account the regional nature of its network (i.e. 50% to 55%). Ergon Energy should be required to develop a detailed programme to demonstrate how it intends to return to this level of utilisation over the next regulatory period.**

7

MAINTENANCE OF THE DISTRIBUTION NETWORKS

The purpose of this chapter is to set out the Panel's findings in relation to the level and adequacy of ENERGEX and Ergon Energy's maintenance expenditure. It addresses the following of the Panel's Terms of Reference as they relate to maintenance expenditure:

> *Review the levels of expenditure on capital works and maintenance required to cater for current demands and future level of the growth in the distribution system, as benchmarked against appropriate comparisons;*
>
> *Determine adequacy of current levels of expenditure on capital works and maintenance to cater for current demands and expected growth, as benchmarked against appropriate comparisons.*

This chapter assesses the level and adequacy of ENERGEX and Ergon Energy's maintenance expenditure by reviewing:

- The levels of maintenance expenditure between 2001/02 and 2004/05; and
- Key maintenance programmes which have the greatest effect on reliability.

7.1 Operating and Maintenance Expenditure between 2001/02 and 2004/05

Operating and maintenance expenditure is expenditure on all non-capital items including labour. It does not include depreciation or financing charges.

Operating expenditure principally relates to the costs of operating the network whereas maintenance expenditure principally relates to the costs of inspecting, maintaining and repairing the network. Typically, operating and maintenance expenditure includes:

- Direct costs – these relate to the labour and materials directly involved in delivering an activity;
- Indirect costs – these relate to the cost of the support structures indirectly involved in delivering an activity; and

- Overhead costs – these relate to the corporate and administrative costs not directly or indirectly involved in an activity but rather in supporting the business as a whole.

As noted in Chapter 4, efficient operating and maintenance expenditure is a "building block" assessed by the QCA in determining the AARR for ENERGEX and Ergon Energy. In determining the efficient operating and maintenance costs for the distributors over the period 2001/02 to 2004/05, the QCA used 2000/01 as a base year and factored in ongoing efficiency improvements over the regulatory period having regard for benchmarks against other Australian distributors.

As with capital expenditure, the Panel is satisfied that the distributors were free to decide what level of operating and maintenance expenditure they required over the regulatory period. However, any overspend in operating and maintenance expenditure cannot be recovered in subsequent regulatory periods. Any overspend is therefore "lost" to the business and any underspend is a windfall gain for the business. Other things being equal, the Panel therefore considers that there is an incentive for distributors to spend less than the regulatory "building block" used by the QCA.

ENERGEX

Table 7.1A shows total operating and maintenance expenditure, inclusive of the distributors' direct, indirect and overhead components, for ENERGEX for the period 2001/02 to 2004/05.

Table 7.1A – ENERGEX – Actual / Forecast Operating and Maintenance Expenditure 2001/02-2004/05 ($ millions) (a)

	2001/02	2002/03	2003/04	2004/05	Total
Operating Expenditure	47.7	15.1	n/a	n/a	n/a
Maintenance Expenditure	82.5	105.9	n/a	n/a	n/a
Total Expenditure	130.2	121.0	140.1	132.2	523.5
QCA "Building Block" (b)	161.7	168.9	176.4	184.2	691.2
Variance	**(31.5)**	**(47.9)**	**(36.3)**	**(52.0)**	**(167.7)**

Source: ENERGEX, 2004

(a) 2003/04 and 2004/05 Total Expenditure values are forecasts.

(b) As per 2001 Final Determination.

The Panel notes that ENERGEX tends to regard the capital and operating and maintenance "building blocks" as one "bucket" of funds. However, the Panel has assessed operating and maintenance expenditure in isolation from capital expenditure.

ENERGEX's total operating and maintenance expenditure was significantly less than the QCA "building block" for 2001/02 and 2002/03 and is forecast to remain so for

2003/04 and 2004/05. Over the course of the four year regulatory period the total "under spend" is forecast to be $167.7 million.

Although the Panel acknowledges that this underspend is projected to be re-allocated to capital expenditure, the $167.7 million represents a failure to spend money on operating and maintenance, which was allowed by the QCA in its 2001 determination. As mentioned in Chapter 6, the Panel is of the view that capital expenditure was not adequate.

The Panel notes that there was substantial movement between operating and maintenance categories between 2002 and 2003, with ENERGEX reporting a substantial decline in operating expenditure and a substantial increase in maintenance expenditure between 2001/02 and 2002/03. As noted below, however, this increase in maintenance expenditure did not translate into greater maintenance activity on the network. In considering this matter in its March 2004 *Financial and Service Quality Performance Report* for the distributors, the QCA noted that:

> *A portion of the decline in operating expenditure and increase in maintenance expenditure during 2002/03 may be due to ENERGEX re-classifying a number of costs previously attributed to operating activities to maintenance activities. However, changes made by ENERGEX during the year to the individual cost categories make comparisons between the two periods difficult.*[30]

Ergon Energy

Table 7.1B shows Ergon Energy's operating and maintenance expenditure between 2001/02 and 2004/05.

Table 7.1B – Ergon Energy – Actual / Forecast Operating and Maintenance Expenditure 2001/02-2004/05 ($ millions) (a)

	2001/02	2002/03	2003/04	2004/05	Total
Operating Expenditure	34.6	35.5	n/a	n/a	n/a
Maintenance Expenditure	100.4	123.5	n/a	n/a	n/a
Total Expenditure (b)	135.0	159.0	174.3	178.9	647.2
QCA "Building Block" (c)	150.9	154.6	158.4	162.4	626.3
Variance	**(15.9)**	**4.4**	**15.9**	**16.5**	**20.9**

Source: Ergon Energy, 2004

(a) In 2003/04 dollars as advised by Ergon Energy.

(b) 2003/04 and 2004/05 Total Expenditure values are forecasts.

(c) As per QCA's 2001 Final Determination.

[30] QCA (March 2004), *Electricity Distribution Businesses' Financial and Service Quality Performance*, 2002/03, page 10

Table 7.1B shows that Ergon Energy's total operating and maintenance expenditure was less than the QCA "building block" for 2001/02 but slightly exceeded the "building block" for 2002/03 and is forecast to exceed it further for 2003/04 and 2004/05. Over the course of the four year regulatory period the total "over spend" is forecast to be $20.9 million.

Overall Assessment

In assessing the level and adequacy of maintenance expenditure, the Panel has focussed only on maintenance expenditure (not operating expenditure) as this has a direct bearing on the state of the network.

The Panel has chosen not to rely on benchmarking to assess the level and adequacy of maintenance expenditure because publicly available information that benchmarks Australian distributors generally relates to total operating and maintenance expenditure.[31] There is very limited information that directly compares maintenance expenditure alone.

Maintenance Expenditure

a) ENERGEX

Table 7.1C shows ENERGEX's maintenance expenditure for 2001/02 and 2002/03, separated by cost type.

Table 7.1C – ENERGEX – Maintenance Expenditure 2001/02-2002/03 ($ millions)		
	2001/02	**2002/03**
Common / Shared Maintenance Costs	18.1	31.5
Direct Maintenance Costs	61.3	71.5
Street lighting	3.1	2.8
Total Maintenance Costs	**82.5**	**105.9**
Source: ENERGEX, 2002, 2003		

Table 7.1C shows that while total maintenance expenditure increased by $23.4 million between 2001/02 and 2002/03, $13.4 million of this increase was attributable to an increased allocation of common/shared costs to maintenance expenditure. The main reasons for the increase in network maintenance came about because:

[31] The available information benchmarking operating and maintenance expenditure is typically used by Regulators for the purposes of determining an efficient level of expenditure for the purposes of regulatory revenue and price setting. The Panel considers that this information is of limited value, and could be misleading, in assessing the level and adequacy of ENERGEX and Ergon Energy's maintenance expenditure.

- The allocation of the costs of the offices of the Chief Executive Officer, Chief Financial Officer and the Corporate Affairs area increased from $2.1 million in 2001/02 to $4.7 million in 2002/03;
- The allocation of the costs of the shared service management office increased from $309,000 in 2001/02 to $2.0 million in 2002/03;
- The allocation of the costs of ENERGEX's finance function increased from $7.3 million in 2001/02 to $11.3 million in 2002/03; and
- New allocations were made in 2002/03 of $585,000 for shares of public safety and awareness expenses and $2.9 million for meter reading costs.

The Panel therefore considers that much of the reported increase in maintenance expenditure in 2002/03 was attributable to reallocation of corporate overhead costs to network maintenance, and not direct maintenance expenditure on the network itself.

b) Ergon Energy

Table 7.1D shows Ergon Energy's maintenance expenditure for 2001/02 and 2002/03 separated by cost type.

Table 7.1D – Ergon Energy – Maintenance Expenditure 2001/02-2002/03 ($ millions)

	2001/02	**2002/03**
Common / Shared Maintenance Costs	31.9	28.8
Direct Maintenance Costs	66.2	93.5
Street Lighting	2.3	1.3
Total Maintenance Costs	**100.4**	**123.5**

Source: Ergon Energy, 2002, 2003

Table 7.1D shows that total maintenance expenditure increased by $23.1 million between 2001/02 and 2002/03, all of which was attributable to increases in direct maintenance expenditure on the network. Ergon Energy has noted:

> *.....the opex program required to maintain the assets at an appropriate standard had been forced unsustainably low under previous pre QCA arrangements. In 99/00 and 00/01 Ergon Energy was systematically overspending against that allowed Opex amount in an attempt to address outstanding legacy issues.*
>
> *In 01/02 onwards, under the QCA determination, the regulatory allowances have been more in line with the required spend levels, however there has been an increasing trend over the last 2 years as improved data and analysis uncovers more maintenance requirements that were not known at the time that the QCA made its determination in early 2001. Forecasts for the next regulatory period show the*

increasing trend continuing for the first couple of years before levelling out.

This suggests that Ergon Energy determines operating and maintenance expenditure as needs are identified, and is not constrained by the QCA's operating and maintenance expenditure "building block". Ergon Energy consciously overspent the QCA "building block" in 2002/03 and intended to continue this trend in 2003/04 and 2004/05, knowing that it cannot be recovered in future regulatory periods.

7.2 Causes of Outages

In order to assess the level and adequacy of maintenance expenditure, it is useful to consider the key causes of outages and the measures that the distributors are taking to address them. Both ENERGEX and Ergon Energy monitor the key causes of outages in their networks, although in the case of Ergon Energy information is only available at a high level due to the current constraints of the information available in its asset management system.

ENERGEX

Table 7.2A shows the percentage breakdown of ENERGEX's total number of unplanned outages by cause for 2001/02 and 2002/03.

Table 7.2A – ENERGEX – Unplanned Outages by Cause 2001/02-2002/03 (%) (a)

	2001/02	2002/03
Overhead Equipment	17.8	17.3
Vegetation	14.3	12.9
Animals	15.1	11.5
Transmission/Generation	5.2	10.9
No Cause	12.5	10.4
Substation Equipment	1.9	8.6
Underground Equipment	6.2	7.4
Accidental	8.7	6.9
Others	8.4	5.0
Lightning	4.7	5.6
Wind Material	5.2	3.7
Total	**100.0**	**100.0**

Source: ENERGEX, 2002, 2003
(a) Percentages are based on SAIFI.

Table 7.2A highlights that for ENERGEX:

- Overhead equipment faults and defects caused the highest percentage of unplanned outages for both 2001/02 and 2002/03, accounting for around 17% of all outages. The Panel considers that this is related to the feeder over-utilisation, ageing of some assets and a lack of attention to preventative maintenance in the past. It is also noted that sub-station and underground equipment accounted for an additional 16% of outages in 2002/03;
- Vegetation and animals accounted for over 20% of unplanned outages in both years. ENERGEX's vegetation management programmes are also discussed in the following section of this chapter; and
- Lightning and wind were relatively low contributors to the number of unplanned outages in both years. These causes are generally outside management control although some programmes such as the installation of surge diverters are used by ENERGEX to control the harmful impacts of lightning strikes.

Outages caused by overhead equipment failure and vegetation are controllable by management and are discussed further below.

Ergon Energy

Table 7.2B shows the percentage breakdown of Ergon Energy's total number of unplanned outages by cause for 2001/02 and 2002/03.

Table 7.2B – Ergon Energy – Unplanned Outages by Cause 2001/02-2002/03 (%)

	2001/02	**2002/03**
Equipment defects	52.3	57.8
Lightning	29.2	20.2
Wildlife	5.0	6.8
Vegetation	5.7	6.0
Installation/Operation Factors	2.0	3.4
Load/Capacity	3.7	3.4
3rd Party	0.4	1.3
Protection	1.3	0.8
Design Fault	0.4	0.4
TOTAL	**100.0**	**100.0**

Source: Ergon Energy, 2002, 2003

Table 7.2B highlights that for Ergon Energy:

- Equipment defects are a significant cause of unplanned outages, causing more than half the total number of outages in 2002/03. It is also noted that other equipment related outages (i.e. installation / operation factors, load / capacity,

protection and design faults) accounted for an additional 8% of unplanned outages. Equipment related unplanned outages therefore accounted for around 65% of outages in 2002/03. A combination of ageing assets and lack of preventative maintenance contributed significantly to this situation;

- Vegetation and wildlife accounted for around 11% and 13% of unplanned outages in 2001/02 in 2002/03 respectively; and
- Lightning was a significant cause of unplanned outages in both years, accounting for 29.2% of outages in 2001/02 and 20.2% in 2002/03. Ergon Energy has a limited capacity to control lightning-related outages other than general programmes such as surge diverters and the installation of overhead earth wires (wires strung above power lines or sub-stations and connected to the ground).

Outages caused by equipment failure and vegetation are controllable by management and are discussed further below.

7.3 ENERGEX and Ergon Energy's Maintenance Programmes

Maintenance of ENERGEX's Poles and Overhead Equipment

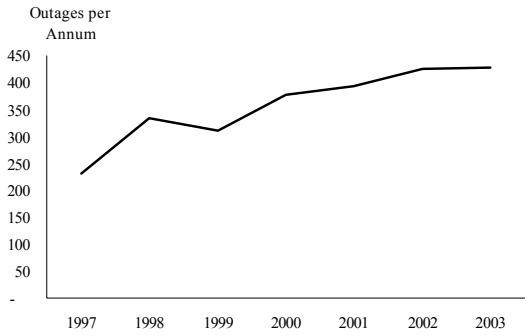
The systems and processes used by ENERGEX to identify, inspect and maintain network equipment are set out in Chapter 8.

The chapter notes that while ENERGEX's processes adequately identify maintenance requirements for bulk and zone supply sub-stations, there are deficiencies in the identification of maintenance needs in high voltage feeders and the low voltage system. It is in this part of the network where the highest levels of outages are occurring. ENERGEX recognised the contribution of overhead lines and associated equipment to its reliability problems in its submission to the Panel as follows:

> *Line maintenance is one area that ENERGEX has identified for improvement. The reliability of overhead lines and associated hardware is a major contributor to SAIDI. Although ENERGEX has trialled a number of initiatives over recent years, the reliability of overhead lines remains static (not getting worse or better), and has not shown any significant step improvements.*

Outages caused by line failures have been increasing by more than 10% per annum between 1997 and 2003. This is shown in Graph 7.3A.

Graph 7.3A – ENERGEX Outages Caused by Overhead Equipment Failures 1997 – 2003 (a)

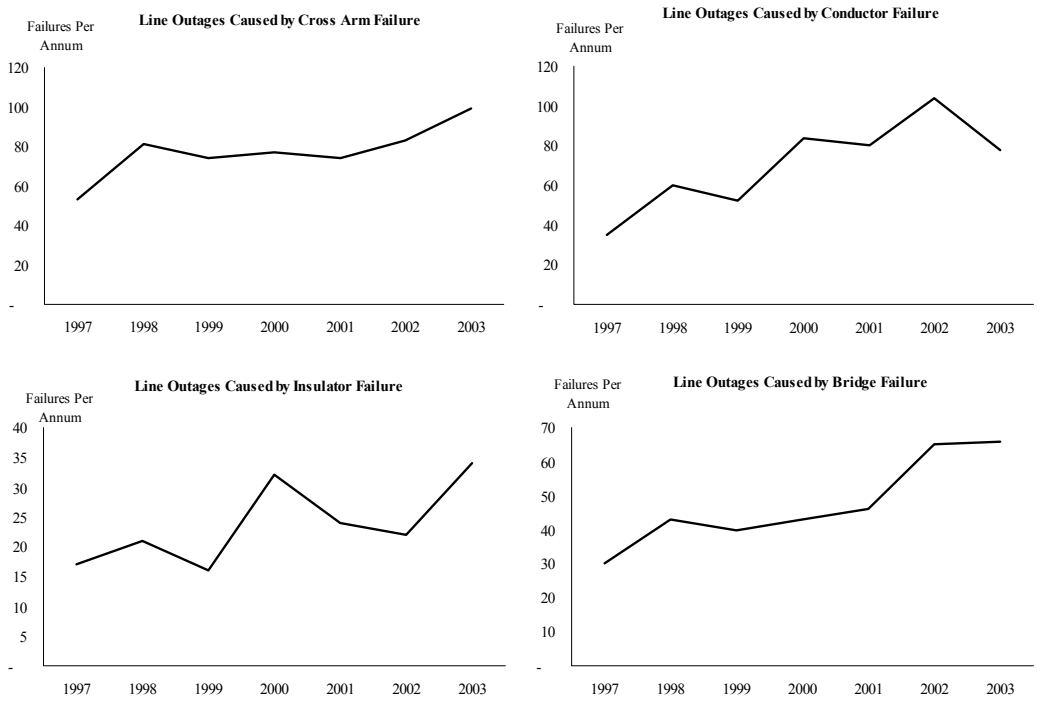


Source: ENERGEX, 2004

(a) Data is presented in calendar years

The Panel examined failure rates of key components of overhead equipment. It found that the top four contributing causes of outages between 1997 and 2003 have been cross-arm failures, conductor failures, bridge failures and insulator failures. Trends in these causes of outages are detailed in Graph 7.3B.

Graph 7.3B – ENERGEX Outages Caused by Overhead Equipment Failures 1997 – 2003 (a)



Source: ENERGEX, 2004

(a) Data is presented in calendar years

Graph 7.3B shows that:

- Outages attributable to cross-arm failures in ENERGEX's area have steadily increased from 53 outages in 1997 to 99 outages in 2003, which the Panel considers to be inappropriately high. This is consistent with the finding in Chapter 8 that ENERGEX does not have a programme to routinely inspect low voltage cross-arms. During interviews with ENERGEX personnel, the Panel was advised that ENERGEX had decided some years ago, for financial reasons, to discontinue its low voltage cross-arm inspection programme with the exception of a cursory inspection of low voltage cross-arms which are also on high voltage poles. During the Review, ENERGEX advised the Panel that it had decided to reintroduce a low voltage cross-arm inspection programme from 1 July 2004;
- The Panel was also told that low voltage cross-arm inspections carried out on 100 cross-arms in each of Strathpine and Alexandra Hills revealed 37 and 20 faulty cross-arms respectively. While the Panel does not suggest that this is reflective of ENERGEX's overall network, it does illustrate that some areas have large numbers of faulty cross-arms;

- Outages attributable to conductor failures in ENERGEX's area have increased from 35 outages in 1997 to 78 outages in 2003, although there was a slight reduction in 2003 from a high of 104 outages recorded in 2002;
- Outages attributable to insulator failures in ENERGEX's area have doubled from 17 outages in 1997 to 34 outages in 2003; and
- Outages attributable to bridge failures in ENERGEX's area have doubled from 30 outages in 1997 to 66 outages in 2003. Bridges are more likely to fail as load increases. The increasing trend in bridge failure rates indicates that ENERGEX has not increased maintenance on these assets as load has grown.

The Panel considered the incidence of pole failures following several public submissions that noted safety issues in relation to the condition of some poles. It found that pole failures were not a major cause of outages. In its submission to the Panel, ENERGEX advised that it has a three year rolling average of 17 in-service pole failures per annum and that a recent external audit indicated that it had an in-service pole failure rate of 0.004%.

The Panel has not taken a view on whether 17 in-service pole failures per annum represents an acceptable level of risk to the public, other than to note that:

- This pole failure rate is within statutory allowances; but that
- Pole failure is a particularly dangerous form of outage, as electricity lines can fall to the ground or collide with other infrastructure and cause significant harm, raising significant public safety issues.

ENERGEX highlighted in its submission a number of initiatives which it intended introducing from 1 July 2004 to improve the reliability of overhead lines and associated equipment, including:

- Implementing a "single pass systems based approach" using a five yearly cycle for the inspection and maintenance of low voltage, 11kV and 33kV overhead lines, poles, cross-arms and associated equipment;
- Fast annual patrols of the rural high voltage network using helicopters before each storm-season; and
- Targeted thermo-scanning of 11kV and 33kV overhead feeders and sub-stations.

In its submission to the Panel, ENERGEX also noted that it:

> *……is confident that the above initiatives to be commenced from 1 July 2004 will lead to improved performance of its overhead network.*
>
> *However, given the nature of an overhead network in south east Queensland, and the impacts of wildlife, storms and vegetation on reliability, it is also recognised that an overhead network of this type can only deliver limited reliability.*

For step changes in reliability, ENERGEX will require significant investments of both OPEX to maintain the performance of current assets and, in particular, CAPEX to replace or underground large areas of ageing and heavily loaded overhead assets through ENERGEX's SARAH strategies and initiatives. [32]

This suggests that ENERGEX believes that maintenance alone is not going to address the problems with overhead equipment failure in its network. The Panel agrees that maintenance programmes will need to be combined with targeted capital expenditure for necessary improvements to be achieved.

Maintenance of Ergon Energy's Poles and Overhead Equipment

The processes used by Ergon Energy to identify, inspect and maintain network equipment are set out in Chapter 8. The chapter highlights current constraints in Ergon Energy's asset management systems, in particular that it is still in the process of gathering information about many of the assets in its network for inclusion in its asset management programme, and that this has constrained the effectiveness of Ergon Energy's preventative maintenance works programme. It has also limited the Panel's ability to obtain sufficient quality data to fully assess Ergon Energy's maintenance programmes.

