

Summary Report

of the Independent Panel

*Electricity Distribution
and Service Delivery
for the 21st Century*

Queensland

July 2004

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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 Summary 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 Summary Report.

TABLE OF CONTENTS

Foreword from the Chairman	1
Table of Contents	3
Summary Report	4
Appendix 1 Terms of Reference	32
Appendix 2 Background to the Review and the Process Followed	34
Appendix 3 Overview of the Queensland Electricity Supply Industry	37
Appendix 4 Abbreviations	45
Appendix 5 Glossary of Terms	46
Appendix 6 Detailed Recommendations	48

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 Summary 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. It 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 Panel's findings, it was timely that this Review took place when it 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 networks.

Currently some key parts of the networks 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 than overhead services. 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 Summary 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. 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, invites public comment 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 QCA's 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.

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. ENEREX 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 ENEREX predicted would be necessary at the time of its 2001 QCA submission. The Panel notes that the QCA’s consultants did not consider ENEREX’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. ENEREX is not only proposing to devote more resources to vegetation management but is implementing a vegetation management plan that will address the entire ENEREX network with a maximum 2.5 year cycle time.

Some years ago, ENEREX 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, ENEREX 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.

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.

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 for 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 and these are set out in Appendix 6 of this Summary 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.

Appendix 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.

Appendix 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 of the Detailed Report.

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 of the Detailed Report. 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 of the Detailed Report and a summary of the key issues raised in the submissions is provided in Appendix 1 of the Detailed Report.

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.

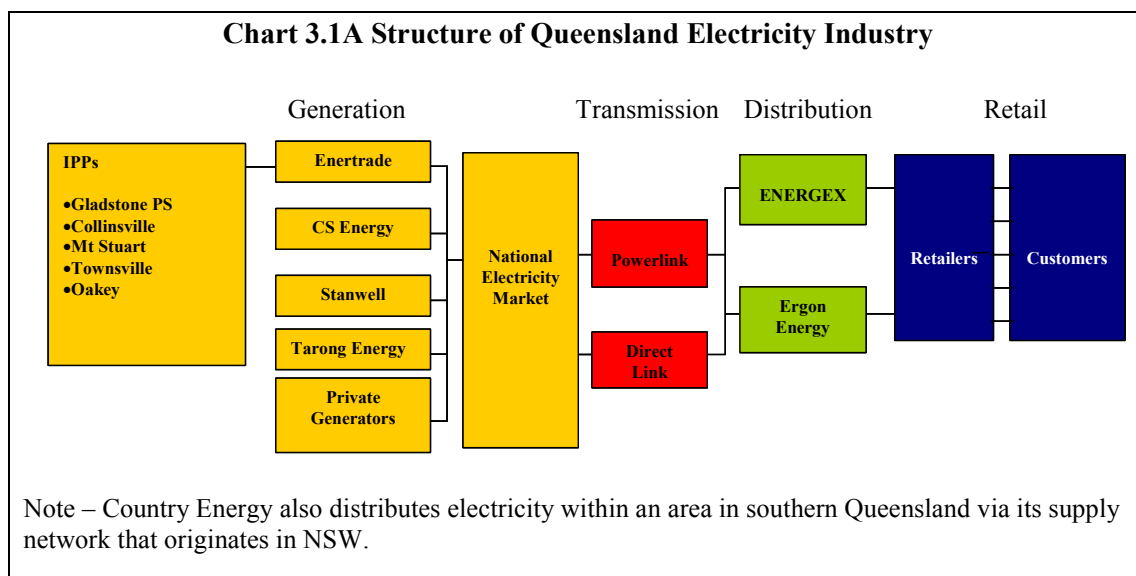
Appendix 3

OVERVIEW OF THE QUEENSLAND ELECTRICITY SUPPLY INDUSTRY

This Appendix 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.

3.1 Queensland Electricity Supply Industry Structure

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



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:

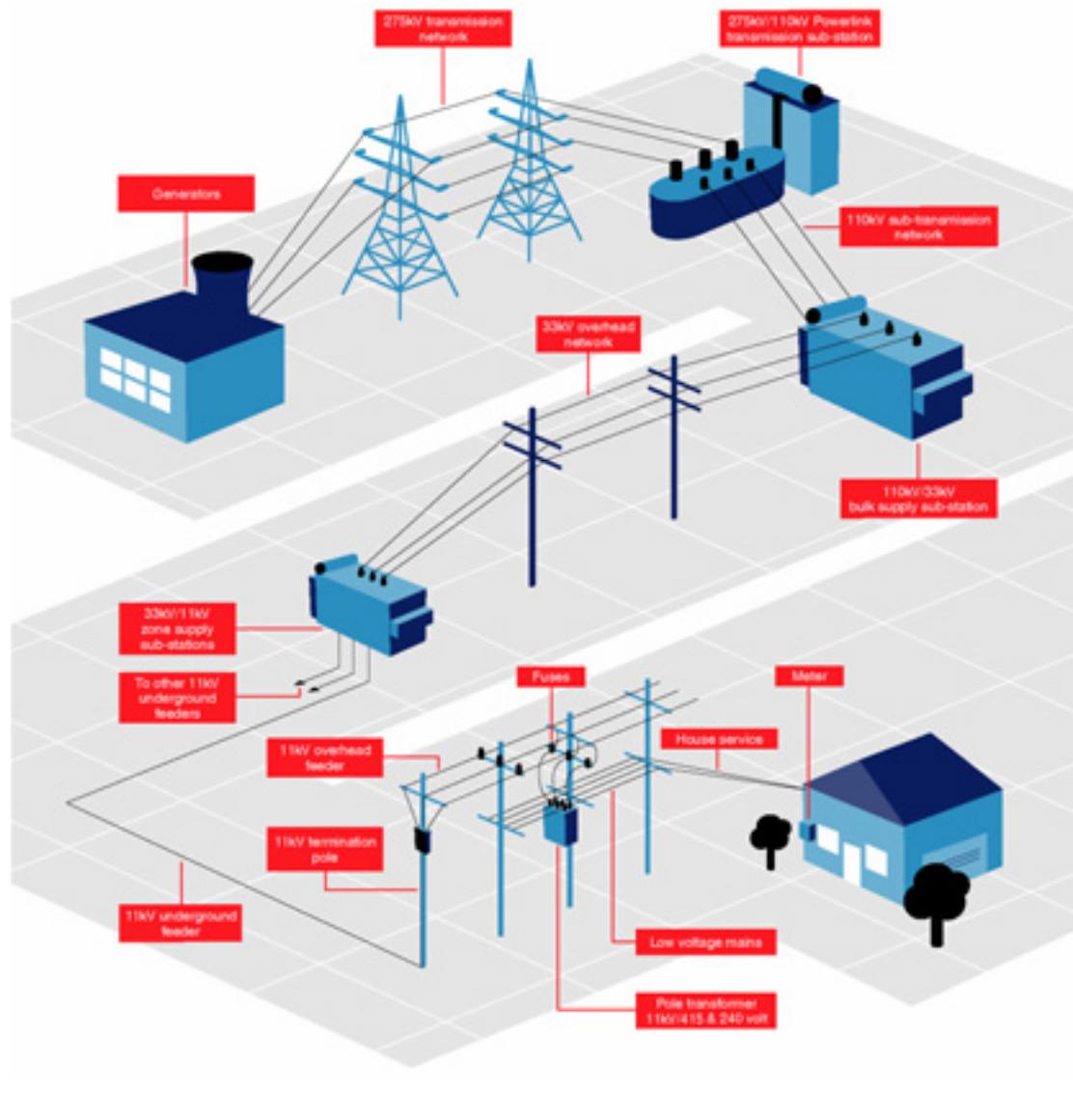
- Bulk supply sub-stations – these sub-stations transform electricity supplied from the 132kV or 110kV system to lower voltages for supply to zone supply sub-stations;
- Sub-transmission powerlines – these powerlines transmit electricity at 132kV, 110kV, 66kV or 33kV from the bulk supply sub-stations 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.