In its submission to the Panel, Ergon Energy advised that it does not report disaggregated fault/interruption data within its network beyond the high level causal categories detailed in Table 7.2B. This has prevented the Panel from investigating detailed causes of equipment faults, which Table 7.2B shows account for over 50% of all outages in Ergon Energy's network.

Further, Ergon Energy recognised the importance to future network reliability of effectively maintaining overhead lines and associated equipment. It noted that:

Ergon Energy's key focus over the last 4-5 years has been to address the key priorities of its high risk assets such as overhead lines.

The high proportion of outages caused by equipment failure, and the current data limitations in planning preventative maintenance works, highlight the importance of Ergon Energy introducing its AIDM project.

Under this programme, Ergon Energy began conducting a full inspection of all line assets over a three year cycle and has recently extended the programme to sub-stations. It has identified the following key benefits of the AIDM programme:

- *Data capture of assets which are not currently available that will enable future planning for asset maintenance.*

[32] "SARAH" is ENERGEX's vision to rebuild system security, increase capacity to meet load growth (including as a result of increased air-conditioning load), improve reliability, address ageing infrastructure and differentiate services, including having regard for health and safety issues.

- *Earlier identification and rectification of asset defects on a programmed basis rather than on an emergency basis after failure of the asset.*
- *Improved reliability and safety of the network through the earlier identification of defective poles and mains below the statutory height.*

In the absence of a robust asset management system, and detailed data on causes of outages indicating where expenditure should be targeted, it was difficult for the Panel to assess specifically the level and adequacy of Ergon Energy's maintenance expenditure. The Panel is of the view that the process of developing an adequate asset management program has been too slow and, combined with the reduction in the field workforce, considers that Ergon Energy has not given sufficient attention to improving its maintenance activity.

ENERGEX and Ergon Energy's Vegetation Management Programmes

ENERGEX's Vegetation Management Programme

Vegetation can be a significant cause of outages when it grows into lines or when it is blown into or falls across lines or other electricity assets during periods of high wind or storms. In fact, senior ENERGEX operational personnel commented to the Panel that a lack of vegetation management was the primary cause of outages during the storm periods. The probability of vegetation related outages increases in sub-tropical and tropical regions where foliage is dense and growth rates are high.

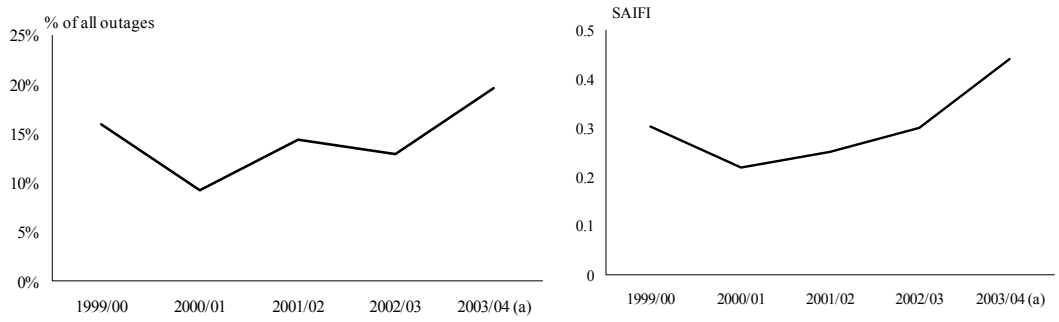
ENERGEX's vegetation management programme attempts to balance the reliability impacts of vegetation growth with community views about the acceptable levels of tree clearance. The Panel notes that there are strong views within the community both for and against aggressive tree clearance.

ENERGEX's vegetation management programme takes into account the growth rates of vegetation and applies general rules in relation to clearance distances from different types of assets. ENERGEX noted in its submission to the Panel that:

> *……at present, the achievable vegetation cycle times are about 3 years for rural areas where large clearances can be obtained, and 15 months in urban areas. With these cycle times, ENERGEX must cut in the order of 13,000 km of network routes each and every year to consistently maintain clearances to conductors.*

The importance of vegetation management in ENERGEX's area is shown in Graph 7.3C, which sets out vegetation outages as a proportion of its total outages and as a contributor to SAIFI for the period 1999/2000 to 2003/04.

Graph 7.3C – ENERGEX Outages Caused by Vegetation 1999/2000 – 2003/04 (a)



Source: ENERGEX, 2004

(a) Forecast as at March 2004

Graph 7.3C shows that between 10% and 20% of the total number of outages are caused by vegetation, and that on average each customer has between 0.3 and 0.5 outages per year from vegetation related causes (i.e. vegetation on average causes a customer outage every two to three years). This compares with an average of around two interruptions per year per customer for all causes. The charts also show that the frequency of vegetation related outages has been increasing since 2000/01.

ENERGEX's own analysis highlights the effectiveness of vegetation management programmes in reducing the number of outages within its network. Table 7.3D details the differences in the number of outages caused by vegetation to urban feeders that had, and did not have, vegetation management works completed when a cyclonic storm event occurred in ENERGEX's area on 5-6 March 2004.

Table 7.3D - Number of Outages to ENERGEX's Urban Feeders Caused by Vegetation		
Outage Cause	**No Vegetation Management**	**Vegetation Management Completed**
Trees growing in mains	9	-
Tree branch falling on mains during storms	15	2
Tree falling on mains	6	-
Tree blown against mains	14	2
Wind borne material	21	5
Total	65	9
Outages per 100km of line	2.4	0.51
SAIDI	0.72	0.18
Source: ENERGEX, 2004		

Table 7.3D indicates that areas that had recent vegetation management had significantly lower numbers and duration of outages, as measured by SAIDI, than those areas where it was not conducted.

ENERGEX has acknowledged that it has not given sufficient attention to vegetation management over recent years and in its submission to the Panel noted that:

> *ENERGEX has recognised that past vegetation management programs have not kept pace with growth of vegetation in proximity to network assets and have not achieved sustainable cycle times. In response, ENERGEX has increased expenditure in 2003/04 by $9.4M or 70% since 2001/02 and is proposing a further increase of $7.77M for 2004/05. The historical and proposed expenditures are shown in the table below.*
>
> | *Financial Year* | *Direct Costs* |
> |---|---|
> | *2001/02* | *$12.95M* |
> | *2002/03* | *$13.62M* |
> | *2003/04* | *$22.03M* |
> | *2004/05* | *$29.80M (proposed)* |
>
> *ENERGEX forecasts that the proposed expenditure of $29.8M per annum sustained for a period of two years will be sufficient to address the immediate issues and create the foundation for a sustainable cycle based program that can be performed for substantially lower cost.*

In addition to this immediate increase in expenditure for vegetation management, ENERGEX has recognised the need to create a sustainable long term tree trimming and vegetation management programme. It also noted in its submission to the Panel that it:

> *……is currently in the process of implementing a vegetation management plan that will address the entire ENERGEX network with a maximum 2.5 year cycle time. The approach will be to manage vegetation on all circuits including low voltage on an area basis, with areas defined by the extent of supply from 11kV zone supply sub-stations. 11kV and 33kV circuits in urban areas will receive an additional reliability trim within 15 months of initial treatment. In addition, this program will incorporate a regime of tree removal, and chemical regrowth treatment to reduce future vegetation density and ongoing cost.*

Ergon Energy's Vegetation Management Programme

Ergon Energy faces unique challenges in implementing vegetation management programmes, as it has a large number of assets spread across a very large tropical and sub-tropical geographical area.

Ergon Energy coordinates the management of its vegetation management programme through four major private sector contracts, each having a two year period with an option for two one-year extensions. These contracts provide a full vegetation management service including development of a vegetation regrowth management strategy, the clearance of vegetation and the chemical treatment of vegetation to control regrowth. Ergon Energy's own field operations personnel conduct vegetation management only in remote locations and in emergency situations.

The Panel's ability to assess Ergon Energy's vegetation management programme is constrained by the limited availability of outage and expenditure data to 2001/02 and 2002/03. Based on the available data, vegetation accounted for 10% of Ergon Energy's total outages in 2001/02 and 6% in 2002/03.

The Panel notes that in August 2002, an audit was conducted of Ergon Energy's four vegetation management contracts. The audit gave Ergon Energy's vegetation management process a high overall assessment noting only minor operational, procedural or internal control issues needing to be addressed. It noted that:

> *Considerable progress has recently been made in the establishment of a more systematic approach to the management of vegetation management issues. The consolidation of the large number of contracts that previously existed into four contracts has resulted in a more consistent and uniform approach to vegetation control. In each of the areas covered by the contract, a Vegetation Management Officer has been appointed to manage vegetation control and to monitor the conduct and performance of the contractors.*

While the Panel acknowledges the audit findings in relation to Ergon Energy's vegetation management programme, it does not have sufficient data with which to review the adequacy of Ergon Energy's programme.

Ergon Energy has proposed that vegetation management be given greater priority in the coming years. In the material that Ergon Energy provided to the Panel, it noted that:

> *Additional contracts have been awarded for a concerted vegetation management program to catch up on a backlog of clearing and trimming of vegetation encroachment into mains and causing outages of supply.*
>
> *A full cycle of clearing will then allow vegetation to be controlled on a more manageable and sustainable basis.*

Other Equipment

The Panel has not assessed the contribution of failures of distribution switchgear, air break switches and sub-station protection equipment to outages in detail. This is because failures in this equipment have not contributed significantly to SAIDI, SAIFI and CAIDI. However, the Panel carried out spot checks on whether maintenance by both ENERGEX and Ergon Energy was being carried out in accordance with their respective maintenance policies. The Panel found instances in ENERGEX's case where the time between maintenance on some items of distribution equipment exceeded ENERGEX's policies. The Panel sighted correspondence and reports which indicated that the respective programmes for Krone and Hazemeyer high voltage switches may be behind schedule. This is indicative of under-expenditure on maintenance and, if left uncorrected, will contribute to deteriorating reliability and possible safety issues.

7.4 Findings and Recommendations

Finding 7.1 – ENERGEX – Maintenance

The Panel considers that ENERGEX's maintenance expenditure has been inadequate over recent years. Specifically, the Panel finds that:

- **While ENERGEX treats the QCA's "building blocks" for capital and operating and maintenance expenditure as a "bucket of funds", ENERGEX has spent less than the QCA's operating and maintenance expenditure "building block". Over 2001/02 and 2002/03, the extent of this underspend was around $79 million, and ENERGEX forecasts to underspend the QCA's total operating and maintenance "building block" by $167.7 million for the four years to 2004/05;**
- **While some of ENERGEX's underspend can be attributed to issues such as efficiency gains, accounting policy adjustments and a superannuation "holiday", there was clearly less spent on the actual maintenance of the network than ENERGEX predicted would be necessary at the time of its 2001 QCA submission;**
- **Given this, and increasing equipment failures, the Panel considers that ENERGEX has not spent sufficient amounts on maintenance and has not had a focus on preventative maintenance, such as vegetation management and cross-arm inspections;**
- **Much of ENERGEX's reported increase in total maintenance expenditure between 2001/02 and 2002/03 resulted from an increased allocation of common/shared costs to maintenance. The reported increase did not represent higher direct network maintenance activity;**
- **The highest causes of outages in ENERGEX's network have been overhead equipment failures, which have been steadily increasing over the past five years;**
- **The number of outages due to cross-arm failures has been increasing over the past five years and this appears to be a direct result of ENERGEX's decision to abandon the cross-arm inspection programme for financial reasons some years ago. The Panel sees ENERGEX's recent decision to re-implement a cross-arm inspection programme as essential; and**
- **ENERGEX has implemented a range of measures to improve its reliability, including doubling expenditure on its vegetation management programme.**

Finding 7.2 – Ergon Energy – Maintenance

The Panel considers that, while much worthwhile planning has been done for the future, Ergon Energy's maintenance expenditure has been inadequate over recent years. Specifically, the Panel finds that:

- **Ergon Energy has inherited six diverse maintenance programmes, but the Panel notes that Ergon Energy has taken considerable time to implement an adequate level of control in its maintenance processes;**
- **The effectiveness of Ergon Energy's maintenance programmes to target and rectify its poor reliability has been constrained significantly by a lack of reliable data. Ergon Energy has limited information on the causes of outages in its network, which is a necessary prerequisite in targeting maintenance expenditure;**
- **Ergon Energy is part way through populating its new asset management system with data, and will consequently be forced to react to maintenance needs rather than to proactively anticipate them for many classes of assets. A targeted effort will be required to complete this programme as soon as possible in order to achieve future performance improvements; and**
- **High level data indicates that equipment failure causes a significant proportion of outages in Ergon Energy's network. Equipment failures are preventable events and as such the failure rates are considered to be unacceptably high when considered in the context of Ergon Energy's very high SAIFI outcomes compared to interstate distributors.**

Recommendations

- **ENERGEX should ensure that sufficient funding is made available to carry out an effective preventative maintenance programme on its network assets. In particular, attention needs to be given to the overhead network;**
- **ENERGEX should establish a logical relationship between the inspection cycles for poles and the line hardware associated with each pole (including cross-arms) to ensure that the line hardware is inspected at least as regularly as the poles;**
- **ENERGEX should apply additional resources to complete data entry and validation in the Ellipse system to ensure equipment is inspected in accordance with its maintenance policies;**
- **ENERGEX should increase its focus on resolving equipment failure issues in its 11kV feeder network;**

- **ENERGEX should investigate and address the high incidence of outages in its distribution sub-stations;**
- **ENERGEX should reduce the three year rolling average of in-service pole failures to a significantly lower level despite the fact that it is within statutory allowances at this time. It should be an objective to eliminate in-service pole failures given the associated safety issues.**
- **Ergon Energy should expedite the implementation of its asset management system;**
- **Ergon Energy should expedite the inclusion of additional asset categories in the SAP maintenance system to remove the need for retaining the regionally based legacy systems;**
- **Ergon Energy should extend the capability of the SAP system to ensure that maintenance is conducted on the basis of both elapsed time and operational count, where applicable;**
- **Ergon Energy should develop and implement a strategy to reduce the incidence of protection system mal-operations, which are contributing to reduced reliability; and**
- **Ergon Energy should reduce the three year rolling average of in-service pole failures to a significantly lower level despite the fact that it is within statutory allowances at this time. It should be an objective to eliminate in-service pole failures given the associated safety issues.**

8

ENERGEX AND ERGON ENERGY'S INTERNAL SYSTEMS

The purpose of this chapter is to set out the Panel's findings in relation to ENERGEX and Ergon Energy's internal systems and processes. It addresses the following of the Panel's Terms of Reference:

> *Assess whether the internal systems and processes of the above entities (i.e. ENERGEX and Ergon Energy) ensure efficient and targeted allocation of resources to capital works and maintenance of the electricity distribution system. This assessment should include a review of the planning criteria used to trigger expansion and reinforcement of the distribution network.*
>
> *If deficient, recommend solutions for achieving improved resource allocation by the entities.*
>
> *Evaluate internal systems, planning and processes of distribution entities to determine whether they support the provision of a reliable electricity network and if deficient develop solutions for achieving improvements.*

There are many internal processes within both ENERGEX and Ergon Energy, and given the timeframes associated with the Review, it was not possible to evaluate all processes within the distributors' businesses. The Panel decided to undertake an evaluation of those systems most critical to the Terms of Reference. Accordingly, this chapter evaluates ENERGEX and Ergon Energy's:

- Capital planning and delivery processes;
- Processes for forecasting demand for network planning purposes;
- Maintenance planning and delivery processes; and
- Processes for responding to customer outages.

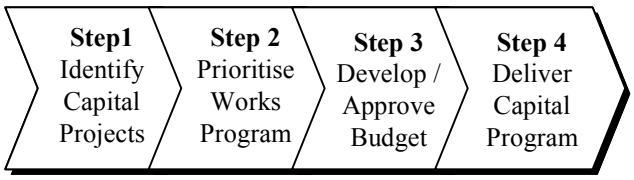
For these systems, the main focus is on the high-level processes and the outcomes that they deliver.

The Panel notes that while processes for capital expenditure and maintenance planning and delivery have been reviewed separately, in practice these categories of expenditure are interdependent. This is discussed further in the assessment of each category of expenditure.

8.1 Capital Planning and Delivery Processes

ENERGEX and Ergon Energy's capital planning and delivery processes have been analysed on the basis of the broad steps set out in Chart 8.1A.

Chart 8.1A – Capital Planning and Delivery Process



An assessment of the processes of the two distributors, in line with these steps, follows.

ENERGEX - Capital Expenditure Planning and Delivery Processes

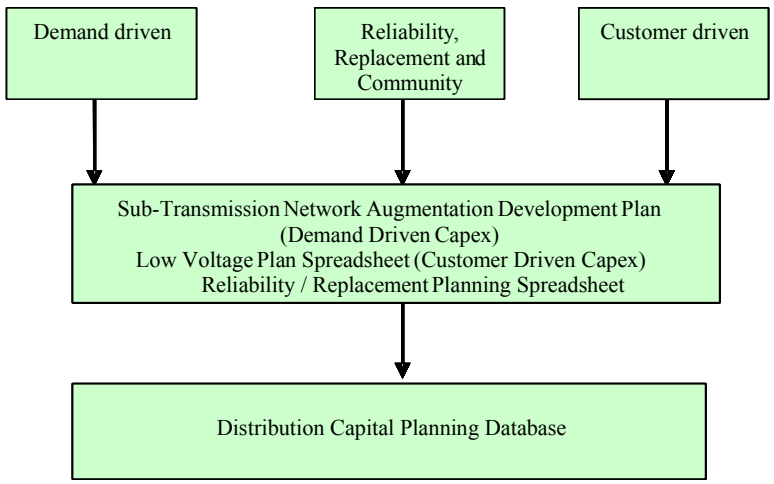
Step 1 - Identification of Capital Projects

ENERGEX's capital programme has three broad categories of works:

- Demand driven works – these relate to the provision of sub-transmission and high voltage capacity to service system demand. ENERGEX prepares a Network Development Plan which provides a list of network augmentation proposals for these projects. This Plan is an input into the annual capital budgeting process;
- Reliability, replacement and community works – these are driven by inspection programmes and defect rates, aged asset replacement programmes and specific reliability programmes. Community works include programmes such as selective undergrounding, installation of aerial bundled conductors and urban beautification programmes. They have a substantive discretionary component in their timing. ENERGEX annually prepares a list of these works and programmes for input into the capital budgeting process; and
- Customer driven works – these works relate to new connections and service upgrades for existing customers and are therefore largely reactive. ENERGEX prepares a list of these works and programmes for input into the annual capital budgeting process.

The planning documents produced for each type of capital expenditure are set out in Chart 8.1B and discussed further below.

Chart 8.1B – ENERGEX Process for Determining the Need for Capital Expenditure



Demand Driven Expenditure

Since 1989, ENERGEX's network planning has been based on a probabilistic methodology, known as the RAP system. The nature of the RAP approach and "N-1" are fully discussed in Chapter 6.

If RAP is applied appropriately, an acceptable level of reliability can be achieved at a reduced overall capital cost. ENERGEX believes that RAP has served it well in planning its network and has resulted in it having one of the most highly utilised systems in Australia – its (uncompensated) system utilisation for the summer 2004 peak was around 76%, which compares with the Australian average of around 56%. ENERGEX claims to have reduced capital expenditure by up to $1 billion in the past 10 to 12 years by using the RAP approach.

However, as noted in Chapter 6, the application of RAP without appropriate safeguards in place and without due regard to reliability, has, in the Panel's view, resulted in the over utilisation of significant parts of ENERGEX's network. As previously noted, it is the Panel's view that criteria should be used which maintain an "N-1" capability at bulk and zone supply sub-stations in urban and CBD areas at a minimum.

This has been recognised by ENERGEX, which now plans to move to new planning guidelines where a combination of deterministic (i.e. "N-1") and probabilistic methodologies (i.e. RAP) will be used. This follows an acknowledgement by ENERGEX in its submission to the Panel that:

- *The network is wearing out more quickly, necessitating higher levels of capital expenditure to replace network components.*
- *The network needs to be reinforced sooner than ENERGEX's original planning horizons, with the most significant of these projects being the Brisbane CBD reinforcement project, which provides for new 110,000 volt underground cables into the CBD.*
- *Higher than forecast growth has reduced the capacity of the network to handle contingency events. Given the high levels of growth predicted it is essential this trend be arrested and additional capacity is required to improve system security and reliability.*

ENERGEX applies a planning policy to determine required demand driven expenditure by preparing an annual five year Network Development Plan to identify current and emerging limitations within its network. These limitations are then reconciled with existing augmentation plans in order to identify the need for new investment. Major new industrial and commercial developments are also taken into account.

As is discussed further in the section below, ENERGEX determines network limitations by forecasting the loading of bulk and zone supply sub-stations and distribution and sub-transmission feeders. These are then compared to each asset's equipment ratings as follows:

- For bulk and zone supply sub-stations, ENERGEX undertakes load forecasting annually to produce a 10 year load forecast using three year historic sub-station growth information as a baseline and then adjusting projections for block loads, load transfers, proposed new sub-stations and network connection arrangements. The resultant forecasts are accumulated and reconciled at an aggregate level with total load forecasts prepared by external consultants;
- For sub-transmission and high voltage distribution feeders, ENERGEX identifies limitations within the feeders by incrementing load recordings (adjusted for load transfers) by annual incremental growth rates. These are compared with equipment nameplate ratings to identify network limitations. The Panel notes that ENERGEX has advised that sub-transmission capacity limitations under both normal and contingency conditions are obtained by comparing load flow analysis stemming from 10 year sub-station forecast loads with plant ratings. However, discussions with ENERGEX senior planning officers have indicated that 33kV load flow analysis has not been undertaken in recent years. This is of concern to the Panel; and
- Low voltage planning is performed on a regional basis, taking into account new connections, block loads, voltage complaints and overloads. While a large number of distribution sub-stations have Maximum Demand Indicator (MDI) equipment installed which would enable ENERGEX to monitor loading, these have not been read on a regular basis in recent years. As a consequence, low

voltage planning has been largely reactive and based on blown fuses and voltage complaints.

The outcome of this process is an identification of demand-related works proposals detailed in terms of their broad scope, timing and estimated cost.

While this process appears to be soundly based, it is hard to accept that it has been rigorously applied given the lack of contingent capacity in ENERGEX's system described in Chapter 6 and what the Panel has learned about the lack of load flow analysis undertaken on feeders.

The Panel has considered ENERGEX's 2004 five year Network Development Plan and considers it to provide a limited basis for delivering the capital expenditure programme. Its inadequacies include:

- The lack of an overall assessment of the state of the network including bulk supply sub-stations and zone supply sub-stations' loadings and limitations on the sub- transmission system;
- The absence of annual load flow analysis on 33kV for several years; and
- The absence of annual load flow analysis on 11kV for several years (although the Panel notes that an analysis was commenced during the course of this Review).

In reviewing the 2004 Plan, the Panel found that a significant number of capital projects due for completion in 2003 are still on the 2004 Plan. This could be due to the fact that the base data in the Plan was developed in 2002 and appears not to have been updated. The Panel finds it unacceptable that a 2004 Plan should be based on 2002 data.

Reliability, Replacement and Community Driven Expenditure

The second major category of capital expenditure relates to reliability, replacement and community related works. These are generally initiated by ENERGEX and can be system-wide or specific in nature:

- System-wide works can relate to programmes or policies, such as programmes for possum guards, air break switch replacement or pole mounted circuit breakers; and
- Specific projects can address particular reliability, replacement or community needs identified throughout the year.

These works can be identified from a variety of sources, such as:

- Analysis of reliability data;
- Evaluation of fault causes by equipment type;
- Feedback from field supervisors;
- Insulation condition monitoring;

- Interaction with community groups; and/or
- Aged asset analysis.

The outcome of this process is a range of broad policies that guide the capital works programme for the year and a detailed spreadsheet of proposed works with specifications of physical units and estimated costs. This spreadsheet is an input to the capital budgeting process.

Customer Driven Expenditure

Customer driven expenditure is largely dependent on new connections. Planning for these connections involves:

- The use of macro demographic indicators to assess population growth;
- Liaison with industry, local councils and State Government departments in order to plan for major new industrial loads and residential developments; and
- Projecting increased demand for existing customers, for example as a result of the installation of three phase air conditioning.

From this information, ENERGEX assesses the number of new sub-divisions and in-fill developments that it is likely to need to service. As is standard industry practice, ENERGEX then applies an After Diversity Maximum Demand (ADMD) assessment to establish estimated new load and identifies the new investment required to service it.

In 2003, ENERGEX increased its ADMD for the design of residential estates from 2.5kVA to 4kVA per lot for "middle / upper income housing" and from 3.5kVA to 5kVA for "prestige housing", in response to the loads encountered in the 2002/03 summer period. This will significantly impact future customer driven expenditure as demand increases.

The overall outcome of this first step is an annual estimate of the works requirements, which contains existing projects carried over from previous years and new initiatives that have been identified from the above processes.

Step 2 – Prioritise Works Programme

ENERGEX's estimate of the requirements for the discretionary works identified in step 1 is then prioritised against business objectives and risk criteria having regard for value, risk and capability considerations. ENERGEX applies a UMS[33] "Spend Optimisation Tool" to prioritise and optimise its discretionary capital works programme. ENERGEX advises that this tool is not applied to non-discretionary works, such as for safety and compliance purposes, which ENERGEX advises are automatically included in the capital programme.

As ENERGEX has noted, the programme:

[33] UMS is a consultancy firm that specialises in advising utility businesses.

...focuses on selecting the optimum bundle of projects that maximises the strategic value with an acceptable risk exposure. It is not intended to support the analysis of limitations or formulation of projects that addresses these limitations. The contribution of individual projects is measured within the bundle that meets the financial restraints. Smaller high value projects can be selected in the bundle because the basic process of optimisation is to maximise value for minimum cost.[34]

Table 8.1C sets out the five measures and the respective weightings used by the spend optimisation tool. ENERGEX has recently revised its weightings and has increased the emphasis on reliability in line with financial measures.

Table 8.1C - ENERGEX Weighting Measures for Prioritisation of Capital Works Programme (%)

Primary Measure	***Secondary Measure*** [35]	***Initial Weighting***	***Amended Weighting***
Financial	– QCA variation "allowance" – Net Present Value – Operating and maintenance expenditure reduction	30	30
Operational Excellence	– Staff Utilisation – Asset Utilisation	12	12
Customers and Markets	– SAIDI – Connections capability	16	30
Staff Safety and Culture	– Staff safety – Progressive and commercial	26	16
Community and Environment	– Public safety, brand and reputation	16	12
Source: ENERGEX, 2004			

Table 8.1C details the recent changes that ENERGEX introduced to the weightings to increase the emphasis on "Customers and Markets" (i.e. connection and reliability) at the expense of "Staff Safety and Culture". ENERGEX has advised the Panel that, in its view, safety is now culturally entrenched in the workplace and consequently has been accorded lower importance.

Once this initial prioritisation is completed, ENERGEX applies a further management risk review to ensure that the resultant list of prioritised projects is appropriate. This additional process is conducted as a check on the outcomes of the prioritisation.

[34] ENERGEX, Network Development Plan 2004-5 to 2008/09, page 4

[35] These "Secondary Measures" are those currently used by ENERGEX and differ slightly from those previously applied.

The Panel notes that while this process appears sound, it can result in some essential projects not being carried out. For example, material provided by ENERGEX to the Panel noted that:

> *...replacement programs for ageing sub-transmission cables are regularly deferred due to insufficient value drivers but they have serious outage consequences if they fail.*

It is noted that in the case of these assets, ENERGEX has now made a capital funding allowance to cover the most severe risks.

Material submitted by ENERGEX to the Panel highlighted that its capital spending decisions have been taken against the background of always trying to fit within the capital expenditure "building block" used by the QCA for determining the AARR. The Panel questions whether such weighting should have been given to limit expenditure to the QCA capital expenditure "building block" and whether the resultant risks should have been accepted. A better alternative may have been to find additional funds to undertake the projects.

The outcome of this step is a prioritised list of proposed capital works.

Step 3 – Develop / Approve Budget

From the prioritised proposed list of capital works, ENERGEX categorises three grades of projects – essential, highly desirable and desirable. The budget process aims to deliver all of the essential projects and as many of the highly desirable and desirable projects as possible, having regard for:

- Previous capital works estimates, including the capital expenditure "building block" estimate made by the QCA in its 2001 network revenue determination;
- Overall financial indicators, including maintaining an appropriate return on assets, credit rating, cash flow, earnings and dividend requirements; and
- The resources available to deliver the capital works programme, when considered in conjunction with the maintenance programme.

In arriving at the final capital works budget, ENERGEX also utilises a facility within the UMS optimisation tool as a check mechanism to determine the level at which the marginal benefits of capital expenditure works are assessed to exceed their marginal costs.

The overall outcome of this process is an annual capital works budget, which is then approved by the Board. It is also noted that in some years the Board has approved increases to the approved annual capital budget to accommodate new requirements that have arisen during the course of the year.

Step 4 – Deliver / Report on Capital Works Programme

Once the global capital budget has been approved, each project requires individual approval. Depending on the size of the project this may require a number of stages, including:

- Confirming the nature and timing of system limitations that the works are seeking to address;
- Detailing the specific nature of the works required and the means for delivering them;
- Refining design details and establishing accurate cost estimates for the works; and
- Seeking project approval, including financial approval in accordance with ENERGEX's delegations policy, which takes into account the Queensland Government's "*Investment Guidelines for Government Owned Corporations*".

As individual projects are approved, the capital works budget is updated to reflect actual costs.

Large approved capital projects requiring complex interaction with internal and external stakeholders are assigned a project manager within ENERGEX. These projects may be delivered using external and internal resources. Other projects are allocated to ENERGEX's Customer Connections Group, Network Distribution Services Group or Network Transmission Services Groups for implementation.

The project manager or the relevant groups are responsible for the delivery of the projects and for managing and reporting against the approved budget and timing. There is monthly reporting for all projects against their completion time and budget.

Recent Improvements by ENERGEX

ENERGEX has recognised that there is significant scope for improvements to its current planning processes, and has identified in the submission to the Panel the following measures in order to target future capital investment more effectively:

- Improving the annual network investment plan to provide greater transparency about system planning processes, data and assumptions used in its analysis and the status of major projects;
- Improving planning guidelines to match community expectations for a reliable electricity network;
- Promoting greater interaction with Powerlink to identify emerging network limitations;
- Ensuring more effective information collection and monitoring of end use data, especially in relation to air-conditioners and other electrical appliances, so as to better incorporate customer demand profiles into planning processes;

- Improving the accuracy of demand forecasts through improved use of external consultants and the installation of additional load survey meters to monitor customer use; and
- Creating a specialised transmission planning group to monitor network limitations and potential overloads. It is envisaged that this group will liaise closely with Powerlink.

The Panel considers that these proposed improvements are overdue and should be implemented as soon as possible. In addition, the Panel believes ENERGEX should undertake a more rigorous and formal planning and reporting process, such as by developing a Network Management Plan, as discussed in Chapter 4.

8.2 Capital Expenditure and Delivery Process – Ergon Energy

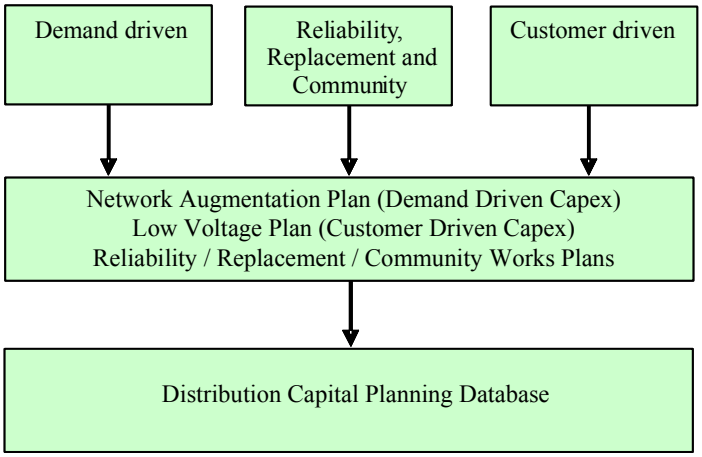
Step 1 - Identification of Capital Projects

Ergon Energy's capital programme is separated into three broad categories of works:

- Demand driven works – these works relate to the provision of sub-transmission and high voltage maximum system demand. Ergon Energy prepares annual Sub-Transmission Network Augmentation Plans and annual Distribution Network Augmentation Plans for each of its six regions. These plans are an input into the annual capital budgeting process;
- Reliability, replacement and community works – these are primarily driven by inspection programmes and defect rates, aged asset replacement programmes or specific reliability programmes. Ergon Energy prepares a list of these works and programmes for input into the annual capital budgeting process; and
- Customer driven works – these primarily relate to new connections and service upgrades for existing customers and are therefore largely reactive. Ergon Energy prepares a list of these works and programmes for input into the annual capital budgeting process.

The planning documents produced for each type of capital expenditure work are inputs into Ergon Energy's Distribution Capital Planning database, as set out in Chart 8.2A and discussed further in the following text.

Chart 8.2A – Ergon Energy Process for Determining the Need for Capital Expenditure



Demand Driven Expenditure

Planning for demand driven works is undertaken for three broad types of assets:

- Bulk supply sub-stations and connection points – Ergon Energy prepares 10 year forecasts based on regression analysis using up to 15 years of recorded maximum demand data at each connection point, extrapolated with adjustments to accommodate confirmed and anticipated developments. Ergon Energy applies temperature correction techniques for review purposes. Bulk supply sub-station forecasts are reconciled with forecasts prepared by external consultants, and are supplied to Powerlink in accordance with the Code to accommodate system wide planning;
- Zone supply sub-stations – Ergon Energy prepares 10 year zone supply sub-station maximum demand forecasts in a similar way to bulk supply sub-stations and connection point forecasts; and
- Sub-transmission feeders – Ergon Energy undertakes load flow analysis in line with the Code.

Forecasting processes are discussed in section 8.3. At a high level, the planning assumptions underpinning demand driven expenditure are:

- Probability of Exceedance (PoE) 50, which is applied on a regional basis to determine expected asset loadings. As discussed below, the Panel has some concerns with the use of PoE 50 because of recent high growth rates and increasingly temperature-sensitive loads in Queensland; and
- "N-1" for 99% of the time, which is used for reviewing bulk and zone supply sub-stations and sub-transmission lines to supply loads, except in rural areas with relatively small loads where "N" is applied. This planning seeks to ensure that in the event of a contingency the remaining network load (after load

transfers and the curtailment of switchable load) can be supplied for 99% of the time. In essence, the failure would need to coincide with the annual maximum demand for customers to be affected. A RAP process is then applied to verify that these criteria represent a reasonable risk for individual assets.

The output from the planning process for demand-related works is a list of bulk and zone supply sub-stations, sub-transmission feeders and high voltage feeders which require up-rating. This list includes the estimated cost and proposed timing for these upgrades. These are incorporated into Ergon Energy's Sub-Transmission Network Augmentation Plan and its Distribution Augmentation Plans for each of its regions.

Reliability, Replacement and Community Expenditure

The second major category of Ergon Energy's capital expenditure relates to reliability, replacement and community-related works.

These works can be identified from a variety of sources, such as:

- Analysis of reliability data;
- Evaluation of fault causes by equipment type;
- Feedback from field supervisors;
- Insulation condition monitoring;
- Interaction with community groups; and
- Aged asset analysis.

Ergon Energy has a range of specific policies relating to this type of works, including:

- Pole top refurbishment;
- Safety initiatives;
- Environmental initiatives;
- Cyclone area undergrounding;
- Sub-transmission line re-insulation, rebuilding, conductor replacement and overhead earth wire installation;
- Sub-transmission underground cable replacement and refurbishment; and
- Zone supply sub-station switchgear, transformer, battery, capacitor and instrument transformer replacements.

The outcome of this process is a range of broad policies that guide the capital works programme for the year and a detailed spreadsheet of proposed works with specifications of physical units and estimated costs. This spreadsheet is an input to the capital budgeting process.

Customer Initiated Works

Customer driven expenditure is largely dependent on new connections and, for Ergon Energy, planning is particularly exposed to major industrial and mining developments. Ergon Energy's distribution network planning is conducted on a regional basis. It relies on:

- The use of macro demographic indicators to assess population growth;
- Liaison with industry, local councils and State Government departments in order to plan for major new industrial loads and residential developments; and
- Projecting increased demand for existing customers, for example as a result of the installation of three phase air conditioning.

From this information, Ergon Energy assesses the number of new sub-divisions and in-fill developments that it is likely to need to service. It applies an ADMD assessment to establish the infrastructure requirements for this new load and to determine the new investment that it will require in order to service new load.

The combination of the above steps leads to the development of a preliminary estimate of capital programmes and projects, including their estimated cost and proposed timing.

The overall results of this first step are regional Sub-Transmission Network Augmentation Plans, Distribution Network Augmentation Plans and separate spreadsheets for reliability, replacement, community and customer-related works.

Step 2 – Prioritise Works Programme

Ergon Energy advises that it automatically includes identified "non-discretionary" works, such as for safety and mandatory compliance purposes, in its capital programme.

For "discretionary" works, Ergon Energy uses a Project Risk Assessment Methodology (PRAM) for assessing and prioritising network projects. PRAM:

- Applies a system of risk weightings to event scenarios in assessing individual projects – these weightings are set out in Table 8.2B;
- Establishes a project risk ranking, project risk category and the highest individual risk area score; and
- Assigns a score for each risk area.

Table 8.2B: Ergon Energy Weighting Measures for Prioritising "Discretionary" Capital Works (%)		
Primary Risk Measure	**Explanation**	**Weighting**
Safety	Probability of public and workplace safety risk associated with works not proceeding.	25
Reliability of Supply	Relates to the SAIDI consequences of works not proceeding	25
Community Perception	Relates to the community's response to works not proceeding	20
Financial Impact	Relates to the financial costs to Ergon of works not proceeding	10
Environmental	Identifies risks of not complying with environmental legislation if works do not proceed	10
Network Operational Constraints	Identifies network plant and line limitations if works do not proceed	10
Source: Ergon Energy, 2004		

Following the application of PRAM, an internal review is conducted by senior management to ensure appropriate priority is given to projects and programmes from a technical, timing and financial perspective before they are approved for inclusion in the capital budget.

The outcome of this step is a prioritised list of projects including their associated estimated costs.

It is noted that the above prioritisation methodology does not adequately accommodate the unique nature of the SWER system. The SWER system is considered further in Chapter 12.

Step 3 – Develop / Approve Budget

Following the application of PRAM, Ergon Energy categorises the prioritised discretionary works list into high, medium and low ranked projects and programmes. The budget approval process aims to deliver as many projects as possible, having regard for:

- The resources available to deliver the capital works programme;
- Overall financial indicators, including maintaining an appropriate return on assets, credit rating, cash flow, earnings and dividend requirements; and

- Previous capital works estimates, including the capital expenditure "building block" made by the QCA in its 2001 network revenue determination – this was in turn based on Ergon Energy's own capital forecasts. Ergon Energy has advised that the QCA's "allocation" is not a driver or constraint on the capital expenditure budget. As discussed in Chapter 6, Ergon Energy's actual capital expenditure has in recent years significantly exceeded the capital expenditure "building block" used by the QCA for its AARR.

Ergon Energy has advised that, where proposed capital expenditure works exceed available internal funding, it explores opportunities for sourcing additional funding either from the Government as shareholder or the Queensland Treasury Corporation as its debt financier.

The outcome of this process is an annual capital works budget, which is approved by the Board prior to the commencement of the financial year.

Step 4 – Deliver / Report on Capital Works Programme

Once the global capital budget has been approved, each project requires individual approval. Depending on the size of the project this may require a number of stages, including:

- Confirming the nature and timing of system limitations that the works are seeking to address;
- Detailing the specific nature of the works required and the means of delivering them;
- Refining design details and establishing detailed cost estimates for the works; and
- Seeking project approval, including financial approval in accordance with Ergon Energy's delegations policy, which takes account of the Queensland Government's "*Investment Guidelines for Government Owned Corporations*".

As individual projects are approved, the capital works budget is updated to reflect actual costs.

The Manager - Network Assets assigns responsibility for the delivery of capital projects requiring less than 500 man hours to the three regional general managers and larger projects to the General Manager - Transmission and Distribution Services. These general managers are accountable for the delivery of, and reporting on, the capital works programme.

A monthly Works Programme Progress Report is then prepared by Ergon Energy's Works Planning Group, which details variances between actual, budget and forecast capital expenditure by type of works.

8.3 Forecasting Demand for Network Planning Purposes

This section sets out the processes used by both ENERGEX and Ergon Energy for forecasting demand for network planning and development purposes and for investing in demand driven capital expenditure works.

ENERGEX and Ergon Energy follow a similar three step forecasting process:

- A bottom up assessment of ten yearly maximum demand for bulk and zone supply sub-stations and ten yearly low voltage demand where available. These forecasts are based on PoE assumptions and economic growth scenarios;
- Provision of connection point forecasts to Powerlink for their review in accordance with the Code joint planning requirements; and
- Comparing the adjusted bottom up forecast with "top down" forecasts prepared by external consultants.

ENERGEX – Forecasting Demand for Network Planning Purposes

Step 1 – Bottom-up Assessment of Maximum Demand

As noted earlier in this chapter, ENERGEX prepares five yearly connection point forecasts for bulk and zone supply sub-stations using regression analysis. Low voltage forecasting takes into account known new loads, such as residential sub-divisions.

ENERGEX's forecasts are made for summer and winter temperature outcomes on the basis of various probability of exceedance assumptions, including PoE 10 and PoE 50:

- A PoE 10 assumption involves investing in sufficient system capacity to cope with a daily mean temperature that occurs only one in every ten years – i.e. the forecast daily mean temperature is extremely high and will lead to significantly increased system demand; and
- PoE 50 assumption involves investing in sufficient system capacity to cope with a daily mean temperature that occurs only one in every two years – i.e. the forecast daily mean temperature is high (but lower than for a PoE 10 assumption) and will lead to slight increases in system demand.

Forecasting under a PoE 10 assumption therefore plans for the system to cope with a more extreme weather event than under a PoE 50 assumption.

ENERGEX currently uses PoE 50 planning assumptions when planning maximum demand growth for its bulk and zone supply sub-stations. Loads above the PoE 50 level are accommodated with contingent capacity and cyclic ratings.

ENERGEX has recognised the limitations of using PoE 50 in an over-utilised network. It stated in its submission to the Panel:

> *With a highly utilised network, ENERGEX is finding it more difficult to cope with extreme weather conditions. A network designed to meet N-1*

using 50 percent PoE forecasts will comfortably cope with extreme weather loads (10 percent PoE) but a network with high utilisation like ENERGEX will find it more difficult as experienced in January and February 2004. Until the network utilisation is reduced to 65%, ENERGEX will use 10 percent PoE forecasts commencing in 2005/06.

The use of PoE 50, combined with RAP, has contributed to high utilisation levels in ENERGEX's system and inadequate capital expenditure. The Panel endorses ENERGEX's intention to move to PoE 10. This approach could be reviewed when utilisation reaches an acceptable level.

Step 2 – Joint Planning Exercises

Section 5.6.2(b) of the Code requires that:

Each Transmission Network Service Provider must conduct an annual planning review with each Distribution Network Service Provider connected to that transmission network within each region. The annual planning review must incorporate the forecast loads submitted by the Distribution Network Service Provider in accordance with clause 5.6.1 or as modified in accordance with clause 5.6.1(d) and must include a review of the adequacy of existing connection points and relevant parts of the transmission system and planning proposals for future connection points.[36]

In line with clause 5.6.2 of the Code, ENERGEX provides its forecasts for bulk and zone connection points to Powerlink annually, and amends its forecasts following any discussion between the two parties.

Step 3 – Comparison and Reconciliation with Aggregate System Forecasts

ENERGEX annually retains the National Institute of Economic and Industrial Research (NIEIR) to validate its internally produced forecasts. ENERGEX stated in its submission to the Panel that:

NIEIR has been engaged to prepare an independent system forecast for checking ENERGEX's internal forecasts….NIEIR is also the consultant used by Ergon and Powerlink for preparing an independent state forecast.