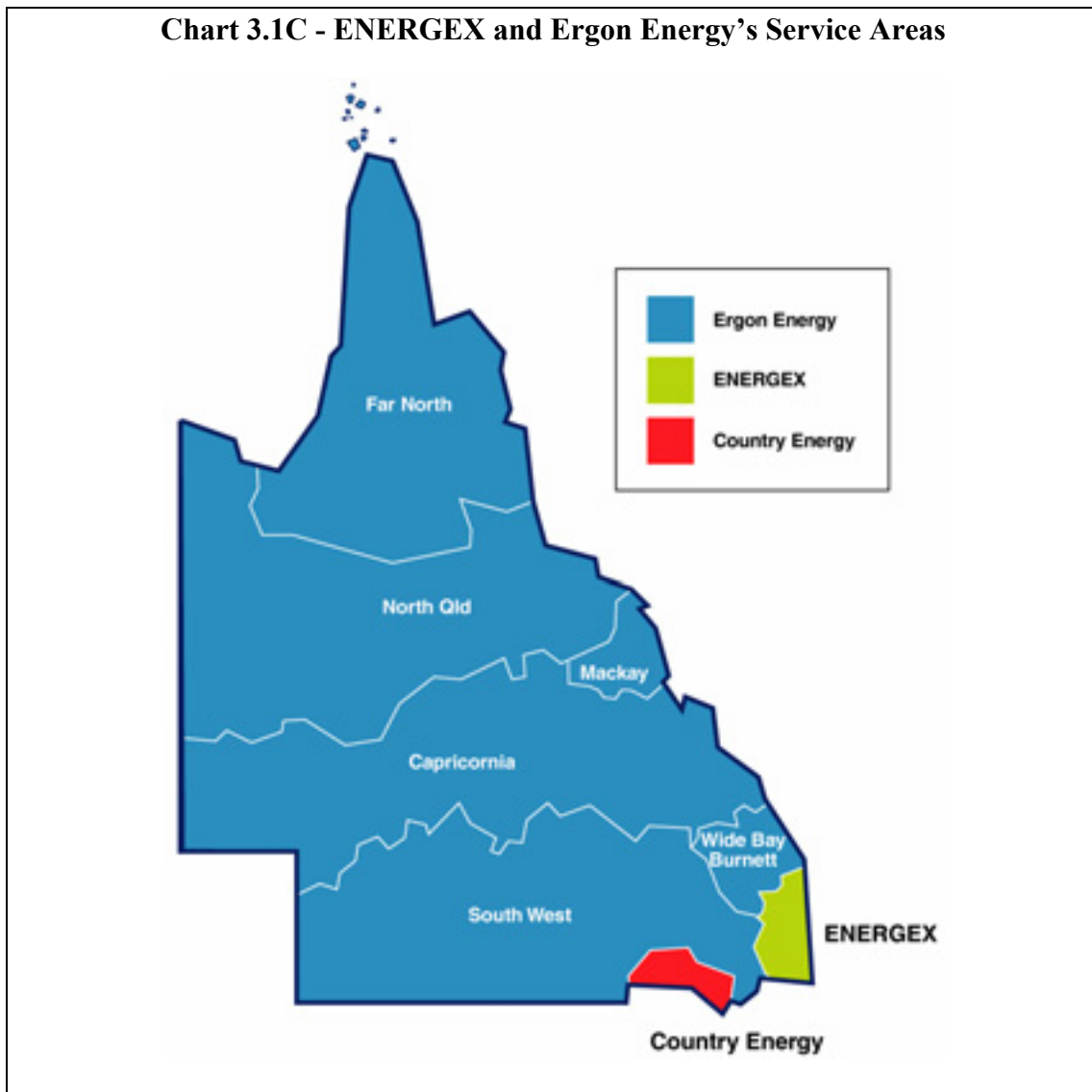
Additionally, Country Energy, a NSW government-owned distributor, holds a Special Approval under the *Electricity Act 1994* which authorises it to distribute and sell electricity to about 5,500 customers within an area in southern Queensland from its network which extends across the State border.

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.



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.

Appendix 4

ABBREVIATIONS

Abbreviation	Definition
AIDM	Asset Inspection and Defect Management
CAIDI	Customer Average Interruption Duration Index
CB	Circuit Breaker
CBD	Central Business District
CCD	Call Centre Development Pty Ltd
ECPO	Energy Consumer Protection Office
ETU	Electrical Trades Union
IVR	Interactive Voice Response (Unit)
kV	Kilovolt
kVA	Kilovolt-amps
kW	Kilowatt
MVA	Megavolt-amps
NECA	National Electricity Code Administrator
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NSW	New South Wales
PoE	Probability of Exceedance
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
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SWER	Single Wire Earth Return
TRG	Technical Review Group

Appendix 5

GLOSSARY OF TERMS

Term	Abbreviation	Description
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.
Energy Consumer Protection Office	ECPO	This is a body within the Office of Energy responsible for customer protection in accordance with <i>Electricity Act 1994</i> .
Government Owned Corporation	GOC	This is a corporation established under the <i>Government Owned Corporations Act 1993</i>
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.
National Electricity Code	NEC	(Also called “ <i>The Code</i> ”) 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.
Single Wire Earth Return	SWER	A type of electricity powerline that has only one wire, with the return path for the electrical circuit 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.

Appendix 6

DETAILED RECOMMENDATIONS

The following is the full set of recommendations set out in the Detailed Report. This Summary Report does not address all of the issues dealt with in these detailed recommendations. For a full understanding of the detailed recommendations, readers should refer to the Detailed Report.

Queensland's Regulatory Environment

- 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.

Reliability of the Distribution Networks

- 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;³
- 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.

³ 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.

Capital Expenditure on the Distribution Networks

- 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.

Maintenance of the Distribution Networks

- 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.

ENERGEX and Ergon Energy's Internal Systems

- 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.

Communicating with the Public on Outages

- 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.

ENERGEX and Ergon Energy's Resourcing

- 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.

Single Wire Earth Return, Demand Management and Special Dividends

- 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.