Ergon Energy – Forecasting Demand for Network Planning Purposes

Step 1 – Bottom-up Assessment of Maximum Demand

Maximum demand forecasting was centralised from Ergon Energy's six predecessor organisations following the formation of the company. Ergon Energy has devoted considerable effort into consolidating data and developing a demand forecasting policy which can be applied across the regions.

[36] National Electricity Code, Clause 5.6.2.

As noted earlier in this chapter, Ergon Energy undertakes ten yearly connection point forecasts for bulk and zone supply sub-stations, and low voltage forecasting which takes into account known new loads, such as residential sub-divisions.

While low voltage planning has been largely reactive in the past, Ergon Energy has recognised this deficiency and is implementing a system which will link customer consumption information from its billing system to information about its low voltage feeders and sub-stations. The application of standard load profiles will enable Ergon Energy to assess the need for new investment in the low voltage system.

Ergon Energy's forecasts are currently undertaken on a PoE 50 basis. For the same broad reasons as set out for ENERGEX, the Panel believes that critical assets in the system such as bulk supply sub-stations should be planned on an assumption of PoE 10.

Step 2 – Joint Planning Exercises

In line with clause 5.6.2 of the Code, Ergon Energy provides its forecasts for bulk and zone connection points to Powerlink annually.

In its submission to the Panel, Ergon Energy advised:

> *There is extensive interaction with Powerlink in the production of Connection Point & Bulk Supply Point Demand Forecasts. A draft forecast is produced in Ergon NPD[37] & provided to Powerlink annually. Powerlink review the forecasts in detail in view of their own analysis & independent forecasts that they also commission. A consultation process between Ergon & Powerlink is then followed to arrive at the final agreed forecast.*
>
> *Meetings are held with Ergon Retail Forecasters to review matters of common interest including general impressions & conclusions within the parameters of Ring-Fencing restrictions. Ergon Network has access to the Retailer's Franchise Billing information & this is reviewed for various forecasting purposes.*
>
> *There is normally no direct contact with 3rd party retailers for Network Planning forecasting purposes. Such contact may occur as required with Connection & Pricing staff in determining major customer intentions and intelligence from these interactions is then provided to Planning Department.*

Step 3 – Comparison and Reconciliation with Aggregate System Forecasts

Ergon Energy annually retains NIEIR to validate its internally produced forecasts. In its submission to the Panel, Ergon Energy stated:

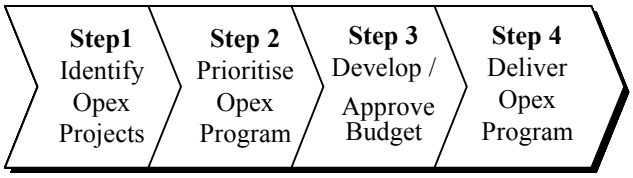
[37] NPD – Ergon Energy's Network Planning Division

The National Institute of Economic & Industrial Research is retained annually to validate the internally produced forecasts. This involves the production of independent forecasts using regionally based econometric models which reference specific economic and demographic indicators as well as historical electricity usage.

8.4 Maintenance Planning and Delivery Processes

ENERGEX and Ergon Energy's maintenance planning and delivery processes have been analysed on the basis of the steps set out in Chart 8.4A.

Chart 8.4A – Maintenance Planning and Delivery Process



An assessment of the process for the two distributors, in line with the steps set out in the Chart 8.4A, follows.

ENERGEX - Maintenance Planning and Delivery Processes

Step 1 - Identification of Maintenance Projects

Maintenance planning within ENERGEX is performed in the Network Capability and Planning Group within the Asset Management Division. The annual maintenance programme is divided into:

- Triggered maintenance – the MINCOM Ellipse maintenance management system and other legacy maintenance systems provide information on inspection and maintenance cycles based on elapsed time and operational counts – this is the largest category of maintenance and relates to inspection and planned maintenance;
- Corrective and emergency maintenance – these works can be either urgent or non-urgent and are typically identified by field personnel and forwarded to maintenance co-ordinators for scheduling; and
- Coordinator or policy initiated maintenance – this is a more informal process whereby field coordinators and maintenance planners identify maintenance works based on field experience and ENERGEX's policy objectives.

It is noted that vegetation management can fall into all of these maintenance categories. Vegetation management is discussed further below.

ENERGEX is in the process of transitioning from a variety of legacy asset and maintenance management systems to the Ellipse system – the starting point data for

this system was, in the case of some asset classes, uploaded from the pre-existing Asset Management Maintenance System. The Ellipse system is progressively updated as maintenance is undertaken on items of equipment.

Discussions with field personnel indicate that there are deficiencies in the completeness and quality of data, particularly in the case of distribution equipment, which ENERGEX is continuing to address. In the meantime, ENERGEX remains reliant upon the legacy systems as well as Ellipse in planning and delivering its maintenance programme.

ENERGEX describes the Ellipse system as follows:

> *MINCOM Ellipse (is a) fully integrated financial, project, works management and maintenance system. The system interfaces to Hand Held Computing for planning, patrolling, scheduling repairs of identified faults, costing of work and close-out through to the equipment register of all maintainable items making up the maintenance plan.*
>
> *In May 2003, Ellipse replaced several software packages in a single system for whole of business use.*
>
> *All capital and operating works for the maintaining or creation of assets within the electricity transmission and distribution network is performed using this system – including both internal and external resources. All resource groups within the business utilise Ellipse for project / work planning and execution. Close-out of work and costing.*
>
> *Work to be conducted by external suppliers is sourced from Ellipse, provided to contractors and closed out in Ellipse to record cost and performance data. This includes the contract management of out-sourced work such as vegetation, pole inspections and projects.*
>
> *Through this system, it is possible to identify work done by asset class, specific pieces of transmission equipment and major distribution plant. Inspection cycles are based on the cyclic time or operational statistic triggers which are recorded against each piece of equipment requiring routine inspection, as per ENERGEX maintenance policies (for) the distribution and transmission network assets.*
>
> *Completion of an inspection work order triggers the next inspection which appears in the schedule for the workgroup as part of the planning and scheduling of work. The setup of Ellipse allows ENERGEX to identify physical quantities done and the average cost of work.*
>
> *For non-routine maintenance work eg replacement of cross-arms, the work orders that are created enable the identification of the category of work being performed. This also enables physical quantities and average costs of maintenance activities using these categories to be determined.*

The Ellipse system schedules maintenance on the basis of an extensive library of maintenance practices and intervals that are highly dependent on the type, manufacturer and criticality of the equipment. ENERGEX has advised that its asset information is held in its Network Facilities Management (NFM) database within the Ellipse application. The NFM is now estimated by ENERGEX to be 95% complete.

ENERGEX also advised the Panel that it initiated a Network Data Accuracy project in June 2004 which will identify the key data sets required for effectively managing the network business. It expects data to be fully reviewed within this system within five years, with high priority asset types being completed sooner.

Each year, ENERGEX's Group Manager Network Capability and Planning produces a report from the Ellipse system to prepare a detailed spreadsheet, which identifies the triggered maintenance required for the coming year. This spreadsheet is supplemented with estimates for corrective and emergency maintenance works and for coordinator or policy initiated works that have been identified by maintenance coordinators, maintenance planners and field personnel.

An overall spreadsheet is produced which identifies all proposed types of maintenance works and details preliminary costs, built up from units, "hours to complete" and standard unit rates.

Step 2 - Prioritise Works Programme

ENERGEX applies the same UMS Spend Optimisation Tool for prioritising its discretionary maintenance works as it employs for capital planning. However, ENERGEX has advised that the tool is less useful for maintenance planning because the link between maintenance works and specific outcomes that the tool gives weightings to is less clear for capital expenditure.

As a consequence, ENERGEX conducts a further review of proposed maintenance works after the Spend Optimisation Tool has been applied, on the basis of:

- Compliance with its maintenance policies;
- Safety considerations;
- System reliability considerations;
- An assessment of the consequences of not proceeding with certain types of maintenance works; and
- The time to repair equipment in the event of failure.

The outcome of this process is a prioritised list of maintenance activities.

Step 3 – Develop and Approve Annual Maintenance Budget

Once the maintenance expenditure activities have been prioritised, ENERGEX finalises its annual maintenance budget having regard for:

- Previous maintenance works estimates, including the maintenance expenditure "building block" made by the QCA in its 2001 network revenue determination;
- Overall financial indicators, including maintaining an appropriate return on assets, credit rating, cash flow, earnings and dividend requirements; and
- The resources available to deliver the maintenance works programme, when considered in conjunction with the capital programme.

This is an iterative process which the Panel understands can involve adjustments to the prioritised list of capital and maintenance works or an increase in overall budget to accommodate works that are deemed essential but which would otherwise be excluded.

A limitation of ENERGEX's current maintenance planning concerns the linkage between pole inspections and the inspection of equipment mounted on the poles. Cross-arms, in particular, do not appear to be recorded either as assets in their own right or as subsidiaries of the pole.

While ENERGEX has a pole inspection programme, its records are insufficient to demonstrate that all cross-arms and pole top equipment are being regularly inspected or that an adequate programme is in place for their replacement. The Panel understands that there is no inspection programme for low voltage cross-arms that are not associated with high voltage poles. The Panel notes that ENERGEX intended changing its current policies to address this matter from 1 July 2004.

The overall outcome of this process is an annual maintenance works budget, which is approved by the Board as part of the annual planning and budgeting process.

Step 4 – Deliver and Report on Maintenance Programme

ENERGEX's General Manager – Asset Services is responsible for the overall maintenance programme. Responsibility for the delivery of the programme is allocated to various functional groups as indicated in Table 8.4B.

Table 8.4B – ENERGEX Maintenance Responsibilities by Work Group	
ENERGEX Work Area	**Maintenance Responsibilities**
Network Distribution Service Group	Distribution sub-stations (fused protection) Overhead 33kV, 11kV and low voltage feeders Low voltage underground distribution lines
Network Transmission Services Group	Bulk supply sub-stations Zone supply sub-stations Distribution sub-stations (relay protection) 33kV underground
Business Performance and Contracts Group	Vegetation management Street lighting Initiate contracts on behalf of Network Transmission and Distribution Service Groups Report physical and financial performance against the maintenance plan
Source: ENERGEX, 2004	

ENERGEX submitted to the Panel that:

> *The MINCOM Ellipse system also produces standard reports for the reporting of financial (linking to ENERGEX's PeopleSoft financial system) and physical progress against the maintenance plan.*

ENERGEX has not yet sufficiently populated the Ellipse system with data and as a consequence, it is unable to comprehensively report physical outcomes against the maintenance programmes. As a result, ENERGEX's maintenance programme currently tends to be managed more by expenditure levels than the outcomes that are being achieved.

ENERGEX prepares a monthly performance report to its executive committee. This report does not provide details of the progress of maintenance works but rather focuses on a range of financial parameters and specific outcomes intended to be achieved from the maintenance programme. This includes:

- The level of controllable expenditure, overhead rates and its proactive versus reactive maintenance expenditure;
- Reliability performance based on SAIDI, CAIDI and SAIFI; and
- Vegetation related outages and expenditure.

Ergon Energy - Maintenance Planning and Delivery Processes

When it was established in July 1999, Ergon Energy inherited a diverse set of asset management policies, practices and systems from the six regional electricity authorities. At that time, it identified significant safety and legal compliance issues that needed to be addressed.

Consequently, Ergon Energy began a comprehensive overhaul of its asset management policies, practices and systems in order to coordinate them across the regions and to provide a sound basis for the future management of the system.

As it noted in its submission to the Panel:

> *Ergon Energy is currently 2 years through its first 3 year inspection and maintenance cycle and to ensure all maintenance issues are addressed is proposing at least one more 3 year cycle before reverting to a cycle more relevant to the assets being inspected and maintained. Consequently, Ergon Energy still has a maintenance backlog and an associated risk exposure. In addition not all assets are currently covered by the new maintenance disciplines. The current programme will be extended to pick up additional assets in 04/05.*

In the case of poles and overhead distribution assets, Ergon Energy is implementing an AIDM programme to achieve these objectives.

Ergon Energy also noted in its submission to the Panel that its:

> *..... ability to resource the significant amounts of works that have been identified as required to bring the assets in to the 21st century is an issue which will take some time to address.*

In order to support its future operations, Ergon Energy has introduced two key initiatives to achieve a reliable maintenance management system in the medium term:

- A SAP[38] Asset Management System PM[39] module has been introduced to provide a detailed register of physical assets and a more disciplined maintenance management regime for both line assets and zone supply sub-station assets. Ergon Energy has estimated that it will be four to five years before the SAP implementation is completed. In the meantime, it is highly dependent on spreadsheets prepared in individual regions to build up maintenance plans; and
- A Smallworld Geographical Information System (GIS) has been introduced as a design tool which will also provide benefits for maintenance management by providing up-to-date information on installed assets. This GIS system will provide data structures for feeders (switch-zones, poles, sub-stations, switches

[38] SAP is an integrated computer system for financial and business management
[39] Preventative Maintenance

and pillars) and for zone supply sub-stations (transformers, circuit breakers, auxiliary equipment and protection equipment).

In its submission to the panel, Ergon Energy stated that its "vision is to eventually have all assets stored within the GIS and to use the SAP system to manage all maintenance". It has further noted that:

> *……from a maintenance perspective, this will also be a great benefit as it provides integrated asset management, materials management, works management, accurate costing of both labour and logistics and detailed reporting of both work progress and budget expenditure.*

As at March 2004, the asset management system includes details on all feeders and links to approximately 480,000 poles (of an estimated population of 900,000 poles) with this increasing at a rate of about 30,000 poles per month. The major equipment in zone supply sub-stations is also captured, as are protection schemes (but not relay details). Limited information has been gathered on pole mounted distribution sub-stations (but information has not been gathered for padmount type distribution sub-stations).

Additional work programmes are underway to incorporate an extended range of assets in the programme, including:

- Public lighting:
  - Traffic route lighting; and
  - Minor lighting;
- Earthing:
  - SWER; and
  - Non-SWER (excepting zone supply sub-stations);
- Access tracks to equipment;
- Pole top inspections on lines 11kV and above where rainfall exceeds 1500 mm per annum;
- Air break switches; and
- Underground assets:
  - Padmounts;
  - Pillars;
  - Underground cables; and
  - Lighting columns.

Ergon Energy is now implementing a single maintenance management system. It anticipates, however, that it could be four to five years before this system is fully populated. Ergon Energy is ensuring that its most critical assets are captured in the

new system on a priority basis and that its legacy systems are providing interim support.

The Panel notes there is a risk that the lower priority assets may not be adequately maintained over this period (e.g. line reclosers and air break switches).

Step 1 – Identification of Maintenance Projects

Ergon Energy's annual maintenance programme has three categories:

- Triggered maintenance – the SAP and other legacy systems provide information on inspection and maintenance cycles based on elapsed time;
- Corrective and emergency maintenance – this relates to corrective / repair works which can be either urgent or non-urgent and are typically identified by field personnel and forwarded to maintenance co-ordinators for scheduling; and
- Co-ordinator or policy initiated maintenance – this is a more formal process whereby field coordinators and maintenance planners identify maintenance works based on field experience and Ergon Energy's policy objectives.

At present, Ergon Energy draws on a variety of data sources to plan its maintenance programme. Data is of variable quality and completeness:

- Where no specific asset information is available, Ergon Energy sets annual percentage completion targets, for example, by targeting assets requiring a four year maintenance cycle at the rate of 25% per annum; and
- Where specific asset information is available either from SAP or legacy systems then Ergon Energy produces reports to identify assets due for maintenance.

Ergon Energy has, during the transition phase where it has overhauled its asset management systems, introduced relatively standardised maintenance cycles as a means of forecasting the need for maintenance works. Switchgear, for example, is categorised by generic type rather than manufacturer as an interim step until equipment is appropriately catalogued.

Ergon Energy assesses the cost of maintenance works either by analysing the current costs and outputs or estimating "work units" required and applying a "work unit" rate. The Panel was advised that Ergon Energy does not yet have a full understanding of the costs of completing different maintenance tasks. This can result in a variance in expenditure against the budget or a variance in physical units delivered.

The outcome of this step is a spreadsheet of costed maintenance works for the coming 12 months. This is used as an input to the maintenance budgeting process.

Step 2 – Prioritise Works Programme

Once the initial identification and costing of maintenance programmes has been completed, the detailed spreadsheet is considered by the Regional Asset Managers and General Managers – Operations. They assess each programme for its policy soundness, risks and Ergon Energy's ability to deliver it. If programmes cannot be

delivered with internal resources then Ergon Energy considers whether it will use external contractors and factors in appropriate processes and costs.

The overall outcome of this step is a prioritised list of maintenance programmes and resource plans which are presented to the Distribution Management Team for review.

Step 3 – Develop and Approve Maintenance Budget

Once refined, the package of prioritised proposed maintenance works is presented to the Distribution Management Team for review. This team includes representatives with responsibility for operations, asset ownership, finance and resource management. The team's role is to determine the operational validity and completeness of the proposed maintenance programme while building a view as to the total financial impact on Ergon Energy.

In assessing the programme, the Distribution Management Team has regard for:

- Previous maintenance works estimates, including the maintenance expenditure "building block" used by the QCA in its 2001 network revenue determination. The Panel notes that Ergon Energy underspent the QCA's operational and maintenance expenditure "building block" by about $13 million in 2001/02 and overspent it by $7 million in 2002/03. It has forecast a further $16 million overspend for 2003/04. This reinforces Ergon Energy's statements to the Panel that the QCA "building block" does not cap its expenditure decisions;
- The delivery of maintenance programmes in previous years against budget; and
- The resources available to deliver the maintenance works, including personnel and materials. Ergon Energy sometimes supplements its internal labour force with external contractors where resource constraints have been identified.

Once a refined programme is endorsed by the Distribution Management Team, it is presented to the Group General Manager – Distribution who reviews it in conjunction with the Chief Financial Officer to assess the financial impacts of the programme on the business.

Ergon Energy treats capital and maintenance expenditure as separate programmes so that the maintenance budget is not reduced to offset increased capital spending. As a result, Ergon Energy has maintained the momentum of its safety and compliance programme despite significant increases in its overall capital programme.

The outcome of this process is submitted to the Board for approval.

If, during the course of the year, Ergon Energy's maintenance programme is exceeding its approved budget then its practice has been to defer the lowest priority maintenance works to subsequent years, rather than to reduce the overall works programme proportionately.

Step 4 – Deliver and Report on Maintenance Programme

Ergon Energy's Manager – Network Assets is responsible for the overall maintenance programme. Responsibility for the delivery of the work is allocated on both a regional and functional basis:

- Major projects including augmentation of bulk sub-stations, zone supply sub-stations and sub-transmission lines are delivered by the General Manager – Transmission and Distribution Services. The Works Planning Manager is responsible for implementing major programmes delivered under contract, and for the provision of logistics support for other service providers; and
- Projects requiring less than 500 man-hours work, small customer connection works and emergency response works are delivered regionally by General Managers.

The AIDM programme for poles and other overhead distribution equipment categorises defects identified through the inspection programme as "P1", "P2" or "PB". P1 defects must be resolved within seven days and, where this is not achieved, the process of rectifying the defects must be reported to the Board. P2 defects must be resolved within 26 weeks and where this is not achieved, these must also be reported to the Board. Current reporting indicates that these works are being adequately managed. PB defects are being catalogued by Ergon Energy to assess what future action is required and whether a specific policy initiative is needed.

The Manager - Network Assets is responsible for monitoring and reporting on the implementation of maintenance programmes. A monthly "Works Plan Progress Report" is prepared for senior management, which details capital and operational expenditure on both a financial basis and a "work unit" basis.

8.5 Customer Outage Response

This section sets out the processes followed by both ENERGEX and Ergon Energy when responding to an outage, detected either through telemetry associated with protection devices that activate on the electricity network to isolate a fault or when notified by a customer.

Telemetry is installed in the majority of high voltage feeders or zone supply sub-stations and provides ENERGEX and Ergon Energy with instant notification of faults. Where telemetry is not installed, both ENERGEX and Ergon Energy rely on customer contacts before dispatching a field crew to repair a fault.

Both ENERGEX and Ergon Energy follow a three-stage process for responding to customer faults. The process is:

- Stage 1 - notification of fault – in this stage, the distributors are notified that a fault exists through either telemetry or by customer contact;

- Stage 2 - analysis of fault - in this stage, the distributors record outage information on databases and assess the cause of the outage; and
- Stage 3 - restoration of fault – in this stage, field crews attend the location, assess the fault, undertake repair works and report progress of work to controllers.

Details of the three-stage process are outlined for ENERGEX and Ergon Energy below.

ENERGEX – Process for Responding to Customer Fault

ENERGEX identifies a customer outage in one of two ways. The first is via an alarm from its Distribution Management Control System where a telemetered device "opens" to isolate and disconnect part of the network following a fault (telemetered fault). The second is following the receipt of customer telephone calls advising of a loss of supply (non-telemetered fault).

<table>
<tr><td colspan="2">Stage 1: Notification of Fault
Control Centre becomes aware of a fault.</td></tr>
<tr><th>Non-Telemetered Fault</th><th>Telemetered Fault</th></tr>
<tr><td>• Customer telephones ENERGEX's 136262 fault telephone number to report loss of supply;
• Technical Customer Service Representative (CSR) obtains information from customer to determine if the fault is network-related or if the fault is within the customer's premises. (If the fault is assessed to be within the customer's premises, the customer is advised to seek the services of an electrical contractor) as the fault is deemed not to be network-related;</td><td></td></tr>
<tr><td>• If CSR determines it is a network-related fault the CSR logs the call and creates a service order request in ENERGEX's Customer Management System (CMS); and
• The CMS routes the service order request to the Service Call Management (SCM) system which is sent to an ENERGEX Evaluator.</td><td>• If a fault is detected through telemetry, (installed in zone supply sub-stations) an alarm is activated on the Distribution Management (DMS) system; and
• The fault is treated as an incident and a service order request is automatically raised and logged in the SCM system. The ENERGEX Evaluator is advised automatically of the incident.</td></tr>
</table>

Stage 2: Analysis of Fault Control Centre records and assesses the cause of the fault.	
Non-Telemetered Fault	**Telemetered Fault**
• The Evaluator assesses whether it is an existing or new fault by reviewing previous service requests in the CMS system. If the outage is associated with an existing fault, the Evaluator groups service order requests together; • If the outage is identified as a new fault, the Evaluator raises a service order request; • The Evaluator then assesses whether the fault relates to a single loss of supply or is part of a larger area outage; • If the fault is assessed as being a single loss of supply, the Evaluator advises the Hub Controller who dispatches a field crew to rectify the problem;	
• If it is assessed as being a fault causing a multiple loss of supply, the Evaluator advises the Hub Controller who dispatches a field crew and updates the SCM system; and	• The Evaluator assesses the fault and advises the Hub Controller who dispatches a field crew and updates the SCM system; and
• The System Controller also updates the Power Outage Console (POC) system with outage information. The POC system automatically updates ENERGEX's Interactive Voice Response (IVR) System with outage information.	• The System Controller also updates the Power Outage Console (POC) system with outage information. The POC system automatically updates ENERGEX's IVR System with outage information.

Stage 3: Restoration of Fault A field crew attends the location of the fault, undertakes repair work and updates customer information about restoration times. The same process applies for non-telemetered and telemetered faults.
• Following arrival at the fault location, the field crew assesses the fault and advises the Hub Controller and/or Evaluator of the cause and estimated restoration times associated with the fault; • The Evaluator updates the POC system which automatically updates the IVR system with target response times and indicative restoration times for customers. The IVR automated message is updated at two hourly intervals as more information becomes available from the field crew on the cause of the outage and the estimated restoration time; • ENERGEX does not directly notify customers of the cause and estimated restoration times associated with the fault. Customers can access information about the fault by ringing the IVR system or by speaking to a CSR; and • The IVR message remains on the 136262 number for two hours following the most recent update. The message is automatically removed two hours after the last update, if supply has been restored.

Communication between field crews and the Hub Controller/Evaluator is mainly undertaken by trunk mobile radios, mobile phones and a Computer Aided Schedule and Dispatch (CASAD) system.

In repairing the fault and restoring supply, ENERGEX has service standards to which it requires its field crews (whether internal personnel or contractors) to adhere. For single outages in non-storm situations and where a site visit is required, ENERGEX aims to be at the customer's premises within two hours of the initial outage report, and to restore supply within:

- 3 hours for high energy demand areas such as CBD customers;
- 12 hours for urban customers; and
- 18 hours for rural customers.

Many submissions to the Panel noted the inconvenience associated with the use of the IVR system during the severe weather events in January and February 2004, including shortcomings associated with updating of the IVR message and the inability to speak to a person about an outage. These issues are discussed further in Chapters 9 and 11.

ENERGEX has introduced a range of performance improvement projects, including increasing the capacity of call handling facilities during peak events and the development of shorter targets for restoring supply.

Ergon Energy – Process for Responding to Customer Fault

Ergon Energy also identifies customer outages in one of two ways. The first is via an alarm from the SCADA system where a telemetered device "opens" to isolate and disconnect part of the network following a fault. The second is following the receipt of customer telephone calls advising of a loss of supply.

Stage 1: Notification of Fault Contact Centre becomes aware of a fault.	
Non-Telemetered Fault	**Telemetered Fault**
• Customer telephones Ergon Energy's 132296 faults/emergencies number to report loss of supply;	
• The customer hears a recorded IVR message advising of known outages in the area. If the customer elects to report a loss of supply, the customer can speak to a Customer Care Representative (CCR);	
• The CCR obtains information from the customer (name, address, contact details and outage information if available). If the fault is assessed to be within the customer's premises, the customer is advised to seek the services of an electrical contractor as the fault is deemed not to be network-related; and	
• The CCR provides notification of the loss of supply to the Scheduler during working hours or the Faults Analysis Officer (FAO) after working hours via its FdrStat system, which is Ergon Energy's master system for outage management.	• If a fault is detected through telemetry, (installed in high-voltage feeders) an alarm from the SCADA system automatically logs an event into the FdrStat system that a fault has occurred. The Scheduler/FAO at the Contact Centre is advised automatically of the fault.

Stage 2: Analysis of Fault Contact Centre records and assesses the cause of the fault.	
Non-Telemetered Fault	**Telemetered Fault**
• The Scheduler/FAO conducts an analysis of the FdrStat log entry to assess the nature of the fault and whether it is a single loss of supply or multiple loss of supply;	
• The Scheduler/FAO provides details of the fault to the CCR via its FdrStat system;	
• If the fault is assessed as being a single loss of supply, the Scheduler/FAO dispatches a field crew to rectify the problem; and	
• If it is assessed as being a fault causing a multiple loss of supply, the Scheduler/FAO assists with fault-finding and isolation of the fault on the network by analysing FdrStat and directing field crews towards suggested fault points.	• The Scheduler/FAO assesses the SCADA alarm on the FdrStat system to assess the nature of the fault.

Stage 3: Restoration of Fault

A field crew attends the location of the fault, undertakes repair work and updates customer information about restoration times.

The same process applies for non-telemetered and telemetered faults.

- Following the assessment, the fault information is sent to the Scheduler/FAO who schedules the work and allocates and dispatches the field crew via a job ticketing system. The Scheduler/FAO advises the CCR via the FdrStat system that a field crew has been dispatched;
- The Scheduler/FAO places an automated message on the FdrStat system and the IVR system which notifies customers of the fault in their area. The estimated time of arrival of the field crew is updated in the FdrStat system. The IVR system is integrated with FdrStat and an automated message can be placed on the IVR system via FdrStat. Manual messages can also be placed on the IVR system;
- The field crew locates and assesses the fault and advises the Scheduler/FAO of:
  - Its arrival at location;
  - The nature of the fault;
  - The expected restoration time;
  - Any other delays; and
  - The completion of the job.
- The field crew remains in contact with the Scheduler/FAO while repairs and restorations are being made. The communication process between field crews and the Scheduler/FAO is mainly via mobile and satellite telephones. The Scheduler/FAO updates FdrStat which, in turn, updates the automated IVR system as information is received from field crew. The field crew advises the Scheduler/FAO when power is restored, the Scheduler/FAO updates the FdrStat system and the automated message is removed from the IVR system; and
- Ergon Energy does not directly notify customers of the cause and expected restoration times. Customers can access information about the fault from the IVR system or from a CCR.

Using information sourced from the FdrStat system, the Contact Centre can contact a field crew by telephone and dispatch it to the fault area. The Panel was advised that Ergon Energy takes between 5 and 10 minutes to analyse the outage and dispatch a crew.

Finding 8.1 – ENERGEX – Capital Planning and Delivery Systems and Processes

ENERGEX's capital expenditure planning and delivery processes have not achieved the efficient and targeted allocation of resources needed to ensure ongoing reliable supply. Processes appear to be reactive rather than strategic, focussing on short-term constraints rather than medium-term solutions. Specifically, the Panel considers that:

- **ENERGEX's internal systems and processes have given priority to financial measures over reliability measures. Until recently, reliability was given half the weighting that financial outcomes were given in prioritising capital projects. This has constrained its ability to deliver necessary contingent capacity, reliability and replacement capital works, and resulted in customer driven works being the dominant focus of ENERGEX's works programme. ENERGEX has recognised the shortcomings of this approach and has now introduced a system which gives equal weighting to financial and reliability measures;**
- **ENERGEX's planning processes have been impacted by resource constraints. In particular, this has impacted on the completion of load flow analysis of the sub-transmission and high voltage network and the acquisition of data on the low voltage system. ENERGEX has reinstituted load flow analysis on parts of this network during the course of this Review. Information is not available on many parts of the network to enable the Panel to make an assessment or draw conclusions as to whether the sub-transmission meets "N-1". The Panel is of the view that such critical assets should be fully evaluated using load flow analysis at least annually. Without this information it is difficult to understand how ENERGEX can assess the adequacy of its network;**
- **ENERGEX plans to reduce utilisation ratios and move toward "N-1" as a general planning policy in its sub-transmission network and bulk and zone supply sub-stations. In some areas, such as the Brisbane CBD, a planning policy that is more conservative than "N-1" will be applied. This will require a significant capital commitment by ENERGEX. It is noted that the CBD works program is already committed; and**
- **ENERGEX's 2004 five year Network Development Plan provides a limited basis for delivering the capital expenditure programme. The Plan appears to lack an overall assessment of the state of the network including detailed information on bulk supply sub-station and zone sub-station loadings and limitations on the sub transmission system. Further, it does not contain the details of load flow analysis for the 33kV network or the 11kV network.**

Finding 8.2 - Ergon Energy - Capital Planning and Delivery Systems and Processes

Ergon Energy's capital expenditure planning and delivery processes have not achieved adequate, efficient and targeted allocation of resources needed to ensure a reliable supply, but are improving over time. Specifically, the Panel finds that:

- **Ergon Energy's capital planning has been limited by a lack of reliable data on the state of its network, which impedes the preparation of its sub-transmission and distribution augmentation plans. Ergon Energy recognises this deficiency and measures are in place to improve this information;**
- **Despite these information issues, Ergon Energy's current planning systems are continuing to identify constraints and augmentation needs in its system. The full extent of these constraints is not yet established but Ergon Energy expects to require significant capital works over the next ten years to improve the state of its network;**
- **Ergon Energy's capital prioritisation processes for capital expenditure planning limits the priority given to the SWER network to compliance related works. This means that there is limited planning and therefore capital expenditure undertaken for the more sparsely populated and isolated areas (see Chapter 12); and**
- **Ergon Energy's capital works requirements are likely to exceed both the available resources, and its ability to engage additional resources, for the foreseeable future. As a consequence, there is a risk that Ergon Energy may need to defer some of the capital projects currently being identified.**

Finding 8.3 – ENERGEX – Forecasting Systems and Processes

- **Employing a forecasting assumption of PoE 50 and a RAP planning methodology has resulted in high system utilisation and low levels of contingent capacity in ENERGEX's network. ENERGEX has itself noted in its submission that its capital expenditure programme requires a "catch-up for the previous under forecast of growth";**
- **With the exception of the use of PoE 50, ENERGEX's current forecasting processes are standard practices as used across the industry at the macro level. It has a need to incorporate local knowledge into its forecasting to cover regional-specific issues including local development patterns and changes in customer demand, for example, air conditioning usage. The Panel supports ENERGEX's proposed adoption of a PoE 10 forecasting assumption; and**

- **The move to a PoE 10 forecasting assumption is likely to require ENERGEX to significantly increase its capital expenditure over the coming years.**

Finding 8.4 – Ergon Energy – Forecasting Systems and Processes

- **The Panel notes that Ergon Energy uses a bottom-up approach to its forecasting by using regional forecasts which take into account local economic and demographic conditions. Ergon Energy's current forecasting processes are consistent with standard industry practices.**

Finding 8.5 – ENERGEX - Maintenance Systems and Processes

- **ENERGEX's asset management system is still in transition from legacy systems to the new Ellipse system, which was introduced in 2003. This means that there are deficiencies in the quality and scope of asset data, which impacts on the ability to identify necessary maintenance works. ENERGEX's current strategy involves operating Ellipse in parallel with legacy systems for a number of years until all information is contained in the Ellipse system. The Panel believes that, in order to ensure efficient and effective maintenance programmes, the transition to the Ellipse system should be expedited;**
- **ENERGEX has not sufficiently populated the Ellipse system with data and as a consequence, it is unable to comprehensively report physical outcomes against the maintenance programmes. As a result, ENERGEX's maintenance programme tends to be set by expenditure constraints rather than the achievement of outcomes;**
- **ENERGEX's maintenance planning systems and processes have given priority to financial measures over reliability measures. ENERGEX has recognised the shortcomings of this approach and has now introduced a system which gives equal weighting to financial and reliability measures;**
- **ENERGEX's system does not recognise cross-arms as a separate asset, or as part of a pole asset. As a consequence, ENERGEX does not have an inspection programme for low voltage cross-arms. During the Review, ENERGEX advised that it intended introducing a low voltage cross-arm inspection programme from 1 July 2004 to address this issue; and**
- **ENERGEX's current systems do not appear to contain an exception reporting system that routinely alerts management to items of equipment which are assessed as being outside of ENERGEX's maintenance policies. In the Panel's view, this increases the chance of failure with consequential reliability impacts.**

Finding 8.6 – Ergon Energy - Maintenance Systems and Processes

- **Ergon Energy's six predecessor organisations did not have adequate asset management policies, practices and systems, which could have been adopted for the amalgamated organisation. Ergon Energy has taken too long to identify and implement new arrangements that it can rely upon for future asset management;**
- **Ergon Energy's initial assessment identified a need to focus on a range of safety and legal compliance programmes. In 2002, it embarked on a comprehensive overhaul of its asset management policies, practices and systems in order to coordinate them across the regions and to provide a sound basis for the future management of the system;**
- **Because it is still in a transition phase, there are deficiencies in the quality and scope of data available in Ergon Energy's asset management system. It is therefore currently unable to ensure efficient allocation of resources for maintenance works;**
- **Ergon Energy continues to enter information on its critical assets into its maintenance management system on a prioritised basis. At the current rate Ergon Energy expects the system to be populated with line data within 14 months but it will be four to five years before the system is fully functional across all asset classes. There is a risk that lower priority assets will not receive adequate maintenance during this period; and**
- **Although Ergon Energy has not been constrained financially, it has not had sufficient human resources to carry out the necessary work. Unless this is addressed, Ergon Energy will not have a sound foundation from which to build its future asset management practices and achieve efficiencies in implementation.**

Finding 8.7 – ENERGEX – Customer Response Systems and Processes

The Panel considers that the internal processes used by ENERGEX to respond to customer faults under normal operating conditions are appropriate:

- **The processes for identifying customer faults are comparable to other best practice utilities, and rely on telemetry supplemented by customer phone calls;**
- **The processes for dispatching field crews are adequate. ENERGEX relies on reasonable systems and makes use of internal field crews supplemented by contractors employed under service level agreements;**

- **The Service Call Management system does not currently provide the controller with a network attachment point required by the crew in order to locate and attend to the outage, because the database that contains this information is incomplete. The controller must locate the network attachment point via a GIS system if it is not available in the Service Call Management system. This is a time consuming task that can delay dispatching a crew; and**
- **Improved communication between the crews and the controller could allow the IVR to be updated more regularly.**

Finding 8.8 – Ergon Energy – Customer Responses Systems and Processes

The Panel considers that the internal processes used by Ergon Energy to respond to customer faults under normal operating conditions are appropriate. In particular, the Panel finds that:

- **The processes for identifying customer faults are comparable with utilities' normal practices by relying on telemetry supplemented by customer phone calls;**
- **The processes for dispatching and updating field crews through FdrStat are efficient; and**
- **Regular reporting from the IVR system should be introduced to measure the frequency of updates to the automated and manual messages.**

Recommendations

- **ENERGEX should adopt planning processes which will return all bulk supply sub-stations, zone supply sub-stations and sub-transmission feeders to an "N-1" philosophy over the next regulatory period. The Panel recognises that this may entail the continued use of the RAP system as appropriate;**
- **Ergon Energy should adopt (unless otherwise agreed with major customers) planning processes which return all bulk supply sub-stations and large zone supply sub-stations (5MVA and above) and sub-transmission feeders to an "N-1" philosophy over the next regulatory period. Critical high voltage feeders should also meet "N-1" with the exception of those where Ergon Energy can provide satisfactory evidence that this does not put significant numbers of customers at risk;**
- **ENERGEX should increase its planning resources in order to ensure that it has a full understanding of the state of the network for the purposes of capital expenditure planning;**

- **ENERGEX and Ergon Energy should undertake a more rigorous and formal planning and reporting process, such as by developing a Network Management Plan, as discussed in Chapter 4;**
- **ENERGEX and Ergon Energy should ensure that they don't regard the QCA capital expenditure "building block" as preventing necessary capital works from being undertaken;**
- **ENERGEX should adopt a PoE 10 forecasting assumption in planning its network expansion. This position should be reviewed when asset utilisation is reduced to the order of 60% to 65%;**
- **Ergon Energy should examine adopting a PoE 10 forecasting assumption in its future planning for critical areas e.g. high growth urban areas;**
- **ENERGEX and Ergon Energy both need to expedite the population and use of their state of the art maintenance management systems; and**
- **While it is recognised that the primary function of field crews is to repair faults, ENERGEX and Ergon Energy should encourage them to provide regular updates to the controllers in order that the IVR can be regularly updated to keep customers well informed. This is particularly important during storm events.**

9

COMMUNICATING WITH THE PUBLIC ON OUTAGES

This chapter addresses the following item of the Panel's Terms of Reference:

> *Determine whether communication systems used by industry bodies to advise the Queensland public of system interruptions caused by electricity distribution system failures, including extreme weather conditions are adequate. If appropriate, the report should identify where any improvement can be made.*

In addition, recommendations from a recent external review of both ENERGEX and Ergon Energy's Contact Centres have been discussed in this chapter.

9.1 ENERGEX and Ergon Energy Contact Centres

ENERGEX and Ergon Energy as operators of essential infrastructure have a key role in communicating with the public. Effective communication channels are important at all times but become particularly crucial during supply interruptions caused by electricity distribution system failures. The centrepieces of both distributors' communications for unplanned supply interruptions are the centralised Contact Centres located in Brisbane (ENERGEX) and Rockhampton (Ergon Energy).

The Panel is aware that call centres are unpopular with some sections of the public, who would prefer to speak with a person, rather than utilise interactive pre-recorded messages. Given this fact, there is an expectation that there will always be a number of complaints regarding call centres, especially those of the nature of ENERGEX and Ergon Energy with a customer base which includes the majority of domestic electricity customers in Queensland.

A review of both Contact Centres was instigated in December 2003 by the former Minister responsible for Energy, the Honourable Paul Lucas MP, after an increase in complaints received by his office, particularly in relation to the performance of the ENERGEX Contact Centre. Consulting group Call Centre Development Pty Ltd (CCD) was engaged to undertake a review of both the ENERGEX and Ergon Energy Contact Centres. The results of this review are discussed later in this chapter.

The Panel is aware of a large number of complaints regarding ENERGEX's Contact Centre, particularly after the storms of early 2004. It needs to be recognised that without centralised contact centres there would have been even less information

available to the public. Under previous models the public would have rung local depots to report problems to field personnel and in many cases would have received an "out of office" voice message.

9.2 ENERGEX Contact Centre Performance During the 2004 Storms

During the storms in late January, more than 1,225,000 calls were made to the ENERGEX Contact Centre, of which approximately 383,000 were answered.[40]

The peak call volume was between 7pm and 8pm on 28 January 2004 when Telstra recorded approximately 179,500 attempted calls to ENERGEX. On this day alone, there were over 510,000 attempted calls to the ENERGEX Contact Centre.

The Panel believes it is unrealistic to expect any contact centre to be equipped to respond to this number of calls.

The CCD report contained a number of recommendations, which ENERGEX largely accepts. ENERGEX itself came up with a number of improvement initiatives. ENERGEX has advised that since the storms the improvements introduced include:

- The addition of an extra 120 telephone lines into the Contact Centre;
- The installation of two additional interactive voice response (IVR) units and new software;
- The installation of additional links with Telstra;
- The implementation of a dedicated emergency line for life threatening and emergency calls (although this has not yet been marketed);
- Recruitment of additional customer service representatives to meet increased service levels;
- Additional training of employees regarding customer complaint handling; and
- The introduction of a simplified IVR menu structure.

9.3 ENERGEX's Use of Media in Relation to the Effects of Storms and Other Significant Emergencies

The storms of January 2004, and the ensuing volume of calls made to ENERGEX's contact centre, highlighted the public's dependence on the contact centre for information.

Several public submissions noted that extensive public awareness campaigns are undertaken in far north Queensland prior to, and during, the cyclone season, which detail steps the public should take to prepare for loss of power, potential damage to

[40] ENERGEX data including calls for both the Loss of Supply/Emergency number and the General Enquiries number.

property or isolation for periods of time. These submissions recommended a similar campaign should be instigated for other areas of Queensland prior to the storm season. These campaigns (utilising print media, television, the internet and radio) could include details such as the need for a battery-powered radio and which radio stations ENERGEX outage information will be broadcast. Additionally, during major outages, ENERGEX's Contact Centre IVR system should be updated with a general message detailing which media stations will broadcast updates.

At the time of the storms ENERGEX had in place a number of media strategies to provide information to the public. ENERGEX accepts that these did not operate satisfactorily. It has taken steps to improve the effectiveness of such strategies to reduce the volume of calls (and in particular repeat calls) to the Contact Centres. ENERGEX also accepts the need to improve their current internal processes for obtaining accurate and up-to-date information from field personnel on outage durations.

9.4 Public Submissions on ENERGEX and Ergon Energy's Contact Centres

The Panel received a significant number of submissions with relation to the performance of ENERGEX and Ergon Energy's contact centres. Meeting with the RECs also reinforced the view that neither ENERGEX nor Ergon Energy fulfilled their obligations in relation to communication, particularly in providing accurate and timely information to the public.

The most common concerns raised by submitters regarding the contact centres included:

- Inability to get through to contact centres in times of bad weather;
- Provision of incorrect outage information (i.e. customers being told there are no outages in their areas when they in fact had no power. Some submitters reported being told this on more than one occasion during the same outage);
- Inability of contact centre personnel to provide information about when power will be restored;
- Contact centre personnel's inability to tell customers why an outage has occurred;
- Contact Centre personnel's inability to communicate the issues to customers (submitters reported they didn't understand what call centre personnel were telling them); and
- Difficulty for customers in explaining the problem to contact centre personnel.

In relation to the Ergon Energy Contact Centre, there were several submissions that raised the issue of contact centre personnel not having local knowledge about regional Queensland. Of particular concern to the Panel was an example given by one

submitter with a scenario of an emergency event with powerlines down where the contact centre representative was unable to recognise the location of the emergency.

Both ENERGEX and Ergon Energy utilise customer focus groups to assist in understanding the expectations of different customer groups. Both distributors noted in their submissions to the Panel that customer focus studies into customer values and preferences showed that customers are seeking to have their uncertainty reduced through improved customer service, in particular, more accurate estimation of restoration times. The Panel recognises that while this is a noble aim for the distributors, there are difficulties in providing estimated outage times to the public or industry, especially in relation to legal ramifications if actual outage times are longer than indicated.

The information obtained from the public submissions reinforced the value of conducting the external review of ENERGEX and Ergon Energy's Contact Centres instigated in December 2003. The recommendations from that review are included in the next section.

9.5 Recommendations from the External Review of ENERGEX and Ergon Energy Contact Centres

The review instigated in December 2003 was undertaken by consulting group CCD with an objective to assess current systems and processes utilised by the contact centres and to make recommendations for improving customer service. The review consisted of three key components:

- A Current Service Delivery Review incorporating:
  - Customer access;
  - Interactive Voice Response (IVR) infrastructure;
  - Call handling;
  - Customer satisfaction; and
  - Key performance indicators;
- A customer satisfaction survey which assessed customer satisfaction in relation to the manner in which the Contact Centres handled the logging of complaints; and
- A service quality benchmark study across the electricity, gas and water utility sector within Australia, covering critical Contact Centre operational elements.

The key findings and recommendations from the Call Centre Development Report are detailed in Table 9.7A.

As noted in section 9.2, following the storms in January 2004 the distributors have implemented a number of improvements to their Contact Centres.

ENERGEX also advised the Panel that from July 2004 it intended moving to a standard of 70% of calls being answered in 30 seconds. Previously, its target was 60% of calls being answered in 40 seconds. This will bring ENERGEX more in line with other major utility businesses.

The Panel is aware that Ergon Energy has also made some improvements to its Contact Centre in accordance with upgrades that it had previously scheduled.

Table 9.7A – Findings and recommendations from the CCD Report

CCD Report Findings	CCD Report Recommendations
Finding 1 The Benchmark Study findings indicate that both energy providers, particularly ENERGEX, are below industry standard for call handling service levels during normal operations. Call handling service levels are usually measured by the average time a customer is required to wait in a queue before speaking to a staff member, the percentage of calls answered within a specific time-frame (grade of service), and the percentage of callers hanging up before speaking with a customer service representative. However, the definitions used by the corporations are inconsistent resulting in difficulties with measurement and benchmarking.	• Implement improved grade of service standard to 70% of calls answered within 20 seconds; • Implement end-to-end monitoring of unsuccessful calls; and • Implement minimum performance standards using a common and standard definition.
Finding 2 ENERGEX has insufficient capacity to manage the day-to-day call volumes into its Customer Service IVR as approximately 20% of inbound calls are receiving a busy tone.	ENERGEX needs to assign more capacity to the customer service access arrangement to remove the issue of large volumes of busy tone calls during normal operations.
Finding 3 Neither ENERGEX nor Ergon Energy has sufficient capacity to effectively manage the call volumes which result from large-scale power outages (call avalanche events). Because the concentration of population in south east Queensland places ENERGEX at greater risk of large scale outages than Ergon Energy, it follows that the capacity requirements of each electricity provider will differ.	Implement enhanced outage management capability by: • Setting local IVR targets for both providers based on the benchmark results. The providers will need to ensure that from an end-to-end perspective the infrastructure is able to support management of the required capacity levels; • Investigating the use of network IVR to improve the overall capacity to handle large scale call volumes during avalanche situations; and • Investigating opportunities to increase focus on the use of media as a means of providing customers with up-to-date information regarding restoration of service.
Finding 4 Both ENERGEX and Ergon Energy receive emergency calls via their Faults IVR, placing	• Implement a dedicated emergency line to ensure that genuine emergency calls during a large scale

CCD Report Findings	CCD Report Recommendations
emergency calls via their Faults IVR, placing customers reporting emergencies at risk of receiving a busy tone during a call avalanche situation. International benchmarking studies demonstrate that a separate emergency line can ensure customers with a genuine emergency during a call avalanche situation never receive a busy tone.	outage never receive a busy tone; and • Alter directory listings to include the emergency number.
Finding 5 The menu structure of both Contact Centre's customer service IVRs is below industry benchmark and IVR best practice. ENERGEX in particular has a very complex menu structure for customer service access.	Implement a simplified IVR menu structure based on benchmark results.
Finding 6 The Customer Satisfaction Survey identified that advice to customers on the complaint handling process and what happens next is of primary importance to improving customer satisfaction. No customer comments captured during the survey process indicated that customers were consistently advised of timeframes for call back or resolution of their complaint.	Both energy providers should consider implementation of a process for informing customers what will happen next with their complaint, together with timeframes.
Finding 7 The Customer Satisfaction Survey identified, in ENERGEX's case that 20% of customers were very dissatisfied with the way their complaint was handled at the first point of contact. (The Panel notes that ENERGEX also had 38% of customers who regarded complaint handling to be very satisfactory.)	• ENERGEX to conduct pinpoint training and development around complaints management; • ENERGEX and Ergon Energy to enhance reporting frameworks so that performance in relation to all complaint handling measures are included; and • The Office of Energy conduct regular complaint handling surveys on both entities using the results of the initial survey, conducted as part of the service study, as a benchmark.
Finding 8 The ENERGEX complaints management process does not allow for the capture and logging of all complaints. In addition its complaint reporting framework does not include regular reporting on all performance measures.	• ENERGEX to implement processes to ensure 100% logging of complaints; and • Ergon Energy to review its complaints logging capacity.

In addition to the findings and recommendations in the Table 9.7A, the CCD Report recommended that ENERGEX and Ergon Energy be required to implement regulatory reporting on a monthly basis against defined graduated measures including grade of service, unsuccessful calls, average delays, customer satisfaction, complaints and blocked calls.

9.6 Findings and Recommendations

Finding 9.1 – ENERGEX and Ergon Energy – Call Centres

- **It is unrealistic to expect that any call centre should be able to respond to the exceptionally high number of calls that ENERGEX received during the 2004 storms; and**
- **Steps should have been in place to reduce the number of calls being made to ENERGEX and Ergon Energy's Contact Centres in times of major outages by using alternative means for keeping customers informed (e.g. more informative and regular radio updates). The Panel notes ENERGEX's improved use of these communication channels during the cyclonic storm event on 5-6 March 2004. It also notes the difficulties associated with this in regional areas where radio stations broadcast national network programs which cannot easily be interrupted locally at short notice.**

Finding 9.2 - ENERGEX and Ergon Energy – CCD Report

- **The Panel endorses the recommendations as provided in Table 9.7A with the proviso that the recommendation in CCD Finding 1 (that an improved service standard of answering 70% of calls within 20 seconds) only be implemented if it can be done on a cost effective basis.**

Recommendations

- **ENERGEX and Ergon Energy should ensure that regular training occurs prior to the commencement of the storm season to assist in their coordination of activities involved in the restoration of power to the public and the communication of outage information. These training sessions should involve a mock scenario and include personnel from public relations, contact centre and control room personnel, as well as field workers;**
- **Both ENERGEX and Ergon Energy should investigate opportunities to increase focus on the use of media as a means of providing customers with up to date information regarding restoration of service and reducing the number of telephone calls made to contact centres. This should include developing agreements with specific media groups and/or radio stations to broadcast up-to-date information on a regular basis during major outages. The distributors should also raise awareness of measures that will enable the customers to access useful information in the event of an outage. This campaign should include measures which will reduce the reliance of the public on the ENERGEX and Ergon Energy Contact Centres in times of major power disruptions; and**
- **The Office of Energy should work with ENERGEX and Ergon Energy in the implementation of the CCD Report's recommendations. Additionally, both distributors should work with the Office of Energy in developing service standards and performance indicators which will be reported on a quarterly basis.**

10

ENERGEX AND ERGON ENERGY'S RESOURCING

To achieve the ambitious plans for proposed capital and operating expenditure over the next few years, ENERGEX and Ergon Energy will require an adequate number of well trained and experienced workers across a range of skills. This Chapter takes a high level view of the adequacy of ENERGEX and Ergon Energy's current resources to meet this need.

10.1 Employees of the Distributors

For the purpose of this Report, the following definitions should be applied when reading the graphs:

- ENERGEX
  - "Field Personnel" "includes supervisors, technical servicepersons and power workers (including apprentices); and
  - "Office Personnel" includes managerial, professional, para-professional, administrative, technical, casual and temporary employees. Included within this category would be technical employees in the para-professional and technical categories who would otherwise be included in field personnel. Isolating this group for data capture was not possible for ENERGEX.
- Ergon Energy
  - The definition of "Field Personnel" is slightly more complex for Ergon Energy as the company inherited over a thousand job titles from the merger of the six former regional organisations. Ergon Energy has only recently narrowed its list of field worker titles. As such it now includes apprentices and trainees, trade workers, power workers, depot supervisors, trade and workshop technicians, supervisors, line inspectors and auditors, warehouse personnel and supply officers; and
  - The balance of employees within Ergon Energy (i.e. those that are not considered 'field personnel') are defined as "Office-Personnel". As with ENERGEX, paraprofessionals are captured within "Office-Personnel".

10.2 Current Personnel Numbers and Age Profiles

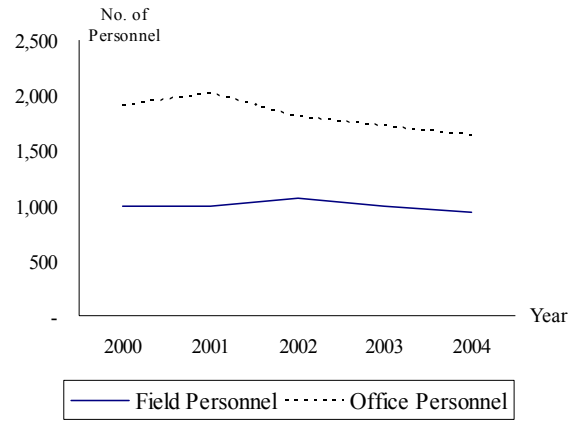
This section overviews ENERGEX and Ergon Energy's current personnel levels and age profiles.

ENERGEX Personnel Numbers and Profiles

Graph 10.2A shows ENERGEX's total number of full time equivalent (FTE) field and office personnel for 2000 to 2004. ENERGEX's field personnel have decreased between 2000 and 2004 and are now some 13% below the levels in 2000. The office personnel levels have remained relatively stable.

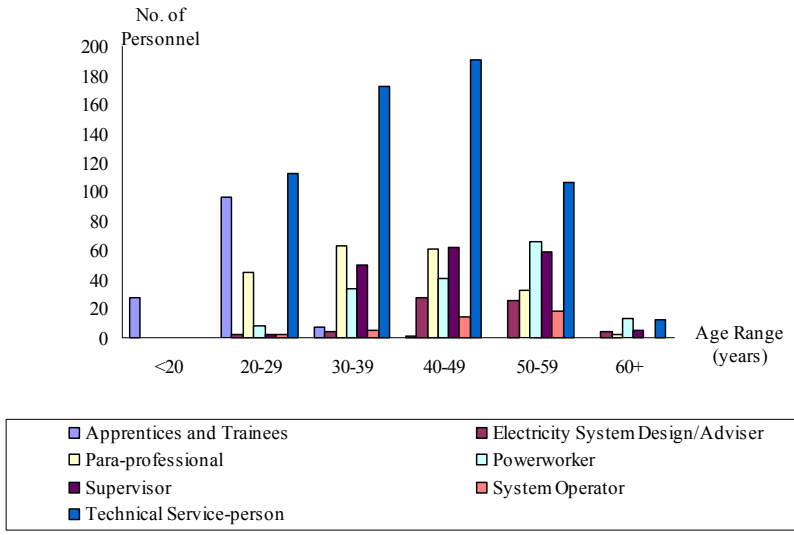
With the projected increased expenditure on both capital and maintenance areas proposed by ENERGEX in the near future, the Panel believes that more field and technical personnel will be required to undertake this work.

Graph 10.2A – ENERGEX Office and Field Personnel – 2000 to 2004



Source – ENERGEX 2004

Graph 10.2B - ENERGEX Age Profile of Field Personnel



Source – ENERGEX 2004

Graph 10.2B suggests that ENERGEX currently has a workforce skewed towards older workers, with about 54% of its field personnel are more than 40 years of age and 25% of field personnel are over 50 years of age. It is common for field personnel, and in particular line workers, to move to other duties or retire when they reach their mid to late fifties.

The age profile of the field personnel raises serious concerns about ENERGEX's capacity to complete its proposed operational and capital works programmes in the short to medium term. ENERGEX should give priority to recruiting young but experienced line workers (i.e. power workers) in the 25 to 35 year age range. The Panel is aware that these resources are in short supply across Australia at this time.

While the recruitment of apprentices is important, there is a need to ensure that some experienced people are recruited into the workforce to improve its overall age profile.

Other categories raise similar concerns, particularly system operators and technical service persons.

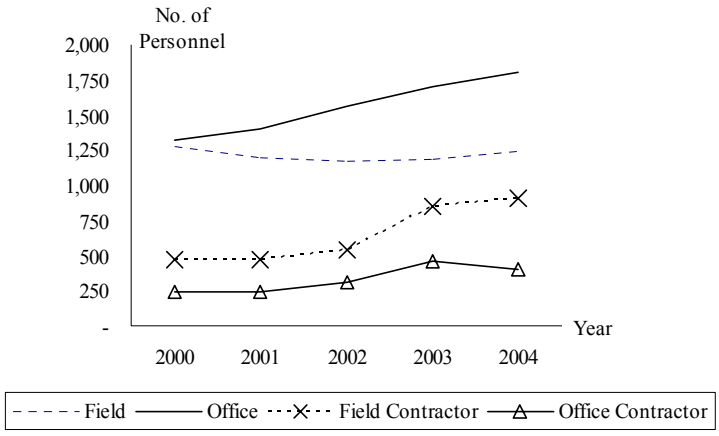
Ergon Energy Personnel Numbers and Age Profiles

Graph 10.2C details the number of office and field personnel (i.e. core Ergon Energy personnel and contractors) for the period 2000 to 2004.

Although there has been a slight decrease in the number of core field personnel, the number of contract field personnel almost doubled (an increase of 431 FTEs), with an overall increase for all field workers of 397 FTEs (as illustrated in Graph 10.2D).

Provided that there is a reasonable base of core field personnel it is an appropriate strategy to make use of contract workers to cover the increased work loads that have occurred and are projected to continue well into the future.

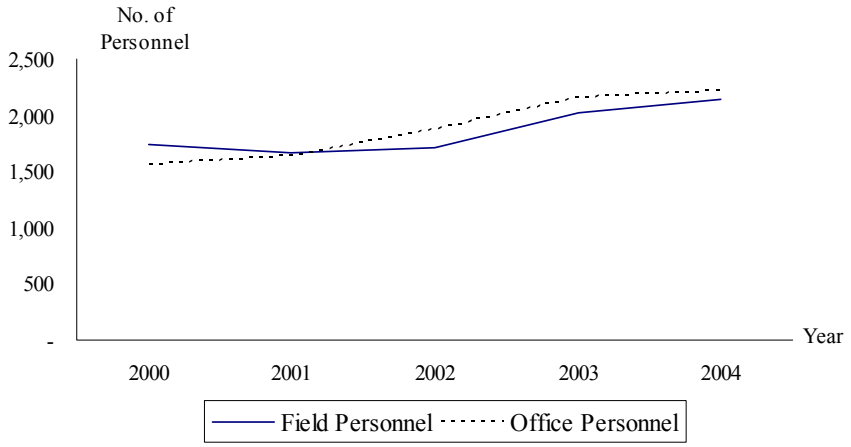
Graph 10.2C – Ergon Energy Field and Office Employees and Contractors Breakdown - 2000 to 2004



Source: Ergon Energy 2004

The Panel notes the steady increase in office personnel over the period and assumes that significant numbers are involved in technical support roles to aid the work of the field personnel. Graph 10.2D illustrates the total number of field and office personnel working for Ergon Energy.

Graph 10.2D – Ergon Energy Field and Office Employees and Contractors Total - 2000 to 2004

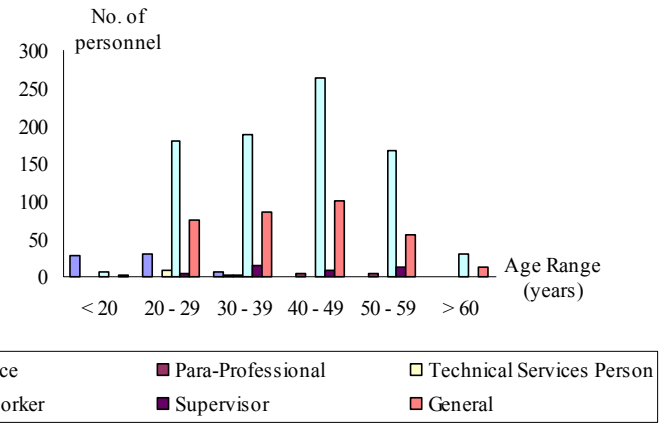


Source – Ergon Energy 2004

Graph 10.2E suggests that Ergon Energy currently has a workforce skewed towards older workers, with about 51% of its core field personnel are more than 40 years of age and 22% of field personnel are more than 50 years of age.

The age profile of the field personnel raises some concerns about Ergon Energy's capacity to complete its proposed operational and capital works programmes in the short to medium term. It is noted that the use of contractors does to some extent mitigate these concerns.

Graph 10.2E – Ergon Energy Age Profile of Core Field Personnel



Source: Ergon Energy 2004

10.3 Skilled Field Worker Shortages and Apprentice Numbers

In relation to availability of administrative office personnel, the Panel believes that both distributors are currently well serviced. However, as noted above, this is not the case for experienced field workers, planning engineers and protection engineers, all of whom are in short supply across Australia.

During discussions with both ENERGEX and Ergon Energy field personnel throughout Queensland, the Panel heard evidence that there is currently a shortage of experienced linesmen, cable jointers and electrical fitter-mechanics. The Panel is aware that this is the case not only in Queensland, but also nationally and internationally. Despite Ergon Energy's recruitment initiatives, there remains a considerable number of existing positions for field personnel unfilled in some rural and remote locations.

The age profiles of the technical workforces in both ENERGEX and Ergon Energy are such that over the next 10 years significant numbers of the existing workforces will be considering retirement. This presents a major risk to the future reliability of the networks for two reasons. Firstly, a properly skilled and resourced work force is needed to simply maintain the networks in their current state. Secondly, both

ENERGEX and Ergon Energy have major capital investment programmes planned and a lack of suitably qualified and experienced personnel will severely limit their ability to complete this work.

The Panel believes this shortage of suitably qualified and experienced field and technical personnel represents a risk to the Queensland industry. It is of the view that it is imperative that steps be taken urgently to address this problem.

10.4 Apprentice Numbers of ENERGEX and Ergon Energy

Table 10.4A provides an overview of the number of apprentices appointed by ENERGEX and Ergon Energy for the period 2001 to 2004.

Table 10.4A – Apprentice numbers ENERGEX and Ergon Energy

Year	ENERGEX Apprentice Numbers	Ergon Energy Apprentice Numbers
2001	35	55
2002	26	30
2003	41	19
2004	24	76

Source: ENERGEX, Ergon Energy 2004

Ergon Energy recruited 76 new apprentices in 2004, in contrast with 19 in 2003 and 30 in 2002. In total, Ergon Energy currently has 180 apprentices at various stages of training.

For ENERGEX, despite plans to significantly increase its capital and operational expenditure, there has been no corresponding increase in apprentice numbers preceding these plans. ENERGEX currently has 125 apprentices at various stages of training.

While it may seem an attractive short term financial option to reduce amounts spent on recruiting and training the distributors' work forces, the longer term repercussions are very serious. The Panel believes that the position has been reached where a major risk is faced if steps are not taken immediately to invest more in recruiting and training the work force of the future.

10.5 Apprentice Training Facilities and Schemes

Currently both ENERGEX and Ergon Energy run individual Enterprise Registered Training Organisations (RTOs) known as EsiTrain and ISES respectively. Along with several other RTOs from other energy businesses throughout Australia, these facilities located within Brisbane for ENERGEX and Townsville and Rockhampton for Ergon Energy provide the technical competency training supplementing TAFE-

based training for the electricity distribution businesses. These facilities are needed because, particularly for lines-people, such skills cannot be taught at a traditional TAFE institute, as TAFE does not have the infrastructure to undertake training (i.e. the poles, cables or overhead lines and associated equipment).

The Panel believes that there is significant potential for the distributors to work together to train field workers. Options for more efficient delivery of training should be explored. This could include combining the training facilities under one programme through to the outsourcing of the training to an appropriate TAFE or similar organisation.

10.6 Future Resourcing Plans

The Panel understands that Ergon Energy has finalised a resourcing plan for 2004/05, which sets the platform for the next three years and that ENERGEX is still finalising its resourcing plan for the next 12 months.

Ergon Energy's resourcing plan shows that:

- The total works programme for 2004/05 is 3.4 million hours, up from 2.8 million hours in 2003/04;
- The main increases in planned hours are in the capital and maintenance areas for Ergon Energy;
- Even allowing for 6% recruitment growth, the filling of existing vacancies and utilisation of turnkey style outsourcing, there remains a 410,000 hour shortfall in the Transmission and Design Services Division. Use of contractors will necessarily be significant; and
- It is also noted that the Northern and Southern Operations regions are significantly under-resourced to meet the 2004/05 work programme.

As ENERGEX and Ergon Energy are competing in the same employment pool, it is essential that they have thorough and well thought through strategic plans for their resources.

10.7 Findings and Recommendations

Finding 10.1 – ENERGEX and Ergon Energy – Resourcing

- **The distributors' field workforces (i.e. linesmen, cable jointers and electrical fitter-mechanics) have been reduced to levels where very significant risk exists that the networks will not be able to be adequately maintained and that essential work will not be able to be carried out with current personnel levels. The increased expenditure planned in the next five years exacerbates the problem. This is a risk for both Ergon Energy and ENERGEX;**
- **Against the background of an ageing workforce and increased planned expenditure on the networks, the Panel believes that the distributors' apprenticeship intake has been too low for a prolonged period, which has led to a shortage of experienced workers;**
- **The Panel notes that ENERGEX currently has not yet finalised its resourcing plan for 2004/05 and given proposed expenditure increases especially in the capital programme, there is a risk that current resourcing will not support these proposed programmes. The Panel notes that Ergon Energy has a resource plan for 2004/05; and**
- **ENERGEX and Ergon Energy's proposed capital expenditure programmes are at risk, given their current levels of resourcing.**

Recommendation

- **A joint working party including representatives of ENERGEX and Ergon Energy should be established to plan and implement joint training arrangements including apprenticeship training, training facilities and TAFE involvement in training; and**
- **Each distribution business should immediately put in place a fully documented plan as to the resources needed over the next five to ten years and the steps that will need to be taken to recruit and train the necessary personnel.**

11

STORMS AND HOT WEATHER IN EARLY 2004

The purpose of this chapter is to examine:

- Whether the storms in January and March 2004 and the hot weather in February 2004 were so extreme for South East Queensland that ENERGEX could not reasonably have been expected to plan for them;
- ENERGEX's reliability performance during this period; and
- How ENERGEX responded to the weather events that occurred during this period.

This chapter focuses on ENERGEX because it was most affected by the storms and hot weather in early 2004.

11.1 Queensland's Weather

There is a great variety of weather conditions across Queensland. Data from the Bureau of Meteorology indicates that Queensland experiences some of the hottest average summer temperatures in Australia, averaging 33^0C to 36^0C in parts of western Queensland. Queensland also has some of the wettest parts of Australia, with annual rainfall in excess of 3200mm, and amongst the driest, with some areas having average annual rainfall of less than 300mm.

In addition to these extremes in temperature and rainfall, Queensland also has some of Australia's highest incidences of lightning strikes.

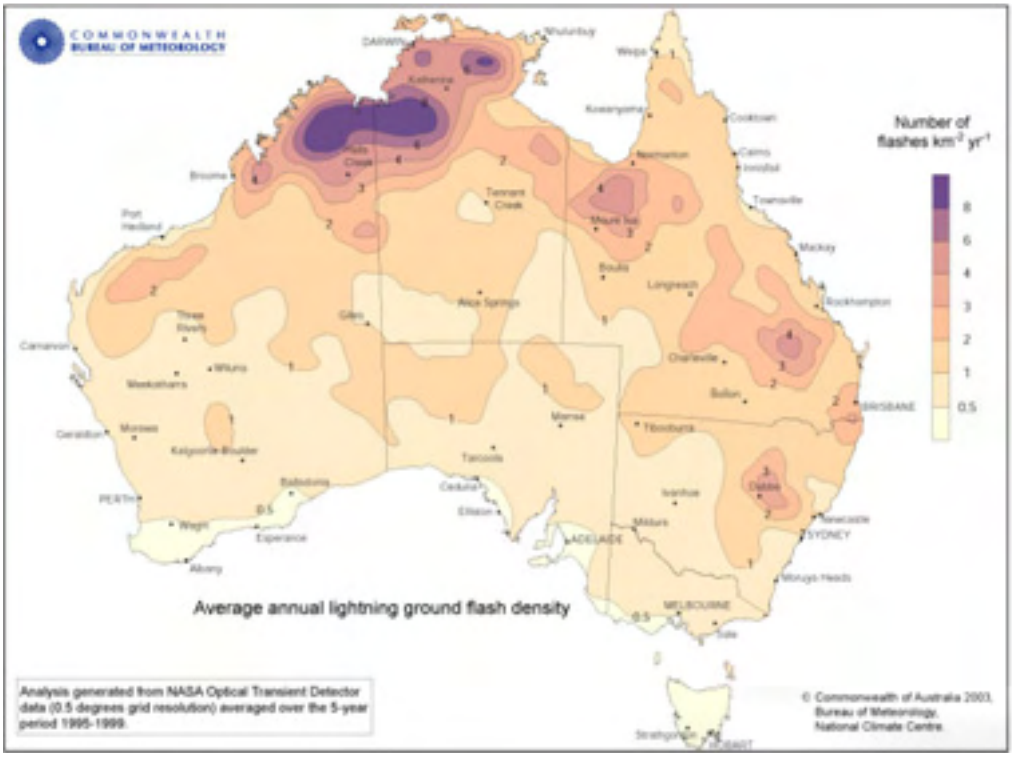
These weather conditions are important considerations for ENERGEX and Ergon Energy in planning, maintaining and operating the electricity distribution system. Ergon Energy, in particular, with 145,000 kilometres of powerlines across 1,698,100 square kilometres of Queensland, is subject to all of the extremes in temperature, rainfall and lightning strikes.

Although ENERGEX has significantly less distance of powerlines to maintain than Ergon Energy within a much smaller service area (approximately 45,000 kilometres of powerlines across an area of 25,264 square kilometres), it has significantly higher customer densities so that a fault caused by weather conditions can impact upon a greater number of customers.

Lightning Strikes

Lightning is a significant contributor to outages within both ENERGEX and Ergon Energy's service areas. As is illustrated in the Chart 11.1A from the Bureau of Meteorology, Queensland has some of the highest incidences of lightning strikes in Australia.[41]

Chart 11.1A – Incidence of Lightning Strikes 1990-1999



Source: Bureau of Meteorology

Lightning is most concentrated in northern Australia, with the highest intensity in north Western Australia and the Northern Territory. Queensland has significant areas of high lightning concentration across the State, with Brisbane and the surrounding area having the second highest lightning intensity of the Australian capital cities, behind Darwin.

Data from Ergon Energy and ENERGEX indicates that lightning is a major contributor to sustained outages in their service areas, accounting for approximately 5.6% of outages for ENERGEX and 20% of outages for Ergon Energy in 2002/03. The data suggest that lightning strikes will continue to pose problems for the

[41] For the purposes of this map, lightning is defined as "all of the various forms of electrical discharge produced by thunderstorms" (Bureau of Meteorology, *Estimates of Lightning Occurrences by the Satellite Mounted Optical Transient Detector Analysis for the Australian Region*).

distributors in Queensland despite preventative measures and ongoing retrofitting of earth-wires to lines. These lightning strikes are typically accompanied by heavy storm activity that damages trees and other objects, which may further interfere with power lines.

11.2 Storm Events in ENERGEX's Area in January 2004

The series of severe thunderstorms in ENERGEX's area in the last week of January 2004 resulted in large numbers of customers being without power for extended periods.

Storm statistics provided to the Panel by ENERGEX for the period 24 to 30 January are detailed in Table 11.2A.

Table 11.2A: ENERGEX Storm Statistics 24 – 30 January 2004

Date	Number of Feeder outages	Number of Field Jobs	Number of Wires Down	Max number of Customers without Supply
24/1/04, Saturday	60	756	185	34,000
25/1/04, Sunday	82	1,460	240	60,000
28/1/04, Wednesday	160	1,986	618	90,000
29/1/04, Thursday	103	1,420	223	60,000
30/1/04, Friday	203	4,767	1,386	120,700

Source: ENERGEX, 2004

The storms over these five days brought with them extensive lightning and winds reported up to 145km/hour, which brought down many trees and caused widespread damage to ENERGEX's powerlines, transformers and cross-arms. Restoring supply across the system required almost 10,400 field jobs in one week, which is about 4.5 times ENERGEX's monthly average of 2,400 jobs. These jobs were performed by:

- 200 ENERGEX crews, comprising about 1,700 employees;
- Supplementary field workers from Ergon Energy, Powerlink and ENERGEX's contractors; and
- 57 field workers from NSW and Victorian distribution businesses.

The worst storm occurred on 30 January when more than 120,000 ENERGEX customers suffered outages. The most severely affected area was Brisbane's southern suburbs, with customers in Lytton having the longest average outage of more than 27 hours. The longest restoration time was in Wynnum, where some customers' outages lasted more than 34 hours.

The January storms were followed by two days of very high winds (up to 130km/hour) and heavy rain on 5 and 6 March 2004. The outages associated with these storms are discussed in Chapter 6 of this Report.

ENERGEX provided information to the Panel in relation to the January storms which indicated that while:

- The individual storms were not unusual occurrences in south east Queensland for that time of the year - the period October to March often experiences high storm activity; and
- There have been individual recordings of more destructive storms in recent years;

the sequence of the five severe storms within a week was very unusual.

In material submitted to the Panel, ENERGEX cited a Sunday Mail report on 1 February 2004 which quoted a Bureau of Meteorology representative as saying *"Its pretty unique to get that number of storms in such a short period" and that "The cumulative effect of having a storm day after day is significant".*

In support of this, ENERGEX provided Table 11.2B to the Panel, which compares the effect of the January 2004 storms with the severe storms of January 1985 (where wind speeds reached about 145km/hour) and November 1998 (where wind speeds reached about 100 km/hour).

Table 11.2B: ENERGEX – Comparison of Severe Storm Activity

Year	SAIDI (minutes)	Customers affected
January 1985	260	80,000
November 1998	35	100,000
January 2004	118 [(a)]	120,700

Source: ENERGEX, 2004
(a) ENERGEX advised that this is a preliminary estimate of SAIDI.

Table 11.2B indicates that the January 2004 storms affected more customers than the storms in the other two years and that the 118 SAIDI minutes lost were considerably lower than the 1985 levels but considerably higher than the 1998 levels. It is noted that the 118 SAIDI minutes represent more than half the total SAIDI reported in ENERGEX's area for the 2002/03 year.

As is discussed further in Chapter 9, ENERGEX experienced extremely high volumes of calls from customers seeking information about outages during late January. ENERGEX has provided information to the Panel indicating that in the four days between 28 January and 31 January, the public made more than 1 million attempts to contact ENERGEX by telephone, which is almost double the total number made to ENERGEX during all of 2003.

The volume of these calls greatly exceeded the capacity of both ENERGEX's Interactive Voice Response (IVR) units and the Telstra network. As a consequence, many customers received a busy tone during this period. As an immediate response, ENERGEX introduced extra IVR capacity and additional telephone lines on 1 February 2004.

ENERGEX also commissioned an internal inquiry, which identified four areas to improve the performance of ENERGEX's existing operations for managing the effects of major outages. These were to:

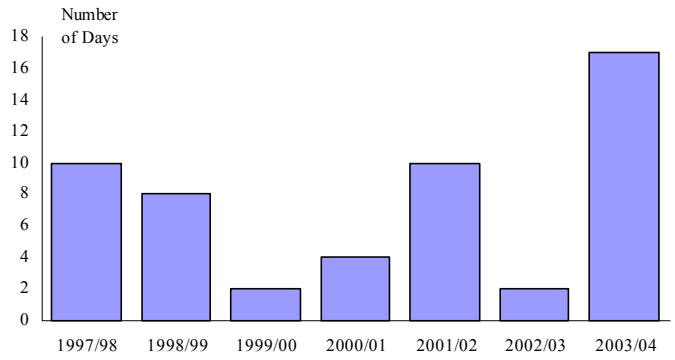
- Improve the ability to provide timely and accurate information to a large number of people by:
  - Making better use of mass communications media;
  - Better using technology to provide information to the public;
  - Changing the basis of automated information systems from postcodes to information about the network relevant to the customer; and
  - Monitoring the quality and operation of information systems and improving contingency plans;
- Improve the quality and effectiveness of information flow to and from field centres;
- Improve the prioritisation and organisation of work as it is dispatched from regional resource coordination centres; and
- Improve organisational contingency planning and coordination with other authorities.

11.3 Hot Weather in South East Queensland in February 2004

Between 16 February and 23 February 2004, south east Queensland experienced a period of extremely hot weather caused by stagnant tropical continental air. Temperatures in Brisbane reached a maximum of 41^0C on 22 February, which broke the previous recorded high of 39.9^0C reached 80 years ago. The Gold Coast also exceeded its previous recorded high reaching 40.5^0C on 21 February.

Graph 11.3A shows that as well as individual days of extremely hot weather, the overall number of very hot days in the summer of 2003/04 was significantly greater than any of the last six years.

Graph 11.3A – Number of Days Above 28.5 Degrees Average Temperature - Brisbane



Source: Powerlink, 2004

On 16 February 2004, ENERGEX recorded a maximum demand of 3,835MW, which is about 750MW above the average summer day at 30^0C. This increase was largely driven by the use of air-conditioners. In material submitted to the Panel, ENERGEX noted that:

> *The impact of this high increase in maximum demand was to load many items of plant and equipment at the High Voltage (H.V.) system level to their ratings. No significant interruptions occurred to customers due to this loading. However, some local area interruptions occurred at the Low Voltage (L.V.) distribution level (mainly due to fuses blowing).*
>
> *At the 33,000V/11,000V zone sub-station level, the assessed load at risk, based on the firm capacity planning criteria, due to the 2003/04 extreme hot weather was 535MW (i.e. 11% of an installed capacity of 4860MW).*

It is clear that, although ENERGEX averted significant outages during this period[42], the system was very heavily loaded and was being operated very near, or at, its maximum capacity in many areas. As is discussed more fully in Chapter 6, the Panel believes that this high loading is an outcome of ENERGEX's extended use of RAP as ENERGEX's primary planning philosophy, instead of an "N-1" approach for critical assets. In the Panel's view, the continued use of RAP has created an unacceptable level of risk of extended supply interruptions in parts of the system in the event of equipment failure.

For this reason, the Panel supports ENERGEX's recent move to adopt an "N-1" planning criteria for the majority of its network but believes that achieving a higher level of system security will take an extended period of time to achieve. In the meantime, ENERGEX faces the prospect of the system remaining heavily constrained if peak demand grows according to current forecasts and air-conditioning usage continues to rise.

[42] ENERGEX's SAIDI performance increased from about 0.5 minutes on a normal day to around four minutes on hottest days in February 2004.

12

SINGLE WIRE EARTH RETURN, DEMAND MANAGEMENT AND SPECIAL DIVIDENDS

The purpose of this chapter is to set out the Panel's findings in relation to the very large proportion of the Queensland network that is supplied by the Single Wire Earth Return System (SWER) system, and in relation to tariffs and demand management mechanisms used by Ergon Energy and ENERGEX in Queensland. The Chapter also considers the special dividends paid by the distributors to the Government.

These three issues were raised consistently in submissions made to the Panel, in discussions with Regional Electricity Councils and in discussions held with the QCA and Ergon Energy and ENERGEX.

12.1 Single Wire Earth Return (SWER) Systems

Nature and Extent of SWER in Queensland

Single Wire Earth Return (SWER) feeders consist of an isolating transformer, which converts electricity from the voltage on the "backbone" system (33kV, 22kV or 11kV) to the SWER voltage (typically 19.1kV and 12.7kV). The SWER voltage uses a single wire (and the earth as a return path) to distribute power to each customer. At the customer's premises, a SWER transformer converts from the SWER voltage to 240 volts for the customer's use.

SWER lines have been successfully used to supply electricity to sparsely populated areas in New Zealand, Australia, Canada, India, Brazil, Africa and Asia. They are the preferred methods of supplying remote customers because they are cost effective and reasonably reliable alternatives to stand alone remote area power supply systems.

Unlike multiple wire systems with cross-arm supports seen within city and urban areas, SWER lines do not have cross-arms or braces. This design adds to the economic viability of SWER, with the approximate costs of a SWER line being around $9,000/km compared with $15,000/km for a two wire line of similar capacity and $30,000/km for a 3-phase network (at three times the capacity of a SWER line).

In order to meet its cost constraints, SWER is constructed using small diameter, high strength steel conductor, and widely spaced poles. This limits its ability to supply large loads.

Nearly 200,000km of SWER lines are currently in use in rural areas of Australia, of which approximately 65,000km are owned by Ergon Energy in Queensland. Ergon Energy estimates there are approximately 68,200 customers connected to its long rural network, with many of these customers serviced by SWER.

By any measure, Ergon Energy's SWER system is extensive. It adds an additional 65,000 km of line to the 51,000 km of high voltage backbone line.

Challenges in Operating a SWER Network

The main challenge in operating and being supplied from a SWER system is the limited load carrying capability, and the long distances that energy travels. The line itself has a high level of exposure to the elements, particularly storms. A lightning strike, for example, on an unmeshed SWER network has a greater adverse effect on the power quality than a meshed network. This gives a lack of system security, and therefore poor service quality outcomes for customers.

The largest factor in the unreliability of supply in a SWER line is its linear design. While a non-meshed design minimises the cost of constructing a network to sparsely populated areas, reliability is reduced because any fault in a part of the network results in all the "downstream" parts of that linear network losing supply. In many instances, it can also impact upon the reliability of the upstream supply system.

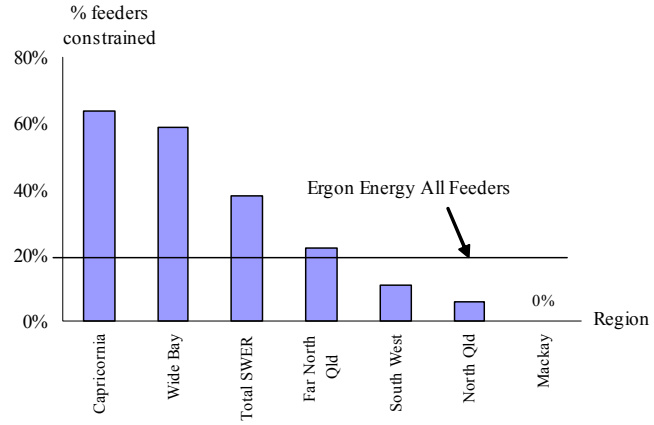
Voltage problems are also common in SWER lines. Voltage drops increase with the length of the line and the electrical load being supplied. Because SWER lines generally transport electricity over long distances, voltage drops in a SWER line are generally high.

The reliability of a network supplied by SWER is also impacted significantly by customers' electricity usage patterns. Any sudden increase in demand for electricity reduces the voltage of the supply to the user's premises and to other users. This was a common theme in public submissions to the Panel.

Given these limitations, the Panel is aware that customers attached to SWER are restricted in the type of appliances that can be connected and the number of appliances that can be used concurrently. SWER, for example has sufficient capacity to supply loads for items such as lighting, TV, radio, cookers, refrigerators and moderately sized water pumps, but cannot be used for large items such as irrigation pumps, large air-conditioners and welders.

SWER lines exist across all of Ergon Energy's regions, with the majority in the Capricornia and South West Regions. The most common constraint in relation to these lines relates to voltage, causing quality of supply issues. Graph 12.1A shows Ergon Energy's current estimates of the extent of these constraints.

Graph 12.1A – Percentage of Ergon Energy's SWER Lines with Voltage Constraints in each Region



Source – Ergon Energy, 2004

The regions where SWER lines are most affected by voltage constraints are Capricornia and Wide Bay Burnett. The constraints limit Ergon Energy's ability to connect new loads in these areas, such as air conditioning, without further exacerbating existing voltage constraints on the lines. Lines originally intended to cope with lighting and refrigeration loads are now inadequate to meet the expectations of customers.

Possible Options to Improve SWER Reliability

Sparsely populated areas will be less reliable and more costly to supply than more populated areas. This is because electricity networks are expensive, and areas with small numbers of customers make recovery of asset investment difficult to achieve. Queensland has a highly dispersed population and there are many areas which are supplied by SWER lines. It follows that there is a very high cost associated with improving reliability to these customers.

The Panel notes that mandating "city like" reliability standards in these many areas supplied by SWER lines would require capital expenditure of many billions of dollars in order for small numbers of customers to have more reliable supply. This is not realistic.

The Panel considers there are several options for improving the supply of electricity in remote areas.

Firstly, the Panel notes that Ergon Energy in particular currently supplies remote and isolated customers as part of its commercial operations. Investments in improving reliability are therefore considered a commercial decision, and balanced against the financial returns from doing so. Not surprisingly, Ergon Energy does not invest heavily in replacing or augmenting SWER lines, with capital and operational

expenditure prioritisation tools ensuring that investment only takes place when unsustainable interruptions occur. One option may therefore be for Government to ensure that these investments are not assessed solely on the basis of commercial considerations, perhaps by transferring supply responsibilities for remote areas to a non-commercial Government entity.

Secondly, the Panel notes the various technologies either emerging or already available which might reduce the costs of remote area supply and assist in improving the reliability of supply. These options could include diesel/solar or diesel/wind hybrid systems, combined with SWER lines. Under current arrangements, Ergon Energy assumes the technical and financial risks associated with the SWER system, and customers assume the technical and financial risks associated with local generation options. Customer specific power conditioning devices may also improve quality of supply. Better outcomes may be possible if Ergon Energy shares some of the risk on local generation options or power conditioning equipment.

The Panel recommends that Government consider options for improving the reliability of supply in areas currently serviced by SWER lines. This could include removing areas which are predominantly supplied by SWER lines, and which are non-commercial activities for the distributors, away from the commercial activities of Ergon Energy, and investigating alternative means of supplying these customers.

12.2 Demand Side Management

This report has concentrated on the supply of electricity by ENERGEX and Ergon Energy to their customers, rather than the profile of electricity demand by Queensland customers. While the Terms of Reference did not require the Panel to consider demand side management in detail, the Panel sees merit in Government and the distributors working collaboratively to explore it further, as a means of managing the growth in peak demand.

Demand side management refers to initiatives undertaken either by distributors, retailers or customers to modify customer electricity demand and usage patterns. These initiatives can encourage customers to use energy more efficiently, for example, through the use of electrical appliances with high energy efficiency ratings, in order to reduce the overall consumption of electricity. Other examples include energy efficient building design and the installation of solar hot water systems to reduce the amount of electricity required for water heating during sunny days.

Grid connected photo-voltaic cells, while expensive, also offer prospects for the future in terms of peak lopping of summer peak demands.

The high incidence of air conditioning load in both ENERGEX and Ergon Energy's service areas results in a significant proportion of network capacity being utilised for relatively short periods. The Panel is aware that in some locations (such as Chicago, USA) distributors have arrangements with major customers to alter their load patterns at times of peak system demand, including major customers being compensated for

giving control of their air-conditioning thermostats to distributors to enable them to better manage the system peak. With proper management, each building may only have increased temperatures for very short periods.

Regulators in a number of Australian states have introduced legislative requirements, codes of practice or guidelines which provide a regulatory framework conducive to the active investigation and implementation of demand management programmes.

For example, in New South Wales the *Electricity Supply Act (NSW) 1995* requires Distribution Network Service Providers to hold a licence. Schedule 2(6)(5) of the NSW Act states requires each licence holder to:

> *....before expanding its distribution system or the capacity of its distribution system, to carry out investigations (being investigations to ascertain whether it would be cost effective to avoid or postpone the expansion by implementing demand management strategies) in circumstances in which it would be reasonable to expect that it would be cost effective to avoid or postpone the expansion by implementing such strategies.*

No equivalent legislative or regulatory provision exists in Queensland.

As well as an ongoing commitment to long-standing water heating programmes, ENERGEX has "plans in place to investigate and establish more DM strategies". Ergon is investigating increased use of local generation and other initiatives.

The Panel considers that the current effort on the development of demand management programmes within the network businesses is not commensurate with the capital expenditure programmes being proposed to cater for system growth and reliability. The Panel considers that a more robust framework, such as an explicit licence requirement, should be established to facilitate key developments in this area.

Demand management measures depend on customers to implement them, involve additional costs to the customers and require substantial time and customer involvement for them to have any discernable effects on electricity usage. These initiatives also require customers to see clearly the benefits to them from reducing load or flattening load peaks. This in turn requires tariff structures which allow these "price messages" to be received by the customer. Tariff structures currently in use in Queensland include "time-of-use" supply agreements which offer financial incentives to not use, or reduce the use of electricity. These agreements may relate to industrial processes, irrigation pumps, large water pipeline pumps and chillers for cold stores and large buildings.

The Panel considers there is scope for a review of the role played by tariffs in Queensland in managing peak demand.

KVA tariffs directly induce customers to install power factor correction equipment (also known as capacitors). Power factor is the relationship between the actual capacity required and the theoretical capacity required of an electrical device. By way

of example, a typical industrial plant will require around 25% more capacity in kVA terms compared to kW terms – a power factor of 75%. KVA tariffs charge the customer for the capacity supplied to them in kVA terms, rather than the capacity received by them in kW terms. The customer therefore has a financial incentive to reduce any "inefficiency" caused by low power factor at their premises.

By making the customer responsible for the difference between kVA and kW, the customer is induced to install power factor correction equipment. This in turn reduces the total load across the system and therefore acts as a demand management tool.

The Panel is aware that kVA charges are common practice across Australia and other parts of the world for major industrial and commercial customers. In other Australian states, this is also encouraged by regulation and financial incentives (or disincentives) where charges are applied on the basis of total capacity requirement.

12.3 Special Dividends Paid to the Queensland Government

The Panel was aware of the public and media speculation over dividend payments from ENERGEX and Ergon Energy to the Queensland Government and, in particular, whether these payments have impacted on the ability of the distributors to adequately maintain and develop their networks. The matter was also raised in a number of submissions from the public.

The Panel examined this matter and found that the distributors' ability to spend on the networks was not affected by the payment of the special dividends. Both distributors have access to the funds they require.

It should also be noted, that the initiative to pay the special dividends came from ENERGEX rather than from the Government.

Recommendation

- **Government and Ergon Energy should establish a joint taskforce to consider options for improving the reliability of supply in areas currently serviced by SWER lines; and**
- **The Panel recommends that Government and the distributors work together to develop tariff structures which better assist in the management of peak demand.**

Appendix 1
PUBLIC CONSULTATION – ISSUES PAPER

Summary of Key Issues

There were 122 submissions received during the consultation period for the Review. These submissions included material from each of the seven Regional Electricity Councils.

Submissions were received from a broad range of stakeholder groups with the major groups including: individuals (49% of submissions); local members (20% of total submissions were forwarded from Members of Parliament on behalf of constituents); consumer groups (8%), Local Government (6%, with the majority of these being received from regional councils) and business and industry (5%). Submissions were also received from the Electrical Trades Union, ENERGEX and Ergon Energy.

The majority of submissions were received from the region of the State covered by ENERGEX (58% of total submissions), with the area covered by Ergon Energy representing 36% of submissions. The remaining 5.8% of submissions were received from consumer groups representative of all of the State or interstate submissions.

Analysis of submissions showed that reliability was a key issue with more than 80% of all submissions raising this issue. Maintenance (including vegetation management) and communication were also key issues for the greater majority of submissions.

The overall quality of submissions was high with an overall consistency in the major issues raised by submitters. Any summary of the submissions cannot do justice to the valuable material that was provided. The submitters should be aware that the Panel read with interest every submission and has drawn many conclusions from the submitted material.

Reliability

In relation to reliability, generally respondents were not satisfied with their electricity supply for a range of reasons including:

- Poor quality of supply (especially in rural Queensland);
- The perceived increasing frequency of supply interruptions;
- The perceived increasing duration of supply interruptions, and

- The perception that the condition of the network has been allowed to deteriorate since distribution entities have become corporatised and focussed on profits rather than providing a reliable supply.

Communication

Submitters noted that issues relating to reliability were exacerbated by poor communication from the entities, especially in relation to their call centres. Of particular note were submitters' views on the inadequacy of the information provided to customers in relation to outage location, probable duration and restoration of supply.

Submissions noted for Ergon Energy's call centre that personnel often did not know where customers were when they rang to report an outage, seek information on the duration of the outage or to report a safety issue. (Submitters gave specific examples including that there were lines down, problems with street lights or power poles).

Submitters in the ENERGEX distribution area noted the poor performance of the automated system during the storms early in 2004, which was in their view, compounded by ENERGEX's poor use of the media to communicate the extent of the outages.

Overwhelmingly, submitters were seeking the improved use of the media by the entities during major outages (e.g. caused by extreme weather events) and improved automated messaging, including information on the estimated time of supply reconnection and locations of outages. There was also consistency within the submissions on the need for call centre personnel to be understanding and listen to customer problems when they were speaking with them.

Related to communication, submitters also are seeking more information to be made public by ENERGEX and Ergon Energy on the causes of outages by specific location and what they are doing to prevent future occurrences.

Vegetation Management

Vegetation management was also raised in a large number of submissions, especially in relation to the perceived poor preventative maintenance undertaken by ENERGEX prior to the storms early in 2004. Additionally, there was a common call across submissions for appropriate trees to be planted near powerlines, balancing the need for environmental protection and the reduction in power outages caused by vegetation. There was also a perception from a number of submitters that the entities used vegetation as a frequent 'excuse' for outages.

Maintenance

There was a broad range of comments made by submitters on current allocation of funds provided by the entities for maintenance. Submitters noted the need for increased spending on maintenance, due to ageing network (i.e. need for repairs, replacements and upgrades), rapid growth of the network into rural and semi-rural

areas, rapidly increasing loads on existing infrastructure, a likelihood of more frequent weather extremes and the need for increased reliability in the digital age.

Additionally, there was a significant number of comments made by submitters relating to personnel issues affecting the maintenance of the system, including the use of contractors and reductions in personnel numbers and training. It was also submitted that preventative maintenance had been reduced leading to more reactive maintenance and deterioration of the network.

Capital and Assets

Capital and assets were only commented on by a small number of submitters. Many of those who did comment believed that the electricity infrastructure in Queensland has not expanded sufficiently to provide for increases in electricity demand resulting from population and increased air conditioning usage.

A number of submissions also asserted that the high incidence of power outages is directly attributable to a lack of upgrades to electricity infrastructure. A key concern of many submitters was the age of the electricity infrastructure and the capital investment required in rural and city areas to replace aged equipment, to ensure reliability of supply and to meet future demand.

Willingness to Pay

The overwhelming response of those submitters who addressed this issue was that they were not willing to pay increased amounts for higher reliability. The few respondents who said they were willing to pay more usually added qualifications such as the need to compensate customers for breaches in supply standards if they occur.

Additionally some submitters (especially from rural and remote Queensland) felt that because electricity is an essential service, all areas should have the same high reliability and that the lower reliability in rural areas was discriminatory.

Internal Systems

Submissions that commented on internal systems noted issues in relation to the planning by entities, the reduction in personnel levels over recent years and the need to increase the number of apprenticeships to cater for future needs.

As noted previously, submitters sought more publicly available information from the distributors in relation to outages, the state of the network and specific information by location (e.g. maintenance spending and plans and capital work programmes).

There was a general concern from submitters that there had been insufficient expenditure on the network in recent years, as evidenced by the inability of the system to cope with the summer peaks although, understandably, there was little hard evidence to support these concerns.

Rural and Remote Queensland

There were also several comments regarding planning and investment decision making in relation to rural Queensland.

Some of the submissions raised concerns about the expense of connection to grid power (i.e. the customer contribution to the capital expenditure), and that once connected their supply was often extremely unreliable. Additionally it was noted by several submissions that Ergon Energy refuses to accept an instalment payment system for significant capital requirements, placing extreme hardship on individuals and communities.

There were also comments from both individual submissions and local Members of Parliament indicating that there are often significant delays in the connection time to new residences even within township boundaries.

Appendix 2
LIST OF SUBMITTERS

The following people or organisations provided submissions that were considered by the Panel. Forty-one submissions requested that the author remain anonymous. The content of their submissions was, however, considered by the Panel in the preparation of this Report.

Individual submitters

- Lynette Faulkner
- Brian & Carol Newman
- Keith Lumsden
- M J Cribbin
- Malcolm John Glover
- Keith Cordwell
- Jon B Greenwood
- Douglas Eaton
- Rowena McNally
- Grahame B Dunn
- Ian Campbell
- Eric Nothard
- Jocelyn Clarkson
- Robert Moran
- Nigel French
- Jack Wallis
- Tim Griffin
- Ruth Milner
- Les Rode
- Trevor J Gilbert
- David Abernethy
- Vicki O'Flynn
- Bruce Wilkinson
- Derrick J Austin
- Keith Bagnall

Businesses Submissions

- Deuar Pty Ltd (Dr Kris Deuar)
- Taroom Four Square (Chris Stringer)
- Equigold NL Mt Rawdon Gold Mine (David Morgan)
- Shane & Mary Lou Gittins
- Australian Underground Construction & Tunnelling Association (Alan Robertson)
- Brisbane Hi-Load Escort Services (Keiron Shepherd)

Consumer Group or Committee Submissions

- Macleay Island Ratepayers Association (Rod Carter)
- Kersley Grove Body Corporate Committee (J Malcolm Rose)
- Booringa Action Group Inc. (Wayne Dobbin)
- Glenwood Progress Association (Kerrie Bartlett)
- Wynnum/Lytton Community Group (Ron Dale)
- Alternative Technology Association (Qld Branch) (Raymond Miller)

Local Government

- Roma Town Council (Ian O'Donnell)
- Barcoo Shire (Karissa Hooper)
- Taroom Shire Council (Denis Carr)
- Councillor Gail Macpherson
- Broadsound Shire Council (Gordon Webley)
- Gold Coast City Council (Joseph T Hance)

State Government

Peter Wellington MP on behalf of:
- Jack Rossiter

Howard Hobbs MP on behalf of:
- petitioners from Balonne, Boringa and Paroo Shires
- the Glenmorgan Community
- Tara Shire Council
- Philip Leeds
- Nita Chandler
- John East
- Booringa Action Group
- Belinda McGrorey
- David Newsham
- seven other constituents (names with held)

Research/Academic

- in tempore Advisory (Mark Christensen)
- The University of Queensland and Lightning and Transient Protection Pty Ltd (Emeritus Professor Mat Darveniza)
- Coaching First Australia (Derrik J. Austin)

Electricity Corporation

- ENERGEX (Neville Bradford)
- Ergon Energy Corporation Ltd (Tony Pfeiffer)

Regional Electricity Councils

- North Queensland Regional Electricity Council (Professor Peter Arlett)
- Far North Queensland Regional Electricity Council (Tom Pyne)
- Mackay Regional Electricity Council (Mario Demartini)

Unions

- Electrical Trades Union of Employees of Australia (Qld Branch) (Peter Simpson)

Individual submitters	Businesses Submissions	Consumer Group or Committee Submissions	Local Government	State Government	Research/Academic	Electricity Corporation	Regional Electricity Councils	Unions
- Ben Lawson - Helen France - Bernie Nicolle & Kerrie Bartlett - Regine Ruppet, Gabi Luft & Helen Rosenbaum - Jack Taylor - Linda Beckett - Duncan Ezzy - Cynthia Bates - Christine Burrows - Christopher & Renuka Russell - Peter H Brown - John Drinkwater - Ian & Julie Groves - Peter Hale - Ray Pyzik		- Energy Users Association of Australia (Roman Domanski) - Queensland Consumers Association (Ian Jarratt and Fiona Guthrie) - Prosper Australia (Victoria) Inc. (Dr Gavin Putland) - Bellthorpe Road Safety Council (Bede Mackenzie) - Commerce Queensland (Stewart McFarlane) - www.treeless.org		Andrew Fraser MP on behalf of: - twelve constituents (names with held) Barbara Stone MP Ted Malone MP			- SEQ Regional Electricity Council (John Magee) - SW Regional Electricity Council (Phil Doyle) - Wide Bay-Burnett Regional Electricity Council (Alan Brown) - Capricornia Regional Electricity Council (Peter Corones)	

Appendix 3
CONSULTANCIES

The Panel has relied on consultancies undertaken by the following groups as part of the Review process:

- Deloitte Touche Tohmatsu;
- Evans & Peck;
- Network Advisory Services; and
- Call Centre Development Pty Ltd*.

* Call Centre Development Pty Ltd undertook a detailed study of the ENERGEX and Ergon Energy Contact Centres. Although this study was commissioned prior to the establishment of the Review, its analysis and findings have been considered by the Panel in Chapter 9 of this Report.

Appendix 4
ABBREVIATIONS

Abbreviation	Definition
AARR	Aggregate Annual Revenue Requirement
AIDM	Asset Inspection and Defect Management
ADMD	After Diversity Maximum Demand
CAIDI	Customer Average Interruption Duration Index
CB	Circuit Breaker
CBD	Central Business District
CCD	Call Centre Development Pty Ltd
CCR	Customer Care Representative
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CPI	Consumer Price Index
CSO	Community Service Obligation
CSR	Customer Service Representative
CASAD	Computer Aided Schedule and Dispatch
DM	Demand Management
ECPO	Energy Consumer Protection Office
ETU	Electrical Trades Union
FAO	Faults Analysis Officer
FTEs	Full Time Equivalents
GIS	Geographical Information System
GOC	Government Owned Corporation
GSP	Gross State Product
HV	High Voltage
IVR	Interactive Voice Response (Unit)
kV	Kilovolt

kVA	Kilovolt-amps
kW	Kilowatt
LV	Low Voltage
MAIFI	Momentary Average Interruption Frequency Index
MVA	Megavolt-amps
MW	Megawatt
MWh	Megawatt hours
NECA	National Electricity Code Administrator
NEM	National Electricity Market
NFM	Network Facilities Management
NEMMCO	National Electricity Market Management Company
NIEIR	National Institute of Economic and Industrial Research
NSW	New South Wales
PM	Preventative Maintenance
POC	Power Outage Console
PoE	Probability of Exceedance
PRAM	Project Risk Assessment Methodology
QCA	Queensland Competition Authority
QNI	Queensland-New South Wales Interconnector
RAP system	Reliability Assessment Planning system
RAPS	Remote Area Power Supply
REC	Regional Electricity Council
RTO	Registered Training Organisation
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCM	Service Call Management
SWER	Single Wire Earth Return
TRG	Technical Review Group

Appendix 5
GLOSSARY

Term	Abbreviation	Description
Annual Aggregate Revenue Requirement	AARR	The total amount of revenue the regulated entity can recover from customers for the use of the regulated assets.
Contestable and non-contestable Customers		Contestable customers are those customers who are able to choose their electricity retail suppliers. Queensland franchise (non-contestable) customers are those who are unable to choose their retailer and are subject to uniform tariffs regardless of their geographical location or the cost of supply. The requirements for becoming a contestable customer relate to the level of electricity consumed on an annual basis. In Queensland, there are four tranches of contestability. From 1 July, 2004, a new tranche (T4A) was introduced, allowing for a larger base of franchise customers to potentially move into the contestable market. The tranches of contestability are as follows: • Tranche 1 >40 GWh p.a. • Tranche 2 >4 GWh p.a. • Tranche 3 >200 MWh (0.2 GWh) p.a. • Tranche 4A>100 MWh (0.1 GWh) p.a.
Contingent Capacity		Contingent capacity means the extent to which spare capacity has been built into the system so that in the event of equipment failure, the system has capacity to continue to carry the load.
Customer Average Interruption Duration Index	CAIDI	The average duration (in minutes) of long duration (more than 1 minute) outages over a period of time.
Distribution Sub-Stations		Distribution sub-stations normally convert electricity from high voltage (11kV) to the low voltage (240/415 volts) that services most customers. They are usually pole-mounted transformers or enclosed ground level padmounts.

Term	Abbreviation	Description
Distribution Network Service Provider	DNSP	Under the Code, distributors such as ENERGEX and Ergon Energy are referred to as Distribution Network Service Providers.
Energy Consumer Protection Office	ECPO	This is a body within the Office of Energy responsible for customer protection in accordance with *Electricity Act 1994*.
Government Owned Corporation	GOC	The is a corporation established under the *Government Owned Corporations Act 1993*
Interactive Voice Response	IVR	An interactive voice response unit is an automated telephone answering system that plays voice prompts or voice menus and allows the user to respond via the telephone keypad.
Momentary Average Interruption Frequency Index	MAIFI	The average number of short duration (less than 1 minute) outages experienced by a customer over a period of time.
Megawatt	MW	One thousand kilowatts
Megawatt hours	MWh	One thousand kilowatt hours
National Electricity Code	NEC	(Also called "*The Code*") Defines the design of the NEM and the terms of participation in the wholesale electricity market for generators, transmission and distribution network owners and service providers, retailers and customers.
National Electricity Market	NEM	A wholesale market for the supply and purchase of electricity combined with a regime of open access (i.e. no one holds rights over) for use of the transmission and distribution networks in the participating jurisdictions of the ACT, NSW, QLD, SA and VIC.
National Electricity Market Management Company	NEMMCO	A company formed by the participating jurisdictions to administer the operation of the wholesale electricity market and security of the power system.
Probability of Exceedance	PoE	PoE describes the probability that the maximum temperature in a particular year will exceed the long term average maximum temperature.
System Control and Data Acquisition	SCADA	Equipment which allows the remote reading of system information and the remote switching of network elements, such as circuit breakers.
Single Wire Earth Return	SWER	A type of electricity powerline that has only one wire, with the return path for the electrical circuit

Term	Abbreviation	Description
		being through the ground. SWER lines are commonly used for long feeders in rural areas which have few customers.
System Average Interruption Duration Index	SAIDI	The average duration (in minutes) of long duration (more than 1 minute) outages experienced by a customer over a period of time.
System Average Interruption Frequency Index	SAIFI	The average number of long duration (more than 1 minute) outages experienced by a customer over a period of time.
Telemetry		Equipment used to send electrical data from remote sources to central control room.
Tranche		The grouping of electricity consumers by their electricity use. The NEM currently has four tranches of usage, ranging from tranche 1 (the very large users) to tranche 4 (the average domestic user). NSW, Victoria and South Australia have, or are in the process of, implementing contestability into all four tranches. Queensland allows contestability in tranches 1, 2 and 3 and from 1 July, 2004, a new tranche (T4A) was introduced, allowing for a larger base of franchise customers to potentially move into the contestable market.

Appendix 6
CURRICULA VITAE OF PANEL MEMBERS

Darryl Somerville (Chairman)

Darryl Somerville is a partner in PricewaterhouseCoopers in Brisbane. He joined the firm in 1982 from the Australian Taxation Office. He became a partner after three and a half years with the firm and eighteen months later was put in charge of the Taxation Practice in Brisbane. In the mid 1990s, he was appointed as the National Leader of the firm's Indirect Tax Practice, a position that he held until the GST was introduced in the year 2000.

At the end of October 2003, Mr Somerville finished an eight and a half year term as the Managing Partner of the Brisbane Office. His clients have included businesses ranging from privately owned companies through to multi-nationals in the manufacturing, mining, energy and resources and retailing industries. He was a member of the PricewaterhouseCoopers National Board of Partners (and its predecessor) for seven years until 30 June 2004. In January 2003, Darryl finished a three year term as a National Director of the Institute of Chartered Accountants.

Mr Somerville holds a Bachelor of Commerce degree and is a Fellow of the Institute of Chartered Accountants of Australia, a Fellow of the Australian Society of Certified Practising Accountants and a Fellow of the Taxation Institute of Australia.

Steve Blanch (Member)

Steve Blanch is the CEO of Dellwind Australia – a specialist consulting company focussing on strategic advice in the Utility Industry. He recently returned from Saudi Arabia, where he was the Chief Operating Officer for the newly privatised Marafiq Utility – which produced and distributed water, wastewater and seawater for cooling, and electricity generation and distribution. He was formerly chairman of Energy Brix Australia Pty Ltd, a briquetting and cogeneration power business.

Mr Blanch was previously the Chairman of a Government Taskforce, to introduce full retail contestability to the Victorian Gas Market, and he also chaired the task force for the Victorian segment of the National Electricity Market.

Mr Blanch brings in excess of 40 years broad experience in the utility industry, both in Australia and New Zealand. He has been a Chief Executive Officer for 13 years and has held senior and executive management positions in Retail, Distribution, Project Development, Project Management, Transmission Development, System

planning, Design Engineering and Computer Application Development in the electricity industry. In New Zealand he was Managing Director of the PowerDesignBuild Group providing design, construction, maintenance and operations services to the Transmission and general Utility Industry.

Mr Blanch holds a Masters Degree in Electrical Engineering; a First Class honours degree in Electrical Engineering, and a Diploma of Electrical Engineering. He was formerly a fellow of the Institute of Engineers of Australia and member of the Australian Institute of Company Directors.

Jack Camp (Member)

In October 2002, the Governor in Council appointed Jack Camp as the Commissioner for Electrical Safety. The Commissioner advises the Minister for Industrial Relations on electrical safety matters generally and proposed codes of practice to manage electrical risks. Other functions include chairing and managing the activities of the Electrical Safety Board and the Board's committees, which are specifically concerned with licensing and disciplinary matters, electrical safety promotion and standards for electrical equipment. He was also the Assistant Secretary of the Electrical Trades Union of Queensland.

Mr Camp is a qualified electrical fitter mechanic, has many years of experience in the electricity industry and has served on several key electricity related boards. He was previously chair of the Electrical Workers and Contractors Board and a member of the Electrical Approval and Energy Labelling Advisory Committee.